INTERNATIONAL CIVIL AVIATION ORGANIZATION

FINAL REPORT

REPORT OF THE TWENTY SECOND MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/22)

Bangkok, Thailand, 5 to 9 September 2011

The views expressed in this Report should be taken as those of the APANPIRG and not of the Organization. This Report will be presented to the Air Navigation Commission/Council and any formal action taken will be published in due course as a supplement to the Report.

Approved by the Meeting
and published by the ICAO Asia and Pacific Office

TABLE OF CONTENTS

PART I - HISTORY OF THE MEETING

Page

1.1 Introduction i-1

1.2 Attendance i-1

1.3 Opening of the Meeting i-1

1.4 Officers and Secretariat i-2

1.5 Agenda of the Meeting i-2

1.6 Working Arrangements, Language and Documentation i-3

1.7 Conclusions and Decisions - Definition i-3

1.8 Terms of Reference of APANPIRG i-3

List of Conclusions i-5

List of Decisions i-7

PART II – REPORT ON AGENDA ITEMS

Agenda Item 1 Follow-up on the outcome of APANPIRG/21 Meeting 1.1-1

1.1 Review of the Action taken by the ANC and the Council on the Report of APANPIRG/21 …… 1.1-1

1.2 Review Status of Implementation of APANPIRG/21 Conclusions and Decisions…… ...1.2-1
Appendix A

1.3 Review Status of Implementation of APANPIRG Outstanding Conclusion and Decisions…….....1.3-1
Appendix A

Agenda Item 2 Flight Safety and RASG APAC Activities
Global and Inter Regional Activities ..... ….....2-1

Agenda Item 3 Performance Framework for Regional Air Navigation Planning and Implementation

3.0 Regional and National Performance Framework 3.0-1
Attachments 1 to 4

3.1 AOP…… 3.1-1

3.2 ATM/AIS/SAR……..……..…..3.2-1
Appendices A to G

3.3 RASMAG…… ..... ……3.3-1
Appendices A to E

3.4 CNS/MET……..... ……. 3.4-1
Appendices A to S

3.5 Other Air Navigation Matters……..... ……3.5-1

Agenda Item 4 Regional Air Navigation Deficiencies 4-1
Attachment A to D

Agenda Item 5 Future Work Programme 5-1
Appendices A to D

Agenda Item 6 Any Other Business 6-1

Attachments to the Report

Attachment 1 – List of Participants

Attachment 2 – List of Papers

Attachment 3 – APANPIRG/22 Conclusions/Decisions - Action Plan

PART I — HISTORY OF THE MEETING

PART I - HISTORY OF THE MEETING

1.1 Introduction

1.1.1 The Twenty Second Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/22) was held in Bangkok, Thailand from 5 to 9 September 2011 at the ICAO Asia/Pacific Regional Office.

1.2 Attendance

1.2.1 The meeting was attended by 127 participants from 24 Member States and 4 International Organizations (IATA, IACA, IFALPA and CANSO).

1.2.2 A list of participants is given at **Attachment 1** to the Report.

1.3 Opening of the Meeting

Welcome address by Mr. Mokhtar A. Awan, Regional Director, ICAO Asia/Pacific Office and Secretary APANPIRG

1.3.1 Mr. Awan welcomed the participants from the Member States, International Organizations, ICAO HQ and Mr. Norman Lo APANPIRG Chairman. He also conveyed his appreciation to the outgoing APANPIRG Chairman Mr. W. L. Wong for his leadership in guiding the work of APANPIRG during his tenure.

1.3.2 In highlighting some of the global issues from ICAO perspective, he mentioned the industry support for the establishment of runway safety teams and the harmonized development of air navigation system at a global level. On regional issues, he mentioned that in line with ICAO Assembly Resolutions, PBN Implementation was progressing well and the much awaited seamless ATM symposium and Ad Hoc meeting to decide on the mechanism/way forward had been conducted.

1.3.3 In addition, he recalled the considerable work regarding in the implementation of new ADS-B surveillance technology and improvements in the provision of meteorology for international aviation. He said these initiatives and activities demonstrated the spirit of cooperation and coordination between APAC States and established a foundation for a seamless ATM system.

1.3.4 He also recalled the 37th Assembly Resolution A 37/19 and the steps taken by ICAO to minimize the impact of aviation on climate change.

Opening remarks by Mr. Norman Lo, Director General of Civil Aviation, Civil Aviation Department, Hong Kong, China and Chairman APANPIRG

1.3.5 In his opening remarks the Chairman welcomed the members. He cited that Asia& Pacific were the world's fastest growing aviation market and that these regions would become the power house of air traffic growth. At the same time, he cautioned about uncertainties due to economic slowdown, rising prices and inflation, which could hamper aviation business. Against this back drop, he said the task of the APANPIRG was going to be challenging. However he mentioned that with dedication and willingness to go an extra step a lot could be achieved in promoting the safe and harmonious development of civil aviation in the regions.

1.3.6 The Chairman also noted further that under the leadership of the ICAO Asia/Pacific Regional Office and with the commitment of States, APANPIRG and its Sub-Groups and Task Forces

have made notable progress in many areas over the previous year. He highlighted the progress achieved in:

1) implementation of the New Flight Plan Format;

2) PBN implementation and the Asia Pacific Flight Procedure Programme; and

3) implementation of ADS-B.

1.3.7 He acknowledged that, although much had been achieved since APANPIRG/21, there was still a lot to do in the long term interest of promoting the civil aviation development in the Asia/Pacific Region.

1.4 Officers and Secretariat

1.4.1 Mr. Norman Lo, Director General of Civil Aviation, Department of Civil Aviation, Hong Kong, China, and Chairman of the APANPIRG, presided over the meeting.

1.4.2 Mr. Mokhtar A. Awan, ICAO Regional Director, Asia/Pacific Office, was the Secretary of the meeting, assisted by Mr. N. C. Sekhar, Regional Officer/AGA.

1.4.3 The meeting was also assisted by Mr. H. V. Sudarshan, Regional Programme Officer and Mr. Saulo Da Silva ATM Officer, ICAO Headquarters, Mr. Y. Imawaka Deputy Regional Director, Mr. Len Wicks, Regional Officer/ATM, Mr. Li Peng and Mr. S. Saraswati, Regional Officers/CNS.

1.5 Agenda of the Meeting

1.5.1 The meeting adopted the following agenda:

Agenda Item 1		Follow-up on the outcome of APANPIRG/21 Meeting
	1.1	Review of the action taken by the ANC and the Council on the Report of APANPIRG/21
	1.2	Review Status of Implementation of APANPIRG/21 Conclusions and Decisions
	1.3	Review Status of Implementation of APANPIRG Outstanding Conclusions and Decisions
Agenda Item 2		Flight Safety and RASG-APAC Activities Global and Inter Regional Activities
Agenda Item 3		Performance Framework for Regional Air Navigation Planning and Implementation
	3.0	Regional and National Performance Framework
	3.1	AOP
	3.2	ATM/AIS/SAR
	3.3	RASMAG
	3.4	CNS/MET
	3.5	Other Air Navigation Matters

Agenda Item 4	Regional Air Navigation Deficiencies
Agenda Item 5	Future Work Programme
Agenda Item 6	Any other business

1.6 Working Arrangements, Language and Documentation

1.6.1 The working language of the meeting was English inclusive of all documentation and this Report. Information Papers (IP) and Working Papers (WP) considered by the meeting are listed in the **Attachment 2** to this Report.

1.7 Conclusions and Decisions - Definition

1.7.1 The APANPIRG records its actions in the form of Conclusions and Decisions with the following significance:

1) Conclusions deal with matters which, in accordance with the Group's Terms of Reference, require the attention of States or actions by ICAO in accordance with established procedures; and

2) Decisions deal with matters of concern only to the APANPIRG and its contributory bodies.

1.7.2 Lists of Conclusions and Decisions are given on pages i-5 to i-7.

1.8 Terms of Reference of APANPIRG

1.8.1 The Terms of Reference of APANPIRG was approved by the Council of ICAO (6th Meeting of its 171st Session on 27 February 2004) and revised consequent to the decision of the Council [C- DEC 183/9, March/April 2008 and C-WP/13558,C 190/4 on 25 May 2010]. The revised terms of reference are:

1. Membership

All ICAO Contracting States, who are service providers in an air navigation region and part of that region's ANP, should be included in the membership of that region's PIRG. Furthermore user States are entitled to participate in any other PIRG Meetings as a non member. International Organisations recognised by the Council may be invited as necessary to attend PIRG meetings as observers.

2. The Terms of Reference of the Group are:

a) to ensure continuous and coherent development of the Asia/Pacific Regional Air Navigation Plan and other relevant regional documentation in a manner that is harmonized with adjacent regions, consistent with ICAO SARPs and Global Air Navigation Plan for CNS/ATM Systems (DOC 9750) and reflecting global requirements;

b) to facilitate the implementation of air navigation systems and services as identified in the Asia/Pacific Regional Air Navigation Plan with due observance to the primacy of air safety, regularity and efficiency; and

c) to identify and address specific deficiencies in the air navigation field.

3. In order to meet the Terms of Reference, the Group shall:

a) review, and propose when necessary, the target dates for implementation of facilities, services and procedures to facilitate the coordinated development of the Air Navigation Systems in the Asia/Pacific Region;

b) assist the ICAO Asia/Pacific Regional Office in fostering the implementation of the Asia/Pacific Regional Air Navigation Plan;

c) in line with the Global Aviation Safety Plan (GASP), facilitate the conduct of any necessary systems performance monitoring, identify specific deficiencies in the air navigation field, especially in the context of safety, and propose corrective action;

d) facilitate the development and implementation of action plans by States to resolve identified deficiencies, where necessary;

e) develop amendment proposals to update the Asia/Pacific Regional Air Navigation Plan to reflect changes in the operational requirements;

f) monitor implementation of air navigation facilities and services and where necessary, ensure interregional harmonization, taking due account of organizational aspects, economic issues (including financial aspects, cost/benefit analyses and business case studies) and environmental matters;

g) examine human resource planning and training issues and propose where necessary human resource development capabilities in the region that are compatible with the Asia/Pacific Regional Air Navigation Plan;

h) review the Statement of Basic Operational Requirements and Planning Criteria and recommend to the Air Navigation Commission such changes as may be required in the light of new developments in the air navigation field;

i) request financial institutions, on a consultative basis as appropriate to provide advice in the planning process;

j) maintain close cooperation with relevant organizations and State grouping to optimize the use of available expertise and resources;

k) conduct the above activities in the most efficient manner possible with a minimum of formality and documentation and call meetings of the APANPIRG when deemed necessary to do so; and

l) coordinate with RASG APAC on safety issues.

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List of Conclusions

Conclusion 22/1	**–**	**FPL 2012 Implementation Co-ordination**
Conclusion 22/2	**–**	**AIM Transition Table**
Conclusion 22/4	**–**	**APAC ATFM Regional Concept of Operations**
Conclusion 22/5	**–**	**Major Traffic Flow (New)**
Conclusion 22/7	**–**	**Asia/Pacific Air Navigation Concept of Operations**
Conclusion 22/8	**–**	**ADS-B Airspace Mandate**
Conclusion 22/9	**–**	**Regional ATM Contingency Plan Task Force**
Conclusion 22/10	**–**	**RVSM Approvals**
Conclusion 22/11	**–**	**Minimum Monitoring Requirements Amendment**
Conclusion 22/12	**–**	**Provision of Datalink Performance Data to CRA**
Conclusion 22/17	**–**	**Amendment to FASID Tables – CNS 1B, 1C and 1E**
Conclusion 22/18	**–**	**ASIA/PAC AMHS Technical Specifications**
Conclusion 22/19	**–**	**Expedite ATN/AMHS Implementation**
Conclusion 22/20	**–**	**Second Satellite Data-link Operational Continuity (SOCM/2) and Seminar on Satellite Data-link Communication**
Conclusion 22/21	**–**	**Identical SELCAL Codes**
Conclusion 22/22	**–**	**GNSS Minimum Requirement for RNP Navigation Specifications**
Conclusion 22/23	**–**	**Participation in the ASIA/PAC Flight Procedure Programme**
Conclusion 22/24	**–**	**Regional RAIM Prediction System and Minimum Technical and Operational Requirements**
Conclusion 22/25	**–**	**Regional PBN Plan Amendment**
Conclusion 22/26	**–**	**Workshop on GNSS Implementation**
Conclusion 22/27	**–**	**Sharing of Ionospheric Data**
Conclusion 22/28	**–**	**Protection of Aviation Utility of GNSS**
Conclusion 22/29	**–**	**Revised Navigation Strategy for the Asia/Pacific Region**
Conclusion 22/31	**–**	**Development of Guidance Material on ADS-B**
Conclusion 22/32	**–**	**Coordination for VHF for Sharing Voice Communication Capability**

Conclusion 22/33	**–**	**Support DO260B Compliant Avionics**
Conclusion 22/35	**–**	**Expedite ADS-B Implementation Project in South China Sea Area**
Conclusion 22/36	**–**	**Amendment to Regional Supplementary Procedures on ADS-B**
Conclusion 22/37	**–**	**ICAO Position on WRC-12 Agenda Items of Critical Interest to Civil Aviation**
Conclusion 22/38	**–**	**Frequency Spectrum Management**
Conclusion 22/39	**–**	**Accessibility to WIFS and currency of WIFS User Guide and Administrative Messages**
Conclusion 22/40	**–**	**Secure SADIS FTP Download Speed**
Conclusion 22/41	**–**	**Improvement of WAFS SIGMET Availability**
Conclusion 22/42	**–**	**Improvement of WAFC SIGWX Charts**
Conclusion 22/43	**–**	**SIGMET Code**
Conclusion 22/44	**–**	**SIGMET Template and Example for No VA Expected**
Conclusion 22/45	**–**	**Improvement of Timeliness, Regularity and Availability of OPMET Data on the SADIS and ISCS Broadcast**
Conclusion 22/46	**–**	**Amendment to Intro Text of Part IV of Asia/Pacific BANP**
Conclusion 22/47	**–**	**Training Manual (Doc 7192) Part E-2**
Conclusion 22/48	**–**	**Trials on XML Based Data over AMHS**
Conclusion 22/49	**–**	**Estimating Environment Benefits**
Conclusion 22/50	**–**	**Addition of the APANPIRG Air Navigation Deficiencies for Non Compliance with Annex 14 SARPs**
Conclusion 22/51	**–**	**Addition of the APANPIRG Air Navigation Deficiency for Lack of SIGMET in Equatorial Region**

List of Decisions

Decision 22/3 – **ATFMSG Terms of Reference**

Decision 22/6 – **Establishment of SAIOACG**

Decision 22/13 – **Datalink Performance Monitoring Body**

Decision 22/14 – **Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) Endorsement**

Decision 22/15 – **Japan Airspace Safety Monitoring Agency (JASMA) Endorsement**

Decision 22/16 – **Revised TOR and Subject/Tasks List of ATNICG**

Decision 22/30 – **Subject/Tasks List of ADS-B Study and Implementation**

Decision 22/34 – **Name and Terms of Cooperation of ADS-B Implementation WG**

Decision 22/52 – **New APANPIRG Structure**

Decision 22/53 – **Term for Chairperson/Vice Chairperson of Sub Groups**

Decision 22/54 – **Revised Terms of Reference of APANPIRG Sub group and AOP Working Group**

Decision 22/55 – **Dissolution of ABSRTF**

Decision 22/56 – **Establishment of Asia/Pacific Seamless ATM Planning Group**

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PART II — REPORT ON AGENDA ITEMS

AGENDA ITEM 1: FOLLOW-UP ON THE OUTCOME OF APANPIRG/21 MEETING

Agenda Item 1.1: Review of the Action taken by the ANC and the Council on the Report of APANPIRG/21

Agenda Item 1.2: Review Status of Implementation of APANPIRG/21 Conclusions and Decisions

Agenda Item 1.3: Review Status of Implementation of APANPIRG Outstanding Conclusions and Decisions

Agenda Item 1: Follow-up on the Outcome of APANPIRG/21 Meeting

1.1 Review of the actions taken by on the Report of APANPIRG/21 (WP2)

1.1.1 The Meeting was presented with actions taken by the Air Navigation Commission (ANC) during its review and approval of the Report of the Twenty First Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/21), which was held in Bangkok, Thailand from 6 to 10 September 2010. The meeting noted the specific actions taken by the ANC and the follow-up by the States and Secretariat on Conclusions and Decisions of the Meeting as contained in **Appendix A** to **Agenda Item 1.2 of the Report**. In the case of the APANPIRG/21 Report, the meeting noted that as there were no specific items that required Council action, the said Report was not submitted to the Council. The meeting was informed of the following highlights of the review undertaken by the ANC.

1.1.2 Referring to Conclusion 21/3, the meeting noted that the ANC concurred with the view of APANPIRG on the need to have a common set of performance metrics for all the ICAO Regions and requested the Secretariat to complete the task along with guidance for the collection of data by September 2011.

1.1.3 With reference to Decision 21/9, the meeting was informed that the ANC encouraged APANPIRG to expedite the development of a volcanic ash regional contingency plan in coordination with all parties concerned.

1.1.4 Confirming the request of APANPIRG in Conclusions 21/17, the meeting noted that the ANC called upon the Secretariat to provide clarification on the issues related to the Aeronautical Telecommunication Network/Air Traffic Services (ATS) Message Handling System (ATN/AMHS) implementation. Also, responding to a request in Conclusion 21/22 regarding the global IPv6 addressing scheme, the ANC requested the Secretary General to include this task in the work programme so as to develop SARPs for a global IPv6 addressing scheme for ground-ground communications.

1.1.5 On the subject of frequency spectrum, the meeting was pleased to note that the Commission appreciated the ongoing contribution of APANPIRG in addressing this issue in a number of regional forums. As the frequency bands allocated to aviation use are highly attractive to commercial users, the ANC noted Conclusion 21/43 concerning preparations for the forthcoming International Telecommunication Union (ITU) World Radio Communication Conference 2012 and requested the Secretary General to urge States to continue to participate at various levels in different forums to provide support to the ICAO position. Continuing deliberations, the Commission confirmed the need to display the ICAO position for WRC-2012 on the home page of the ICAO website (Conclusion 21/44 refers).

1.1.6 Endorsing APANPIRG request in Conclusion 21/56, the meeting noted that the Commission requested the Secretariat to coordinate with the Air Navigation Services Economics Panel (ANSEP) and World Meteorological Organization (WMO) and consider, if necessary, updating guidance material in the *Manual on Air Navigation Services Economics* (Doc 9161).

1.1.7 The meeting thanked the ANC for their valuable guidance on various activities of the APANPIRG and that it would be taken into account in the development of ongoing work programme of the region.

1.2 Review Status of Implementation of APANPIRG/21 Conclusions and Decisions (WP/3)

1.2.1 The meeting reviewed the progress made on the APNPIRG/21 Conclusions and Decisions.

1.2.2 The actions taken by States and the Secretariat on the Conclusions and Decisions were reviewed and the updated list is provided in **Appendix A to the Report on Agenda Item 1.2.** This updated list is in the new format, in line with the ICAO Business Planning and Performance based approach

1.2.3 The meeting noted that out of the 49 Conclusions and 10 Decisions action had been taken to close/complete 38 Conclusions and 8 Decisions. Action on the remaining 11 Conclusions and 2 Decisions were ongoing.

1.2.4 The meeting acknowledged that sufficient progress had been made in completing required action on the remaining Conclusions and Decisions and recommended continued action for completion of the few outstanding items in the list.

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APANPIRG/21 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/1	**States air navigation modernization plans**	That, States developing their national air navigation modernization plans, which may have an impact on ICAO SARPs, be urged to share those plans in a timely manner with ICAO for review and assessment, to ensure global compatibility and harmonization.	Notify states	ICAO APAC office ICAO HQ/ ANB/CNS	State letter Established procedures	February 2011	COMPLETE COMPLETE	Noted. Requested the Secretariat to provide more details on the established procedures for the harmonization of these modernization plans.
C 21/2	**Wildlife hazard reduction**	That, States confronting problems of wildlife/bird strike hazard to consider developing and implementing an effective wildlife hazard management plan with procedures to control wildlife at or near airports.	Notify States	ICAO APAC office	State letter	January 2011	COMPLETE	
C 21/3	**Common Set of Performance Metrics for all the ICAO Regions**	That, ICAO be invited to: a) develop a common set of performance metrics for all the ICAO regions so as to facilitate comparative analysis; and b) establish the globally harmonised guidance on methodology of how to collect the data in order to achieve commonality.	HQ to develop a common set of performance metrics and establish the globally harmonized guidance.	ICAO APAC Office ICAO HQ	Issue Form A common set of performance metrics for all ICAO regions including guidance material for collection of data.	December 2010 September 2011	COMPLETE	Supported the conclusion and requested the Secretariat to develop a common set of metrics applicable to all regions along with guidance for the collection of data.

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/4	**Regional Guidance material for the implementation of Amendment 1 to PANS-ATM**	That, in order for States to clearly understand what is intended in Amendment 1, the '*Asia/Pacific Guidance Material for the Implementation of Amendment 1 to the 15th Edition of the Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444)*' provided in **Appendix B** to the APANPIRG/21 Report on Agenda Item 3.2 be adopted and published as regional guidance material.	Publish the guidance material	ICAO APAC office	a) State letter b) Upload on the website	September 2010 September 2010	COMPLETE COMPLETE	Noted
C 21/5	**Strategy for implementation of New flight Plan Format**	That, the '*Strategy for the Implementation of new ICAO Flight Plan Format and Supporting ATS Messages*' provided in **Appendix C** to the APANPIRG/21 Report on Agenda Item 3.2 be adopted and published. States and users to be urged to continue implementation planning based on the strategy.	Publish the strategy	ICAO APAC Office	a) State letter b) Upload on the website	September 2010 September 2010	COMPLETE COMPLETE	Noted.
C 21/6	**Notification of State Transition Date to the New flight Plan Format**	That, in order to keep the ICAO Flight Plan Implementation Tracking System (FITS) website updated, States which have not yet provided data inform the Regional Office of the initial set of data required in the FITS website, such as scheduled date and contact person, by 22 October 2010, and subsequently update the data as required.	Update FITS	States	a) State letter b) FITS update	September 2010 22 October 2010	COMPLETE ONGOING	Noted.

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/7	**Use of Global database for allocation of five-letter name codes in the Asia and Pacific Regions**	That, States which have not yet done so be urged to: a) nominate an ICARD authorized user in order to make use of the ICARD system and improve the process of allocation of Five-Letter Name-Codes (5LNCs); b) review the list of allocated 5LNCs with respect to each States, identify non-used, duplicate or non-ICAO 5LNCs and take actions to rectify the situations; and c) update the ICARD database by adding missing information, e.g. latitude and longitude coordinates, etc; and d) take necessary actions to implement the widespread use of the ICARD system.	a) nominate user b) review 5LNCs c) update ICARD d) implement ICARD	States	a) authorized user b) resolutions of duplication or non-ICAO 5LNC c) ICARD update	Ongoing Ongoing Ongoing	ONGOING	
C 21/8	**ICAO Asia/Pacific Seamless ATM workshop**	That, ICAO be invited to organize the Asia and Pacific Seamless ATM Workshop to be held in early 2011 inviting the APANPIRG member States and other parties of interest in order to foster discussion and action for the Asia and Pacific States in the planning of the future air traffic management system, considering the overall vision for the region for seamless ATM.	Convene Seamless ATM Workshop	ICAO APAC Office	Seamless ATM Workshop	February 2011 Deferred	COMPLETE 15-17 August 2011	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
D 21/9	**Develop Sub- Regional volcanic Ash Contingency Plan**	That, a) in view of the recent volcanic activity in Iceland, the CNS/MET Sub-Group be requested to develop sub-regional volcanic ash contingency plans; and	CNS/MET SG to develop volcanic ash contingency plans	ICAO APAC	Volcanic ash regional contingency plan	Dec 2011	IN PROGRESS	Noted and requested the Secretariat to expedite the development of Volcanic ash regional contingency plan in coordination with all parties concerned.
		b) urge States to designate appropriate contact points to establish/maintain contacts in the interim period until the sub-regional volcanic ash contingency plans become available.	States to provide POC for volcanic ash events	ICAO APAC	Contingency contact list Assignment of duties – CNS/MET SG/14 D14/30 to METWARN/I TF and MET/ATM TF	Jan 2011	COMPLETE	Collaborative Decision Making based coordination between Singapore, Indonesia, Malaysia, Philippines and Thailand is basis of development and framework developed at METWARN/I TF fpr ATM/AIS/SAR SG/22 consideration in overall regional contingency plan
C 21/10	**Transfer FASID Table ATS 2 from ATS to MET**	That, ICAO considers the transfer of FASID Table ATS 2, HF radiotelephony VOLMET broadcasts, from ATS to MET, which would involve moving the Tables related to VOLMET broadcasts from the ATS part to the MET part of all ANP/FASID, where applicable.	HQ to assess the transfer of FASID Table ATS 2 to MET part	ICAO HQ	Review of FASID. Modifications, if any, to be incorporated in e ANP	Dec 2011 HQ- November 2012		Noted and requested the Secretariat to review as a part of overall exercise for converting all ANPs to e ANPs.

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
D 21/11	**ATM/AIS/SAR Task List**	That the ATM/AIS/SAR Sub-Group Task List and attachments contained in Appendix D to the APANPIRG Report on Agenda Item 3.2 be adopted as the current work programme for the ATM/AIS/SAR Sub-Group of APANPIRG.	Adopt the task list	ATM/AIS/SAR/ SG/21	Task List	June 2011		
C 21/12	**Convening of the Seamless- ATM Ad Hoc meeting**	That, while recognizing the seamless ATM needs to be addressed in a holistic manner, ICAO Regional Office be invited to organize a seamless ATM Ad Hoc working group meeting as soon as possible.	Convene the Seamless ATM Ad-Hoc Meeting	ICAO APAC Office	Seamless ATM Ad-Hoc Meeting	As soon as possible but not later than February 2011	COMPLETE August 2011	
C 21/13	**Coordination for the Transition to the NEW Flight Plan Format among States**	That, as the global and the regional harmonization is crucial in implementing the NEW flight plan format by 15 November 2012, States start close coordination soon with adjacent States/FIRs on transition about, but not limited to: i) difference of timing for transition between the States/FIRs; ii) operations in the mixed environment of PRESENT and NEW; iii) operational transition for AIDC; and iv) procedures when ATS messages are not processed properly.	Start coordination	ICAO APAC Office States ICAO HQ	State letter Coordination Global harmonization through monitoring of implementation status on ICAO FITS portal	March 2011 Nov 2012	In Progress	Noted and requested the Secretariat to continue to monitor the implementation status of every State on ICAO FITS portal and ensure global harmonization for a transition to NEW Flight Plan.

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/14	**Enhancement of the Global Coordination for Implementation of the NEW Flight Plan Format**	That, in light of the varying degree of States in implementing the NEW flight plan format, ICAO: i) urge all the States, including those outside the Asia/Pacific Region, to record their readiness in the FITS; ii) take action to ensure that any States or ICAO regions not use non-standard local procedures; and iii) ensure appropriate coordination take place between ICAO regional planning and implementation groups (PIRGs) to address implementation issues.	Enhance global coordination	ICAO HQ	Issue Form Global harmonization through monitoring of implementation status on ICAO FITS portal	April 2011 Nov 2012	COMPLETE	Noted and requested the Secretariat to continue to monitor the implementation status of every State on ICAO FITS Portal and ensure global harmonization for a transition to NEW Flight Plan.
C 21/15	**Responsibility Area of China RMA**	That, the China RMA be approved as an APANPIRG Asia/Pacific RVSM Regional Monitoring Agency with responsibility for all RVSM airspaces in China FIRs, and the Pyongyang FIR.	Approve China RMA for the expansion of responsibility	ICAO APAC Office	State letter to China and MAAR	September 2010	COMPLETE	Noted
D 21/16	**ATNICG Subject/Tasks List**	That, the updated Subject/Tasks List placed at Appendix A to the Report on Agenda Item 3.4 be adopted.	Notify ATNICG /8 and ATNICG/6	ICAO APAC Office	ATNICG WG and ATNICG informed and paper prepared	September 2010 May 2011	COMPLETE COMPLETE	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/17	**ICAO Doc 9896 clarifications**	That ICAO be invited to provide clarifications on the following issues related to ATN/AMHS implementation. i) VoIP should be limited to ATS ground service since the ICAO approach is to encourage data communication such as CPDLC. Furthermore, the VoIP performance is network dependent and thus performance acceptance is varied; ii) how the States will come to know about updates on the relevant RFCs; and iii) IPv6 address structure.	Prepare Issue Form	ICAO APAC Office ICAO HQ/ANB/CNS	Issue form sent to ICAO HQ SARPs related to ATN/AMHS implementation	December 2010 2012	COMPLETE	Noted and requested the Secretariat to provide clarifications on the issues related to ATN/AMHS implementation.
D 21/18	**Regional ATN/AMHS Implementation Planner**	That, the Asia/Pacific Regional Implementation Planner Placed at Appendix B to the Report on Agenda Item 3.4 be adopted to report ATN/AMHS implementation progress in the region.	Notify ATNICG WG and ATNICG	ICAO APAC Office	ATNICG WG and ATNICG informed	September 2010 May 2011	COMPLETE COMPLETE	
C 21/19	**AMHS connectivity with ICAO MID region**	That Singapore, Pakistan and India take initiative in transiting to AMHS connectivity with Bahrain, Kuwait, Iran and Oman respectively at the earliest.	Remind States concerned to take initiative	ICAO APAC Office States concerned	States reminded and initiative by States taken	April 2011	COMPLETE AP-CNS0205 AP-CNS0206 24 Dec. 10	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/20	**Strategy for Implementation of Aeronautical Telecommunication Network (ATN) in the Asia/Pacific Region**	That, the document provided at Appendix C to the Report on Agenda Item 3.4 be adopted as Strategy for Implementation of Aeronautical Telecommunication Network (ATN) in the Asia/Pacific Region.	Notify States	ICAO APAC Office	State Letter Available on the website	November 2010	COMPLETE AP184/10 13 Dec. 10	Noted
C 21/21	**AMC Information Form**	That, States be invited to provide data for AMC in respect of their Administration in the format provided at Appendix D to the report on agenda item 3.4.	Notify States	ICAO APAC Office	State Letter	November 2010	COMPLETE AP187/10 13Dec10	
C 21/22	**Asia/Pacific ATN Interim Addressing Plan**	That, i) the proposed IPv6 and IPv4 addressing schemes be submitted to ICAO and ICAO be requested to consider a global IPv6 addressing scheme for ground-ground communication; ii) the proposed IPv4 address plan placed at Appendix E to this report on agenda item 3.4 be adopted to enable the Asia/Pacific ATN ground IPS network implementation to proceed using IPv4 in the interim with minimum delay; and iii) The Asia/Pacific region transition to IPv6 once the above issues have been resolved.	Prepare Issue Form and notify the States	ICAO APAC Office ICAO HQ	Issue Form sent to HQ and State letter A global IPv6 addressing scheme for ground-ground communication IPv4 address plan in order to enable the Asia/Pacific ATN ground IPS network implementation Transition to IPv6	March 2011 2012 COMPLETE TBD	COMPLETE COMPLETE	Noted and requested the Secretariat to develop SARPs for a global IPv6 addressing scheme for ground-ground communication. Noted Noted

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/23	**Amendment/update of Regional ATN/AMHS Guidance Documents**	That, the following amended Regional Guidance Documents for ATN/AMHS implementation be adopted and distributed to the States. a) the amended Asia/Pacific ATN Network Service Access Point (NSAP) Addressing Plan for Asia/Pacific Region as provided in the Appendix F to the Report on Agenda Item 3.4; b) the Test Procedure for ATN Router Connection Test, Annex C to Asia/Pacific AMHS Manual as provided in the Appendix G to the Report on Agenda Item 3.4; c) "Asia/Pacific ATN Security Guidance Document" to replace the existing Asia/Pacific ATN Security Guidance Document, Draft First Edition as provided in Appendix H to the Report on Agenda Item 3.4; and d) the phased testing procedure to transit from AFTN routing to MTA-to-any-MTA routing to be incorporated in the AMHS Manual as provided in Appendix I to the Report on Agenda Item 3.4.	Notify States	ICAO APAC Office	State Letter Updated guidance material available on the website	November 2010	COMPLETE / AP040/11 24/0311	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/24	**Points for Proposed Defect Report (PDR) (Amendment Proposal) raised in the region**	That, States be invited to present their ATN/AMHS implementation related Points for Proposed Defect Report (PDR) (Amendment Proposal) to the ICAO APAC Office. These points will be presented to the ATNICG/ATNICG Working Group (whichever is scheduled earlier) by the Secretariat for endorsement, so that these points, along with the ATNICG/ATNICG WG recommendations can be forwarded to ACP WG – M Secretariat through ICAO APAC Office	Notify States	ICAO APAC Office	State Letter and Procedure is followed	December 2010	COMPLETE AP182/10 9Dec10	
C 21/25	**Japan/Russia AFTN Routing Change**	That, ICAO be requested to coordinate with Europe Region for updating AFTN routing directory and consequential change to the APAC AFTN routing directory.	Coordinate with ICAO European Office for the change	ICAO APAC Office	Coordination carried out and Routing Directory updated	March 2011	Coordination was carried out. Comments are awaited from concerned	
C 21/26	**Pan-Regional ICD for AIDC**	That, ICAO Regional Office inform the NATSPG that the proposed title "Pan-regional ICD for Oceanic AIDC" is unacceptable as the ICD for AIDC is applicable for use by all ATS and ATM facilities in both oceanic, and continental areas within the Asia Pacific Region; and that the document should be titled as "Pan-Regional ICD for AIDC.	Inform NATSPG through EUR Office	ICAO APAC Office	ICAO ERU Office and NATSPG informed	November 2010	COMPLETE CNS0209/10 9Dec10	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/27	**Inter-regional ad hoc SATCOM Task Force**	That, a) the Terms of Reference of the inter-regional ad hoc Satellite Voice Communication (SATCOM) Task Force adopted by NAT System Planning Group as provided at Appendix J to the Report on Agenda Item 3.4 be endorsed; and b) the outcome of the task force should be coordinated with the CNS/MET Sub-group of APANPIRG.	Inform ICAO EUR Office and CNS/MET SG	ICAO APAC Office	ICAO EUR Office and CNS/MET SG informed	December 2010 July 2011	COMPLETE COMPLETE	
C 21/28	**Regional HF Management Guidance Material**	That, the HF Management Guidance Material for the South Pacific as provided in the Appendix K to the Report on Agenda Item 3.4 be adopted as Part One of Asia/Pacific Regional Guidance Material for HF Management.	Notify States	ICAO APAC Office	State Letter and GM on the website	December 2010	COMPLETE CNS0183/10 9Dec10	
D 21/29	**PBN Task Force Tasks List**	That, the PBN Task Force Tasks List provided at Appendix L to the Report on Agenda Item 3.4 be adopted.	Notify PBN TF	ICAO APAC Office	Paper prepared and PBNTF informed	March 2011	COMPLETE the adopted Task List noted by the PBN TF at its meeting in May 2011	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/30	**Limitation of Older Generation FMS**	That, ICAO (IFPP, PBNSG) be invited to note, once again, the importance of the limitation of older generation FMS in storing multiple procedures for the same type of navigation system for a runway. This limitation occurs when pilots attempt to select a specific approach that is not stored in the FMS navigation database. ICAO is requested to consider establishing additional guidance, supplementing existing PANS provisions and to explore solution(s).	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent to HQ Additional guidance supplementing existing PANS provisions regarding limitation of older generation FMS	October 2010 2012	COMPLETE 2012	Noted and requested the Secretariat to develop guidance supplementing existing PANS provisions regarding limitation of older generation FMS.
C 21/31	**Revised APAC Regional PBN Implementation Plan**	That, the revised APAC Regional PBN Implementation Plan Version 2.0 provided in Appendix M to the Report on Agenda Item 3.4 be adopted.	Notify States	ICAO APAC Office ICAO HQ	State Letter Revised APAC Regional PBN Implementation Plan	October 2010	COMPLETE	Noted the delay in implementation of PBN and requested the Secretariat to consider what can be done to encourage greater progress.
C 21/32	**Develop State PBN Implementation Plan**	That, the States, which have not developed their State PBN Implementation Plans so far, be urged to develop the plan in accordance with the Asia/Pacific Regional PBN Implementation Plan at the earliest and advise the Regional Office of the impediments in the implementation of PBN.	Urge State and identify impediments	ICAO APAC Office States	State Letter Impediments in the implementation of PBN informed	March 2011	COMPLETE	Noted the delay in implementation of PBN and requested the Secretariat to consider what can be done to encourage greater progress..

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/33	**Aircraft Equipage Requirements**	That, ICAO provides guidance on aircraft that do not have a lateral and vertical readout on the navigation display, but do display the lateral and vertical profile on the navigation equipment, which could be considered as an alternate means of compliance, if supplemented by appropriate flight crew training for RNP value of 0.3 RNP or greater.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent to ICAO HQ and Required guidance provided Guidance on aircraft equipage requirements for RNP value of 0.3 or greater	March 2011 2012	COMPLETE	Noted and requested the Secretariat to develop guidance on aircraft equipage requirements for RNP value of 0.3 or greater and rationalize the guidance material.
D 21/34	**PBN Task Force continuation**	That, the PBN Task Force be continued.	Notify PBN TF	ICAO APAC Office	Paper prepared and the Task Force informed	March 2011	COMPLETE	
C 21/35	**Slow Progress of PBN Implementation**	That, ICAO highlights the slow progress and impediments in PBN implementation at the upcoming 47th DGCA Conference for their support to expedite implementation.	Prepare paper for DGCA Conf/47	ICAO APAC Office ICAOHQ	Paper prepared and issues highlighted Revised APAC Regional PBN Implementation Plan	October 2010	COMPLETE	Noted the delay in implementation of PBN and requested the Secretariat to consider what can be done to encourage greater progress..

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/36	**Progress of GNSS Implementation & Awareness of GNSS Manual**	That, ICAO a) highlight the slow progress of GNSS implementation in the aviation field at forums such as the coming 47th DGCA Conference in October in Macao, China; and b) raise the awareness of existence of the GNSS Manual among the aviation community.	Prepare paper for DGCA Conf/47	ICAO APAC Office	Paper prepared and issues highlighted	October 2010	COMPLETE	Noted.
D 21/37	**Subject/Tasks List of ADS-B Study and Implementation Task Force**	That, the Subject/Tasks List for ADS-B Study and Implementation Task Force provided in Appendix N to the Report on Agenda Item 3.4 be adopted.	Notify ADS-B SITF	ICAO APAC Office	Paper prepared and the Task Force informed	April 2011	COMPLETE	
C 21/38	**Guidance Material on Processing and Display of ADS-B Tracks on Air Traffic Controller Positions**	That, the Processing and Display of ADS-B Tracks on Air Traffic Controller positions provided in Appendix O to the Report on Agenda Item 3.4 be adopted.	Notify States	ICAO APAC Office	State Letter The GM available on the Website	December 2010	COMPLETE AP017/11 2Feb11	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/39	**Template for promulgation of ADS-B Avionics Equipage Requirements**	That, based on APANPIRG Conclusion 20/54, States intending to implement ADS-B based surveillance service for a defined airspace and having not published regulations be urged to promulgate mandating rule for ADS-B Avionics Equipage Requirements as soon as possible using the following template: *On and after dd/mm/yyyy, if an aircraft operates on airways (insert routes)……..at or above FLXXX…….(or in defined airspace boundaries ……. at or above FLXXX):* *a) the aircraft must carry serviceable ADS-B transmitting equipment that has been certificated as meeting EASA AMC 20-24, or meets the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia; and* *b) the aircraft operator must have the relevant operational approval from the State of Registry.*	Notify States	ICAO APAC Office	State Letter	November 2010	COMPLETE AP174/10 24Nov10	Noted
C 21/40	**Guidelines for Airworthiness and Operational Approval for ADS-B Avionics Equipage**	That, States be advised to use the guidelines provided in Appendix P to the Report on Agenda Item 3.4 for Airworthiness and Operational Approval for ADS-B Out Avionics Equipage.	Notify States	ICAO APAC Office	States informed	January 2011	COMPLETE AP008/11 24Jan11	Noted

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/41	**Revised Regional Surveillance Strategy for Asia and Pacific Regions**	That, the revised Regional surveillance strategy for Asia and Pacific Regions provided in Appendix Q to the Report be adopted.	Notify States	ICAO APAC Office	State Letter Revised strategy available on the website	January 2011	COMPLETE AP004/11 21Jan11	Noted
C 21/42	**Rule on Misleading ADS-B Transmissions**	That, States where ADS-B may be used, even voluntarily, promulgate rule for ADS-B Avionics Equipage Requirements consider publishing additional provisions for misleading ADS-B transmission as follows: *After <insert earliest date that ADS-B may be used for any relevant operational purpose> if an aircraft carries ADS-B transmitting equipment which does not comply with* *a) EASA AMC 20-24, or* *b) the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia.* *the aircraft must not fly unless the equipment is:* *(a) deactivated; or* *(b) set to transmit only a value of zero for the NUCp or NIC.*	Notify States	ICAO APAC Office	State Letter	November 2010	COMPLETE AP175/10 24Nov10	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
		Note: *1. It is considered equivalent to deactivation if NUCp or NIC is set to continually transmit only a value of zero.* *2. Regulators should take appropriate action to ensure that such regulations are complied with.* *3. ATC systems should discard ADS-B data when NUC or NIC=0*						
C 21/43	**Preparation for WRC – 2012**	That, a) States be urged to have the designated contact person closely involved in the preparatory work for WRC – 2012 at the national level in close coordination with the contact points designated by respective telecommunication regulators; b) Make necessary arrangements for the designated contact persons to attend the APT APG meetings and WRC – 2012 Conference to protect aviation interests; and c) Reference to APANPIRG Conclusions 19/41, 20/58 and DGCA Conference Action Item 46/8 may be used to support these efforts.	Notify States and necessary arrangement	ICAO APAC Office and States	States Letter Take necessary action to support ICAO Position for WRC2012	July 2010 2012	COMPLETE AP036/11 11Mar11	Noted and appreciated the preparatory work of APANPIRG in order to seek the support of States for ICAO position at WRC-2012.

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/44	**Visibility of ICAO Position on WRC – 2012 Agenda Items**	That, ICAO be urged to improve visibility to ICAO Position on WRC-2012 Agenda Items of critical interest to civil aviation on the ICAO website.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Visibility of ICAO position for WRC2012 on ICAO Website Increased visibility of ICAO position for WRC-2012 on ICAO website by displaying it on home page.	July 2010	COMPLETE COMPLETE	Agreed and requested the Secretariat to display ICAO position for WRC2012 on the home page of ICAO website.

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/45	**Transition to WAFS Internet File Service (WIFS) from ISCS-G2**	That, a) The ISCS Provider State will work with States, in cooperation with the ICAO Secretariat and Asia and Pacific Regional Office, to assist States with the implementation of WIFS by March 2012; b) States to update Points of Contact in Appendix R to this Report and submit the WIFS registration form; and c) ICAO Asia and Pacific Regional Office to request States to advise on the status of their implementation of WIFS by March 2011. *Note 1: The data currently being provided by ISCS satellite service will only be available via the WAFS Internet File Service (WIFS) after June 30 2012.* *Note 2: WIFS commenced operation in May 2010.*	Assist in WIFS implementation Update POC of ISCS/WIFS users and encourage WIFS registration Inquire with States on status of WIFS implementation	ISCS Provider State ICAO APAC ICAO APAC	Regional Implementation of WIFS State letter State letter	Mar 2012 Dec 2010 Dec 2010	**ON GOING** COMPLETE (SL – 27Sep2010) COMPLETE (SL – 27Sep2010)	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/46	**Improvements to WAFS Implementation**	That, the WAFSOPSG is invited to discuss and consider the following improvement measures in WAFS implementation: a) the WAFC Provider States inform users in advance about forthcoming changes to the contents of the WAFS forecasts; and b) further guidance be provided regarding the specific actions to be taken by the MET service providers and all relevant end users of WAFS upon receiving the administrative message. *Note: Guidance should also include any requirement for a user State to generate its own administrative message for a product affected by a received administrative message.*	Determine changes, if necessary, to the WAFS change bulletin notice Determine further guidance, if necessary, for users of WAFS administrative messages	WAFSOPSG/6 (March 2011) WAFSOPSG/6 (March 2011)	Update WAFS bulletin notice, if required Update guidance on WAFS administrative messages, if required	July 2011 July 2011	**ONGOING** WAFSOPSG/6 C6/8 – provide guidance on requirement to onward-forward WAFS SIGWX forecast correction messages to users and report back to WAFSOPSG/7	
C 21/47	**Improvements to VA and TC advisories**	That, The IAVWOPSG consider including the file name of the graphical advisories, if issued, under "Remarks" of the corresponding textual advisories.	Determine if link between graphical and textual advisories is necessary	IAVWOPSG/6 (September 2011)	Update relevant standards (Am 76 to Annex 3) and/or guidance material if necessary	2013		

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/48	**Update of SADIS and ISCS User Guide**	That, the SADISOPSG and WAFSOPSG consider the need to update the SADIS and ISCS User Guides by aligning with regional Meteorological Watch Offices requirements (Regional FASID Tables) *Note: To achieve this, the following steps should be taken in time for the regional SIGMET advisory trial (1 April 2011)* *a) Regional amendment proposals on FASID Table MET 1B;*	Amendment Proposals to Tables in the Regions, where necessary	ICAO APAC	Up-to-date FASID Tables MET 1B for all Regions	Dec 2010	COMPLETE	
		b) Develop global database based on Regional requirements in a); and	HQ IT develop global database of FASID Table MET 1B	ICAO HQ	Global MWO database	Mar 2011	ONGOING (all regions submitted latest version table in excel format to HQ in Nov 2010, except for NAM)	
		c) Consider global database on SIGMET requirements for use in SADIS and ISCS User Guides	Incorporate SIGMET requirements in SADIS Users Guide (as a link to the global database)	WAFSOPSG/6 (March 2011) SADISOPSG/15 (May 2011)	Provide link to global database for SIGMET requirements	Apr 2011	WAFSOPSG/6 noted development of database at HQ (but will not meet target date)	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/49	**Implementation of OPMET reception**	a) IATA be invited to conduct another period of OPMET monitoring for reception of METAR and TAF at SADIS and ISCS and provide the Regional Office with a list of AOP and non-AOP aerodromes by State whose OPMET data are not available at SADIS and/or ISCS as well as a list of AOP aerodromes by State that distribute FC TAF; and	IATA to monitor OPMET availability at SADIS/ISCS	IATA	List of aerodromes by State whose OPMET not received at SADIS/ISCS	Feb 2011	COMPLETE	
		b) the Regional Office urge States containing AOP aerodromes whose OPMET is not received at SADIS and/or ISCS to comply to the Regional Air Navigation Plan (RANP); and	Inform States	ICAO APAC	SL	Apr 2011	COMPLETE (SL – 29Mar2011)	
		c) the Regional Office encourage States containing non-AOP aerodromes whose OPMET is not received at SADIS/ISCS to provide OPMET data as already agreed upon; and	Inform States	ICAO APAC	SL	Apr 2011	COMPLETE (SL – 29Mar2011)	
		d) the Regional Office inform States that FC TAF is no longer disseminated internationally in accordance with the RANP; and	Inform States	ICAO APAC	SL	Apr 2011	COMPLETE (SL – 29Mar2011)	
		e) the slower transmission times and missing OPMET data associated with ISCS in relation to SADIS be investigated by RODBs Tokyo and Singapore;	Investigate SADIS/ISCS transmission time differences	RODBs Singapore & Tokyo	Reduce OPMET transmission time to ISCS	May 2011	COMPLETE (SL – 29 Mar2011)	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
		f) the Regional Office inform States of OPMET observation, filing and transmission times as described in the ROBEX Handbook section 7.5; and	Inform States	ICAO APAC	SL	May 2011	COMPLETE (SL – 29 Mar2011)	
		g) the Regional Office inform States of OPMET availability and regularity as defined in the Regional Air Navigation Plan and ROBEX Handbook. *Note: this Conclusion is intended to assist in achieving the OPMET data availability goals (95% AOP aerodromes and 90% non-AOP aerodromes) described in APANPIRG/20 Conclusions 20/63 and 20/64)*	Inform States	ICAO APAC	SL	May 2011	COMPLETE (SL – 29 Mar2011)	
C 21/50	**MET/ATM Seminar**	That, ICAO in coordination with WMO conduct a MET/ATM Seminar in early 2011. *Note: This draft Conclusion reinstates APANPIRG Conclusion 19/53.*	HQ consider inviting WMO as partner in MET/ATM Seminar	MET/AIM Section	Invitation Letter/ Seminar	Dec 2010	COMPLETE	Noted and confirmed the need for MET/ATM Seminar in early 2011
D 21/51	**Performance Framework Forms (PFFs)**	That, updated performance Framework Forms (PFFs) of CNS and MET fields as contained in Appendix S to the report on agenda item 3.4 be adopted.	Notify CNS/MET SG	ICAO APAC office	Paper prepared and SG notified	July 2011	COMPLETE WP prepared	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
D 21/52	**Updated Subject/Tasks List of the CNS/MET Sub-group**	That, the updated Subject/Tasks List of the CNS/MET Sub-group provided in Appendix U to the report on agenda item 3.4 be adopted.	Notify CNS/MET SG	ICAO APAC office	Paper prepared and SG notified	July 2011	COMPLETE WP prepared	
C 21/53	**Elimination of ATM Air Navigation Deficiencies**	That, States concerned a) be urged to take urgent actions to correct the deficiencies in the ATM/AIS/SAR fields identified in Attachment A to the Report on Agenda Item 4 ; b) notify details of the problems/difficulties to the Regional Office; and c) designate a point of contact in each State to deal with deficiencies and provide details to the Regional Office by 22 October 2010.	a) take actions to correct deficiencies b) notify details of difficulty c) designate point of contact	States	less deficiencies remedial actions point of contact	Ongoing Ongoing 22 October 2010	COMPLETE	Noted and requested the Secretariat to accord highest priority in its work programme to the urgent elimination of the safety-related deficiencies. States reflected in the APANPIRG list of deficiencies are urged to establish action plans with fixed target dates. Also, commitment to the elimination of deficiencies should be pursued through all available mechanisms, including the annual Conference of DGCAs

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/54	**Aerodrome deficiencies**	That, the States concerned be urged to validate and provide corrective action plan for the elimination of aerodrome deficiencies identified in Appendix B1 to the Report on Agenda item 4 of APANPIRG/21;	Notify concerned States	ICAO APAC office	State letter	February 2011	COMPLETE	Noted and requested the Secretariat to accord highest priority in its work programme to the urgent elimination of the safety-related deficiencies. States reflected in the APANPIRG list of deficiencies are urged to establish action plans with fixed target dates. Also, commitment to the elimination of deficiencies should be pursued through all available mechanisms, including the annual Conference of DGCAs

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/55	**Removal of the APANPIRG Air Navigation Deficiency AP-MET-13**	That, the air navigation deficiency AP-MET-13 be removed from the APANPIRG air navigation deficiencies list.	Remove deficiency from database	ICAO APAC	Updated deficiency database	Dec 2010	COMPLETE	Noted and requested the Secretariat to accord highest priority in its work programme to the urgent elimination of the safety-related deficiencies. States reflected in the APANPIRG list of deficiencies are urged to establish action plans with fixed target dates. Also, commitment to the elimination of deficiencies should be pursued through all available mechanisms, including the annual Conference of DGCAs

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/56	**Cost Recovery Guidance Material Update**	That, ICAO be invited to consider updating the cost recovery guidance material that would take into account States whose air traffic volume is not sufficient in obtaining the cost recovery for the necessary MET services required in Annex 3 and consider shared services in airspace blocks that are based on the number flights needed in obtaining the necessary cost for the services required for that airspace block.	HQ to consider updating cost recovery guidance material	ICAO HQ	Updated Guidance Material (Doc 9161) if deemed necessary by ATB	2012	**ONGOING**	Noted and requested the Secretariat to coordinate with ANSEP and WMO and consider, if necessary, updating guidance material in the *Manual on Air Navigation Services Economics* (Doc 9161)
D 21/57	**APANPIRG Contributory Bodies Structure Review Task Force (ABSRTF)**	That, a) APANPIRG Contributory Bodies Structure Review Task Force with members consisting of Sub-group chairpersons, vice-chairpersons and voluntary members nominated by States be established; and b) In coordination with ICAO Regional Office, the Task Force undertakes a review of the Terms of Reference and activities of the APANPIRG contributory bodies and proposes rationalization of their structures to APANPIRG/22 to meet the changing environment.	Notify States to nominate voluntary members. Establish ABSRTF Review structure and develop proposals for contributory bodies	ICAO APAC Office ABSRTF	State Letter ABSRTF established Paper prepared with proposals.	November 2010 February 2011 June 2011	COMPLETE COMPLETE COMPLETE	
C 21/58	**Establishment of RASGs – Consequent revision to TOR of APANPIRG**	That meeting adopt the revised terms of reference of APANPIRG as shown in the Appendix A to the Report on Agenda Item 6.	Notify States	ICAO APAC office	State letter	March 2011	COMPLETE	Noted and requests the ANC to consider how the reports and actions resulting from RASG meetings will be handled.

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 31 August 2011	ANC Action recommended
C 21/59	**Development of New RANP**	That, ICAO be invited to review the regional air navigation plan structure, processes and contents to incorporate them in to e-ANP and expedite its provision for use.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue form prepared Revised ANP and development of e ANP	December 2010 Nov 2012	COMPLETE	Noted and requested the Secretariat to continue with the development of e-ANPs

*** Note:** ICAO has established the following Strategic Objectives for the period 2005-2010:

A: Safety - *Enhance global civil aviation safety*; **B: Security** - *Enhance global civil aviation security*; **C: Environmental Protection** - *Minimize the adverse effect of global civil aviation on the environment*; **D: Efficiency** - *Enhance the efficiency of aviation operations*; **E: Continuity** - *Maintain the continuity of aviation operations;* **F: Rule of Law** - *Strengthen law governing international civil aviation.*

1.3 Review Status of Implementation of APANPIRG Outstanding Conclusions and Decisions (WP/4)

1.3.1 The meeting reviewed the progress made on the APANPIRG Outstanding Conclusions and Decisions up to its Twentieth Meeting.

1.3.2 The actions taken by States and the Secretariat on the outstanding Conclusions and Decisions were reviewed and the updated list is provided in **Appendix A to the Report on Agenda Item 1.3.**

1.3.3 The meeting noted that out of the 7 outstanding items, the follow-up actions on the 4 Conclusions have been completed/closed and actions on 3 Conclusions were ongoing. The meeting acknowledged that sufficient progress had been made in completing required action on the Outstanding APANPIRG Conclusions and Decisions.

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Status of Outstanding Conclusions/Decisions – Action Plan

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 19/43 **D**	**Training for the new WAFS gridded forecasts**	That, in order to facilitate the implementation by the States of the new WAFS gridded forecasts, a) WAFC Provider States, in coordination with ICAO and WMO, be invited to organize training on the use of the new WAFS gridded forecasts for icing, turbulence and cumulonimbus clouds; and b) WAFSOPSG be invited to consider, in addition to the planned regional training seminars, developing alternative methods for provision of training to the States on the new gridded forecasts for icing, turbulence and cumulonimbus clouds in order to ensure that a maximum number of WAFS users in the States will have access to the training in the most efficient way. *Note: The alternative training methods include computer based training products distributed to States and web-based training.*	a) Organize training b)Develop alternative methods for provision of training to the States on the new gridded forecasts for icing, turbulence and cumulonimbus clouds	ICAO HQ ICAO HQ	conduct training programme Alternative training methods	Dec 2010 Revised target date- Dec 2013 Dec 2010	ON GOING Revised target date Dec 2013 (updated twice, the last target date 2011) ANC action-Noted and invited the Secretary General to invite WAFC provider States in coordination with ICAO and WMO to organize the required training. WAFSOPSG/6 C 6/12: develop guidance on the interpretation of the forecasts for WAFSOPSG/7 WAFSOPSG/6 C 6/13: review training requirements based on guidance developed (Sep 2012)

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 20/8	**Notification of State Transition Date to New Flight Plan Format**	That, in order to align regional implementation planning, States inform the Regional Office by 1 July 2010 of their scheduled date and implementation methodology for transition to the new Flight Plan and ATS Message formats.	**States formulate implementation strategies**	**APAC States**	**Notify Regional Office of methodology and target implementation date**	**Not later than 1 July 2010**	CLOSED Superseded by C 21/6 AP119/10 (ATM), 28 July 2010 SL sent to all contracting States **except** Australia, Hong Kong China, Japan, New Zealand, Rep of Korea
C 20/11	**ATFM Steering Group and Concept of Operations**	That a regional ATFM Steering Group be constituted and tasked with preparing an Asia/Pacific Regional ATFM Concept of Operations based on analysis of regional data and traffic flows. The ATFM Steering Group should consider the outcomes and recommendations from the October 2008 ATFM Seminar/Workshop (Fukuoka, Japan) and information about the CAR/SAM ATFM Project contained in IP/3 to APANPIRG/20 as guidance in deriving its Objectives and Terms of Reference.	**Conduct first meeting of Steering Group**	**ICAO APAC Office**	**First meeting of Steering group conducted**	**Second half 2010**	COMPLETE ATFMSG/1 was conducted 8-10 December 2010

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 20/15	**Survey of RNP 4 Equipage and Approvals**	That during 2010 the Regional Office conducts a regional survey to establish the current and near term equipage and approvals status for RNP 4 operations.	**Conduct survey**	**ICAO APAC Office**	**Survey conducted and outputs compiled**	**March 2010**	**COMPLETE** **SL** AP07410 (ATM), 10 May 2010 RO presented RNP4 survey to PBN TF/8 in May 2011.
C 20/32	**Second Satellite Data-link Operational Continuity Meeting**	That, ICAO be invited to organize 2nd Satellite Data-link Operational Continuity Meeting in 2010 for stakeholders to review the developments on the performance and provision of satellite data link communication in the Asia/Pacific Region and develop a solution.	**Coordination and organize SOCM/2 Meeting**	**ICAO APAC Office**	**Meeting conducted**	**Oct 2010**	On Going Rescheduled to 15-18 November 2011.

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 20/68	**Expanded WV SIGMET Test Development**	That, a) Japan be invited to further develop an expanded WV SIGMET Test utilizing automated templates in consultation with the Darwin VAAC; and b) upon completion of a) above, Japan conducts the expanded WV SIGMET Test and produce an analysis to the OPMET/M TF/8 meeting for further review and subsequent reporting to the CNS/MET SG/14 meeting to determine the next phase of the test.	**Develop WV expansion SIGMET test** **Conduct and report on trial test**	**Japan/ VAAC Darwin** **Japan**	**Updated WV expansion SIGMET Test** **Test results included in OPMET/M TF/8 and CNS/MET SG/14 reports**	**Apr 2010** **Apr 2010 Jul 2010**	**ON GOING** Efforts suspended due to earthquake/Tsunami and accidental release of radioactive material
C 20/70	**Training on QMS**	That, WMO, in coordination with ICAO, be invited to organize a seminar/workshop on QMS related to aeronautical meteorological services during the first half of 2010.	**Conduct QMS Seminar/ Workshop**	**WMO/ ICAO HQ/APAC Office** ICAO HQ ANB/MET/AIM	**Seminar/ Workshop** **Harmonized QMS**	**June 2010** **TBD**	**Complete** (WMO in coordination with the Finnish Meteorological Institute (FMI) conducted workshop in Tonga in July 2010 – 15 States attended) (another WMO workshop in coordination with the FMI followed in Nandi, Fiji from 1-5 April 2011)

*** Note:** ICAO has established the following Strategic Objectives for the period 2005-2010:
A: Safety - *Enhance global civil aviation safety*; **B: Security** - *Enhance global civil aviation security*; **C: Environmental Protection** - *Minimize the adverse effect of global civil aviation on the environment*; **D: Efficiency** - *Enhance the efficiency of aviation operations*; **E: Continuity** - *Maintain the continuity of aviation operations;* **F: Rule of Law** - *Strengthen law governing international civil aviation.*

AGENDA ITEM 2: **FLIGHT SAFETY AND RASG-APAC ACTIVITIES**

GLOBAL AND INTER REGIONAL ACTIVITIES

Agenda Item 2: Flight Safety and RASG APAC (Regional Aviation Safety Group-APAC) Activities

Global and Inter Regional Activities

2.1 Review of the Outline and Objectives for Revised GANP (WP/5)

2.1.1 The meeting noted that the Global Air Navigation Plan (GANP), which was accepted by the Council in November 2006, has also been very successful as a high-level strategic document and has guided the efforts of States, Planning and Implementation Regional Groups (PIRGs) and international organizations in enhancing the efficiency of air navigation systems. The 37th Session of the Assembly (Resolutions A37-4 and A37-12 refer) instructed the Council to ensure that, in light of further operational and technical developments, the GANP is continuously maintained up to date in close collaboration with States and other stakeholders. The Assembly also directed the Council to update the GANP reflecting a globally harmonized series of operational upgrades. The meeting was informed that ICAO would be delivering the revised GANP, which includes the Aviation Systems Block Upgrade (ASBU) concept, CNS, AIM and Avionics Roadmaps, to the upcoming Twelfth Air Navigation Conference (AN-Conf/12) in November 2012.

2.1.2 The meeting was informed that ICAO would be organizing in 2012 a series of regional workshop under special implementation project (SIP) mechanism. These workshops will not only provide training in ASBU methodology but also prepare States for their participation in the 12th Air Navigation Conference. The meeting noted that the electronic Regional Air Navigation Plans (e ANP), which will be presented to the 12th Air Navigation Conference, will have corresponding revisions to reflect the ASBU methodology. The meeting received a PowerPoint presentation describing ASBU Methodology and the work in progress to update the GANP. The meeting requested ICAO to continue to inform, educate and provide training in developing a proper understanding of the ASBU methodology.

2.2 Review of the Proposed Revisions to the GASP (IP/2)

2.2.1 The meeting noted that the Global Aviation Safety Plan (GASP), the latest version of which was accepted by the Council in July 2007, initially served, as a high-level policy document in guiding the efforts of the States, industry and international organizations. In view of the latest developments related to implementation of the State Safety Programme (SSP) and Safety Management Systems (SMS), as well as the associated Standards and Recommended Practices (SARPs), it has become necessary to update the GASP to better reflect the introduction and use safety management principles. This revision is intended to provide the necessary framework and associated tools and will be accomplished in parallel and in harmony with the Global Aviation Safety Roadmap (GASR). The 37th Session of the Assembly (Resolution A37/4 refers) noted the intent to continue to apply the GASP as a tool for safety enhancement by focusing action where it is most needed and directed the Council to update the GASP by December 2011. The meeting noted the details of the proposed revisions to GASP document.

2.3 Workshop and Global Air Navigation Industry Symposium (GANIS) (IP/3)

2.3.1 The meeting noted that ICAO is organizing the GANIS event in an effort to facilitate greater integration and harmonization of air navigation system improvement programmes of States and Service Providers. The Symposium, while emphasizing the need for global harmonization, will identify ways and means to ensure interoperability, to maximize utilization of available and emerging technologies and to support an ongoing global discussion. The GANIS, in addition to ASBU methodology, will review CNS, AIM and Avionics Roadmaps.

2.4 Update on the Establishment of Regional Aviation Safety Group- APAC (IP/4)

2.4.1 The meeting noted that the three COSCAPS (North Asia, South East Asia and South Asia) and PASO supported the RASG concept and that the First RASG APAC Meeting is scheduled for 10th and 11th October 2011 in New Caledonia consecutive with the 48th DGCA Conference. The meeting also noted the draft Agenda and RASG-APAC membership. APANPIRG/21 in Conclusion 21/58 adopted the revision to its TOR to include – *coordinate with RASG- APAC on safety issues.*

2.5 ICAO Air Navigation Panels/Study Groups (IP/5)

2.5.1 The meeting received a presentation with regard to availability of voluntary work force that supports ICAO global programme in developing provisions needed to enhance safety and efficiency of air navigation systems and protect environment. The meeting noted that ICAO has established a number of Panels, Study Groups and Task Forces with a work programme consistent with ICAO Business Plan 2011-2013.

2.6 Update on the implementation of ICAO Language Proficiency Requirements (IP/18)

2.6.1 The meeting noted the ICAO work programme to support the implementation of the language proficiency requirements which was in response to Resolution A37-10 – *Proficiency in the English Language Used for Radiotelephony Communications*. This resolution urges Contracting States to provide ICAO with detailed implementation plans if they are not yet compliant with the language provisions. States can then use these plans to evaluate how another State's measures mitigate risks and show progress towards achieving full compliance.

2.6.2 The meeting was apprised that States can find revised guidelines for the development of implementation plans, the text of resolution A37-10, a new format for the implementation plans that States should provide, as well as an interactive world map at the revised website http://www.icao.int/fsix/lp.cfm. To date, 12 States out of the 38 States to which the ICAO Asia Pacific Regional Office is accredited indicate that they are compliant with the language proficiency requirements and only 2 States provided implementation plans for 2011 and in compliance with the revised guidelines. The meeting noted that new edition of the training aid *ICAO Language Proficiency Requirements – Rated Speech Samples* will consist 22 speech samples using a rigorous methodology and statistical analysis. This new edition will be available free of charge on the ICAO website by the fourth quarter of 2011. Also, ICAO established a mechanism to provide States with impartial recommendations in the selection or development of aviation English language licensing tests.

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AGENDA ITEM 3: PERFORMANCE FRAMEWORK FOR REGIONAL AIR NAVIGATION PLANNING AND IMPLEMENTATION

Agenda Item 3.0: Regional and National Performance Framework

Agenda Item 3: Performance Framework for Regional Air Navigation Planning and Implementation

3.0 Regional and National Performance Framework (WP/10)

3.0.1 The meeting reviewed and discussed the Regional Performance Objectives adopted for the region. The meeting recalled that the PFFs and associated metrics were adopted by APANPIRG/20 under conclusion 20/2 and 20/4 in support to the ICAO planning objective to achieve a performance based global air traffic management (ATM) system through the implementation of air navigation systems and procedures in a progressive, cost effective and cooperative manner. The meeting also noted that 'Air Navigation Commission supported APANPIRG Conclusion 21/3 and requested the secretariat to develop a common set of metrics applicable to all regions along with guidance for the collection of data'.

3.0.2 The meeting reviewed the updated status of the PFFs reported by the ATM/AIS/SAR SG/21 and CNS/MET/SG/15 in addition to the updated status reported by some States in respect of AOP field. The updated PFFs in the ATM, AIS, SAR, CNS, MET and AOP are in **Attachments 1 to 4** to the Report on Agenda Item 3. The meeting urged States, international organizations and stake holders to collect and report the necessary data requested in Conclusion 20/5.

3.0.3 The meeting noted that ICAO has made significant progress on the development of a common set of metrics which would be made available to States in January 2012 for comments.

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ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 11 September 2009)

<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 1</u>

AIRSPACE SAFETY MONITORING TO ACHIEVE REGIONAL TLS</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Improved safety management,
• Compliance with regional Target Level of Safety (TLS)</td></tr>
<tr><td colspan="5">Strategy
Short term/medium term (2009-2015)</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>TIME FRAME</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="2">AOM
(Airspace Organization and Management)</td><td>• Facilitate cooperative arrangements between States to undertake airspace safety assessments

• Review airspace safety monitoring that supports reduction in vertical and horizontal aircraft separation standards</td><td>2009-2015</td><td>RASMAG</td><td>FIT ASIA has proposed to develop a RVSM non compliant aircraft strategy</td></tr>
<tr><td>• Assist States to achieve established regional Target Levels of Safety (TLS)

• Provide advice to States to establish aspects of ATS safety management systems that support compliance with the regional TLS</td><td>2009-2015</td><td>RASMAG

SEA RR/TF
BOB RHS/TF
PBN/TF</td><td>In progress</td></tr>
<tr><td>GPIs</td><td colspan="4">GPI/2 Reduced vertical separation minima, GPI/5 Performance based navigation, GPI/7 Dynamic and Flexible ATS route management</td></tr>
<tr><td>References</td><td colspan="4">• Asia/Pacific Guidance Material for ADS/CPDLC/AIDC Ground Systems Procurement and Implementation;
• Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region
• Asia/Pacific En-route Monitoring Agency (EMA) Handbook
• Regional Monitoring Agency (RMA) Manual
• Global Operational Data Link Document (GOLD).</td></tr>
</table>

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 2*

OPTIMISE TRAFFIC FLOWS

Benefits	
Environment	• reductions in fuel consumption
Efficiency	• reduction in weather and traffic induced holding • improved and smoother traffic flows • improved predictability • optimized demand and capacity balancing through the efficient exchange of information

Strategy
Short term (2009-2010)
Medium term (2011–2015)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
DCB *(Demand and capacity management)*	**Bay of Bengal** • Enhance and facilitate the orderly flow of traffic across the Bay of Bengal and south Asia	2009-2010	Air Traffic Flow Management Task Force (ATFM/TF)	Implemented and reviewed regularly by the Bay of Bengal ATFM/TF First ATFM SG meeting held on 10 Dec 2010 Seamless ATM Symposium held 15-17 Aug 2011
DCB *(Demand and capacity management)*	**South China Sea** • Enhance and facilitate the orderly flow of traffic in the South China Sea area	2011-2015	SEACG	First ATFM SG meeting held on 10 Dec 2010 Seamless ATM Symposium held 15-17 Aug 2011
DCB *(Demand and capacity management)*	**Northeast Asia/Southeast Asia** • Enhance and facilitate the orderly flow between Northeast Asia and Southeast Asia, as well as within and between the North and the South Pacific regions	2009/2015	IPACG, ISPACG, EATMCG SEA RR/TF (ATS routes)	First ATFM SG meeting held on 10 Dec 2010 Seamless ATM Symposium held 15-17 Aug 2011
GPIs	GPI/6 air traffic flow management, GPI/7 Dynamic and Flexible ATS route management, GPI/8 Collaborative airspace design and development, GPI/16 Decision support and alerting system			
References	• *Draft Air Traffic Flow Management Communications Handbook for the Asia/Pacific Region* *APANPIRG Conclusions 20/10, 20/11, 20/12 and 20/13*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 10 September 2010)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 3* **OPTIMISE ROUTE STRUCTURE IN ENROUTE AIRSPACE**				
Benefits				
Environment	• reductions in fuel consumption			
Efficiency	• increase airspace capacity • ability of aircraft to conduct flights more closely to preferred trajectories • facilitate utilization of advanced technologies thereby increasing efficiency • optimized demand and capacity balancing through the efficient exchange of information			
Safety	• enhance safety by use of modern capabilities onboard aircraft			
Strategy **Short term (2010)** **Medium term (2011 - 2015)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
AOM *(Airspace Organization and Management)*	• Implement ATS route enhancements in the Asia Pacific Region, in collaboration with stakeholders, based on new technologies and procedures and in accordance with APANPIRG PBN Regional Plan, to improve en-route airspace efficiency. • Identify ATS and aeronautical communications problems in the Asia Pacific Region including Indian Ocean and the Arabian Sea, and prepare coordinated plans for actions for their resolution.	2009 -2015	**Bay of Bengal and Arabian Sea** BBACG, FIT-BOB, Bay of Bengal Reduced Horizontal Separation Implementation Task Force (BOB-RHS/TF) (Informal Arabian Sea/Indian Ocean ATS Coordination Group - ASIOACG)	Phase I implementation of 50NM separation in the Bay of Bengal selected routes on 11 March 2011
		2009-2015	**Southeast Asia AR9 Flow** SEACG, FIT-SEA Southeast Asia Route Review Task Force (SEA RR/TF)	ATM/AIS/SAR/SG/19 (2009) established the SEA Route Review Task Force (SEA RR/TF) AI/P901 longitudinal separation to be reduced to 30NM. Implementation at an advanced stage

		2009-2015	**<u>Pacific Area</u>** No APANPIRG regional working group established (Informal • South Pacific ATS Coordination Group – ISPACG, • Pacific ATS Coordinating Group – IPACG, and • East Asia ATM Coordination Group EATMG)	50 NM longitudinal implemented North Pacific in 2008 30/30 NM (RNP4) implemented Honiara, Nauru, Brisbane, Nadia Auckland Oceanic FIRs in January 2005 30/30 NM Operational trial Oakland FIR commenced 2007, Fukuoka FIR from August 2008, Anchorage FIR estimated 2011
AOM *(Airspace Organization and Management*	**Cross-Polar routes** • Improve alignment and use of cross polar routes at their south (Asian) ends.	2010-2015	Special ATS coordination meeting – China, Mongolia, Russian Federation, IATA (CMRI) Informal Cross Polar Working Group (CPWG)	In progress
GPIs	GPI/5 Performance based navigation, GPI/8 Collaborative airspace design and management			
References	• *Asia/Pacific Regional Performance Based Navigation Implementation Plan* • *ICAO Performance Based Navigation Manual (Doc 9613)* • *Terms of Reference of the ATM Coordination Groups and Task Forces implementing PBN based route structures and reduced horizontal separation minima.*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 4* **OPTIMISE ROUTE STRUCTURE IN TERMINAL AIRSPACE**				
Benefits				
Environment	• reductions in fuel consumption			
Efficiency	• increase airspace capacity • ability of aircraft to conduct flights more closely to preferred trajectories • facilitate utilization of advanced technologies thereby increasing efficiency • optimized demand and capacity balancing through the efficient exchange of information			
Safety	• enhance safety by use of modern capabilities onboard aircraft			
Strategy **Short term (2010)** **Medium term (2011 - 2015)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
AOM *(Airspace Organization and Management)* **AUO** *(Airspace Users Operations)*	Implement ICAO Performance Based Navigation (PBN) provisions for terminal area operations in collaboration with stakeholders based on the Regional PBN Implementation Plan agreed by APANPIRG, to improve terminal area efficiency by use of advanced navigation specifications for SIDs, STARs and instrument approach procedures.	In accordance with PBN Regional Plan	Performance Based Navigation Task Force (PBN/TF)	PBN/TF prepared Regional PBN Plan adopted by APANPIRG/19
GPIs	GPI/5 Performance based navigation, GPI/8 Collaborative airspace design and management. GPI/10 Terminal area design and management, GPI/11 GPI-11 RNP and RNAV Standard Instrument Departures (SIDs) and Standard Terminal Arrivals (STARs), GPI-12 Flight Management System (FMS) – based arrival procedures			
References	• *Asia/Pacific Regional Performance Based Navigation Implementation Plan* • *ICAO Performance Based Navigation Manual (Doc 9613)*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE*: APAC Objective 5* **IMPLEMENTATION OF NEW ICAO FLIGHT PLAN PROVISIONS**	
Benefits	
Environment	• reductions in fuel consumption and gaseous emissions as a result of efficiency gains.
Safety	• enhance safety by use of modern capabilities onboard aircraft
Continuity	• maintains continuity of aviation operations across the region
Efficiency	• ability of air navigation service providers to make maximum use of aircraft capabilities, • ability of aircraft to conduct flights more closely to their preferred trajectories, • facilitate utilization of advanced technologies thereby increasing efficiency, and • optimized demand and capacity balancing through the efficient exchange of information.

Strategy
Short/Medium Term (2009-2012)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
SDM *(ATM Service Delivery Management)*	• Implement the provisions of Amendment 1 to the Fifteenth Edition of the PANS ATM (Doc 4444), comprising amended PANS ATM Chapter 4, Chapter 11, Appendix 2 and Appendix 3 provisions relating to the ICAO Flight Plan and associated ATS Message formats, with applicability date 15 November 2012.	2009-2012	ICAO Flight Plan and ATS Messages Task Force (FPL&AM/TF)	APANPIRG/20 adopted the *Interim Strategy for the Implementation of New ICAO Flight Plan Format and supporting ATS Messages* 1
GPIs	GPI/5: Performance based navigation, GPI/9: Situational awareness, GPI/11: RNP and RNAV SIDs & STARs, GPI/17: Implementation of data link applications and GPI/18: Aeronautical Information			
References	• *Amendment 1 to 15th Edition of PANS-ATM (Doc 4444, ICAO State Letter Ref: AN13/2.1-08/50, dated 25 June 2008)* • *ICAO Guidance Material for Implementation (ICAO State Letter Ref: AN 13/2/1-09/9, dated 6 February 2009)* • *Asia/Pacific Region – Interim strategy for the implementation of new ICAO flight plan format and supporting ATS messages* • *APANPIRG Decision 19/6, Conclusions 20/7 and 20/8*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 10 September 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 6* **ENHANCED PROVISION OF AIS/AIM**				
Benefits				
Efficiency	• enhanced collaboration between flight crew and the ATM system, • improved collaborative decision making, • improved predictability, and • reduction of workload for aircrew and ATC.			
Strategy **Short to Medium term (2009 – 2012)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
SDM *(ATM Service Delivery Management)*	• Implement the enhanced provisions for AIM becoming available through the work of the Aeronautical Information Services-Aeronautical Information Management Study Group (AIS-AIMSG); • Monitor implementation progress	2009-2016	AAITF	AAITF has developed AIS/AIM table to track States Implementation of Tasks
	Consolidation: (Refer AIM Roadmap) 1. Monitoring of Annex differences 2. AIRAC adherence monitoring 3. Quality 4. WGS-84 implementation	2009 - 2013	AAITF	As above
	Going Digital: (Refer AIM Roadmap) 1. Data integrity monitoring 2. Data quality monitoring 3. Aerodrome mapping 4. Electronic AIP 5. Obstacles 6. Terrain 7. Integrated aeronautical information database 8. Unique identifiers 9. Aeronautical information conceptual model	2009 - 2014	AAITF	As above

	Information Management: (Refer AIM Roadmap) 1. Aeronautical data exchange 2. Digital NOTAM 3. Communication networks 4. Aeronautical information briefing 5. Training Interoperability with meteorological products 7. Electronic aeronautical charts 8. Agreements with data originators	2013 - 2016	AAITF	As above
GPIs	GPI/18: Aeronautical Information			
References	• *Annex 4 – Aeronautical Charts* • *Annex 15 – Aeronautical Information Services* • *AIS Manual (Doc 8126)* • *Aeronautical Chart Manual (Doc 8697)* • *EUROCONTROL Operating Procedures for AIS Dynamic Data (OPADD)* • *APANPIRG Conclusion 20/16*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 7* **ENHANCED SEARCH AND RESCUE CAPABILITY**				
Benefits				
Safety & Efficiency	• cost-efficient use of RCC accommodation and equipment on a shared basis, • development of a pool of experienced SAR mission coordinators skilled across both aviation and maritime domains thus reducing coordination and fragmentation, • proficient services provided near and within States with limited resources, • harmonization of aviation / maritime procedures, and • inter-operability of life-saving equipment			
Strategy **Short to Medium term (2009 – 2015)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
IM *(Information Management)*	Implementation of Annex 12 Standards and Recommended Practices and related APANPIRG Conclusions to ensure appropriate SAR capabilities for the Asia/Pacific regions.			
	• Periodic review of SAR facilities, services and procedures in the region;	2009-2015	States, ATM/AIS/SAR Sub Group	In progress
	• Encourage States to delegate or negotiate SAR services in accordance with Annex 12 provisions;	2009-2015	States, ATM/AIS/SAR Sub Group	In progress
	• APANPIRG Asia/Pacific "SAR Capability Matrix" and "Register of SAR Agreements" be kept up to date and distributed to States for information and action;	2009 - 2015	States, ATM/AIS/SAR Sub Group	In progress
	• States designate an agency for registering ELT Beacons, coded with the country code of the State and unique code of that beacon in a database as required by Annex 10.	2010	States	In progress
GPIs	None applicable			
References	• *Annex 12 – Search and Rescue* • *International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual, Doc 9731)* • *APANPIRG Conclusions 18/19, 18/20, 20/17 and 20/18*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended in May 2011)

REGIONAL PERFORMANCE OBJECTIVE: - ***APAC Objective 8*** **IMPLEMENTATION OF AERONUTICAL TELECOMMUNICATION NETWORK (ATN) FOR GROUND – GROUND COMMUNICATION NETWORK**	
Benefits	
Safety	• Will provide reliable means of communication for Air Navigation Services, with the provision of automatic switching capability, in the event of failure of current media
Efficiency	• Routers will have the capability of choosing between different media based on defined criteria. • Multiplicity of protocols used for different communication requirements will be avoided; • Provision for lower case characters and graphic message included;

Strategy
Implementation strategy, short term (2009-2012)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
SDM *(ATM Service Delivery Management)*	Ensure implementation of Ground to Ground Aeronautical Telecommunication Network (ATN) in the Asia and Pacific Regions			
	• Review the ATN Implementation Strategy, revise it when necessary taking into account the current developments.	2010	ATNICG	The strategy was updated by ATNICG/5 Meeting held from 31 May to 4 June 2010 and endorsed by the CNS/MET SG/14 in July 2010
	• Review the Status of implementation of ATN at the Backbone Boundary Intermediate System hubs	2011	ATNICG	ATNICG reviews the progress of ATN Implementation in its Meetings
	• States hosting Backbone Boundary Intermediate Stations to organize Testing of their system on bilateral basis	2011	States hosting Backbone Boundary Intermediate Systems	States reported the outcome of pre-operational trials/tests carried out by them at the ATNICG meetings
	• Implementation of AMHS Off Line Directory Service. Availability of off-line support by Eurocontrol AMC considered essential for the efficient management of AMHS Addresses. ICAO HQ has directed the States to register the operating personnel with AMC.	2010	ICAO Asia/Pacific Office, Aerothai.	Progress made in the registration of operators with AMC and entering of data into AMC was reviewed by ATNICG/6.

	• States hosting Backbone Boundary Intermediate System hubs to implement dual stack ATN (ATN over OSI and ATN over IPS). APANPIRG, through Conclusion 19/20 urges States to complete the implementation of dual stack ATN by 2011	2011	Asia and Pacific Region States hosting Backbone Boundary Intermediate Systems	States hosting BBIS hubs have been reminded of APANPIRG Conclusion 19/20 and urged to complete the installation by 2011
	• Completion of Networking with the BIS States	2013	Asia and Pacific Regions States	Some States started implementation and conducted operational trials
	• Review if implementation objectives have been met.	2009 - 2012	ATNICG	ATNICG to periodically review the status and direction in which the implementation is progressing and to ensure that the implementation efforts are leading towards the defined objectives
GPIs	GPI/17: Data link applications, GPI/22: Communication infrastructure			
References	• *Annex 10, Aeronautical Telecommunications, Volume III (Part I – Digital Data Communication Systems)* • *Manual on Detailed Technical Specifications for the Aeronautical Telecommunications Network (ATN) using ISO/OSI (Doc 9880)* • *ICAO Aeronautical Telecommunication Network (ATN) Manual for ATN using IPS Standards and Protocols (Doc 9896)* • *Manual on Required Communication Performance (Doc 9869)* • *Regional Implementation guidance materials adopted by APANPIRG*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)
ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended in July 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 9* **ENHANCED COMMUNICATIONS AND SURVEILLANCE CAPABILITY IN OCEANIC AREAS**				
Benefits				
Environment	• reductions in fuel consumption and gaseous emissions as a result of efficiency gains;			
Safety	• improved monitoring of airspace will result in safety enhancement			
Efficiency	• facilitate utilization of advanced technologies (e.g, area navigation, UPRs, DARPs) and ATC decision support tools (e.g., vertical and lateral adherence monitors, short and medium term conflict detection), thereby enhancing safety and increasing efficiency. • enable aircraft to conduct flight more closely to preferred trajectories; • increase airspace capacity by enabling implementation of RHSM using data link;			
Strategy **Short term (2009-2011)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
AOM *(Airspace Organization and Management)* **CM** *(Conflict Management)* **AUO** *(Airspace Users Operations)*	Improve provision of satellite based communications and surveillance capabilities to enable FANS 1/A data link (ADS-C, CPDLC) to RNP 4 and RCP 240 specifications.			
	• codify/quantify existing anecdotal information and combine with available end-to-end system performance data; to summarise current satellite data link performance;	2009	Regional ANSPS, operators, FITS, CRAs. Communications Service providers (CSP)	Reported to Satellite Operational Continuity Meeting (SOCM/1), Bangkok, Thailand, August 2009
	• identify non conformities in current satellite data link performance against; o specifications in Global Operations Data Link Document (GOLD); o specifications in RCP Manual (Doc 9869); and o specifications in Oceanic SPR)	2009	Regional ANSPS, operators, FITS, CRAs.	reviewed status and identify issues at Satellite Operational Continuity Meeting (SOCM/1), August 2009

	• provide summary information on non conformities in current satellite data link performance to all affected parties in the end-to-end communications chain.	2009	Satellite Operational Continuity Meeting (SOCM) August 2009 to summarize and circulate information to affected parties, including CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	Issues identified have been summarized in the report of the first meeting of Satellite Operational Continuity Meeting (SOCM/1).
	• develop a regional strategy and work programme to identify/design suitable long term mitigations and solutions to non conformities that will enable continuous operational compliance with specifications for RNP4 and RCP 240.	2011	Regional ANSPs, operators, FITS, CRAs, CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	The Satellite Communication Datalink Service has been improved since late 2009 to some extent. But still does not meet operational requirements satisfactorily.
	• Develop a sample service level agreement for possible use by ANSPs	2011	Regional ANSPs, operators, FITS, CRAs, CSP	SOCM/2 scheduled for November 2011 to progress this work
	• Implement mitigations and solutions in accordance with timelines in regional strategy	2010	Regional ANSPS, operators, FITS, CRAs, CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	State Letter dated 12 July 2010 issued conveying mitigation solution suggested by ICAO
	• monitor implementation progress	2011	Regional FITS, CRAs provide feedback to all affected parties	Assess implementation of mitigation solution in the next SOCM meeting
GPIs	GPI/5: RNAV and RNP, GPI/7: dynamic and flexible ATS route management, GPI/17: data link applications and GPI/22: Communication Infrastructure;			
References	• *Manual on Required Communication Performance (Doc 9869)* • *RTCA DO-306/EUROCAE ED-122, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (the "Oceanic SPR')* • *FANS-1/A Operations Manual (FOM)* • *Global Operational Data Link Document (GOLD)* • *Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region* • *CEANS Report(2008) on ANS Infrastructure* • *APANPIRG Conclusion 19/24, 20/31, 20/32/20/33, 20/34 and 20/73*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended in July 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 11* **IMPLEMENTATION OF ATS INTER-FACILITY DATA COMMUNICATION (AIDC) IN ASIA/PACIFIC REGION**				
Benefits				
Safety	• Will provide efficient and more reliable means of communication between ACCs in adjacent FIRs for the exchange of traffic coordination related operational messages. • Significantly reduce the coordination errors observed in controller to controller verbal communication across FIR boundaries thus enhance flight safety			
Efficiency	• Increased efficiency for air traffic handover between ATS units • Will improve ATS direct communication between ATS units along the major traffic • Will improve the speed and capacity ; • Will facilitate inter-automation systems communication.			
Strategy **Short term (2009-2015)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
AOM *(Airspace Organisation and Management)* **CM** (Conflict management) **SDM** (ATM service delivery management)	Facilitate implementation of ATS Inter-facility Data Communication in the Asia and Pacific Regions			
	• Review the Status of Implementation	2009	ATNICG. ADS-B SITF	The status to reviewed and updated by ATNICG/4 and ADS-B SITF Meetings held in May 2009
	• Review the Options available for the implementation of AIDC in the region. Discuss options adopted by different states.	2010	SIP AIDC Seminar	Options available were reviewed at AIDC Seminar in October 2010
	• Review implementation issues related to ATS automation systems and recommend methods of mitigating those issues	2009	ADS-B SITF CNS/MET SG	The automation issues discussed in the ADS-B SIFT/8
	• AIDC Seminar: A Seminar to be conducted to discuss various implementation issues and promote implementation	2010	ICAO Asia/Pacific Office	SIP Seminar was conducted from 12-13 Oct. 2010 in Bangkok

	• Develop implementation strategy to decide whether to continue pursuing AFTN AIDC or to choose ATN AIDC over OSI or IPS	2010	APANPIRG	ATN AIDC implementation deferred.
	• Trials to be conducted. Monitoring mechanism to be developed	2011	APANPIRG	State Letter be issued urging the States to expedite implementation and status to be monitored.
	• Review to ensure implementation objectives are met.	2009 - 2015	APANPIRG	APANPIRG to periodically review the status and direction in which the implementation is progressing and to ensure that the implementation efforts are leading towards the defined objectives
GPIs	GPI/17: Data link applications, GPI/22: Communication infrastructure			
References	• *Air Traffic Management* (Doc 4444) • *Manual of Air Traffic Services Data Link Applications* (Doc 9694) • *Manual of Technical Provisions for the Aeronautical Telecommunication Network (Doc 9705)* • *Asia/Pacific Regional Interface Control Document (ICD) for ATS Inter-facility Data Communication (AIDC)*			

ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(*Amended in April 2011)*

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 10* **IMPROVED SITUATIONAL AWARENESS AND SURFACE SURVEILLANCE-IMPLEMENTATION OF THE ADS-B TO GROUND SURVEILLANCE** **Benefits**					
Environment	• Reductions in fuel consumption and subsequent lower gas emissions				
Efficiency	• Increased flexibility and flow of traffic operations • Ultimately, when performing *radar-like* control, potential redesign of airspace taking into account the application of reduced separation minima, integrate use of aircraft navigation and surveillance capability				
Safety	• Introduction of surveillance in a non-radar environment • Support to search and rescue operations				
Strategy ***Medium Term (2011-2015)*** ***Short term (2010)***					
ATM OC COMPONENTS	**TASKS**	**TIME FRAME STARTED**	**RESPONSIBILITY**	**STATUS**	**REMARKS**
AOM *(Airspace Organization and Management)* **CM** *(Conflict Management)* **AUO** *(Airspace Users Operations)*	Implementation of ADS-B based surveillance service in the sub-regions.				
ATM SDM (ATM *Service Delivery Management)*	• Compare current technologies with respect to concept of operations, relative costing, technical and operational performance and maturity of alternative technology/solutions (primary, secondary radar including Mode-S, ADS-B, multilateration, ADS-C)	2009	ADS-B Study and Implementation Task Force (ADS-B SITF)	COMPLETED	Regional Guidance material on comparison of technologies developed and issued

	• Develop an implementation plan for near-term ADS-B applications in the Asia Pacific Region including implementation target dates taking into account: o available equipment standards; readiness of airspace users and ATS providers; o identifying sub-regional areas (FIRs) where there is a positive cost/benefit outcome expected for near-term implementation of ADS-B OUT; o developing a standardized and systematic task-list approach to ADS-B OUT implementation; and o holding educational seminars and provide guidance material to educate States and airspace users on what is required to implement ADS-B OUT.	2009-12	ADS-B Study and Implementation Task Force	In progress	The FASID Table CNS 4A and 4B – surveillance and ATM automation being updated; ADS-B Seminar conducted annually in conjunction with Task Force meetings. Potential sub-regions for using ADS-B identified; Requirements for avionics specification for the near-term application are developed based on AMC2024 and Australian CASA document.
	• Develop Guidance Material to support harmonized regulation of ADS-B systems required on board the aircraft.	2010	ADS-B Study and Implementation Task Force	Completed	DGCA Conf.45 through its Action Item 45/3 invited ICAO APANPIRG ADS-B SITF to develop the Guidance material. The GM was developed by Regulators Workshop and ADS-B SITF/9 held in Aug. 2010

	• Study and identify applicable multilateration applications in the Asia and Pacific Region considering: - Concept of use/operations; - Required site and network architecture; - Expected surveillance coverage; Cost of system; Recommended separation minimas; & - If multilateration can be successfully integrated into an ADS-B OUT system for air traffic control	2012	ADS-B Study and Implementation Task Force	In progress	Concept of using multlateration has been developed; Some states have plan in place to introduce multilateration in particular integrate it with A-SMGCS and Terminal area and en-route surveillance application
	• Coordinate ADS-B implementation plan and concept of operations with other ICAO regions where ADS-B implementation is going on and with relevant external bodies such as EUROCONTROL, EUROCARE, RTCA and Industry.	2013	ADS-B Study and Implementation Task Force	On- going	Information on ADS-B in Europe and North American Regions is provided to Task Force Meeting annually; Some Industry representatives provide input at ADS-B Seminar and meetings

	• Develop **Terms of Co-operation** for SEA which will include: • Establishing model documents for possible use by States when - Agreeing to share ADS-B data and DCPC (such as VHF radio voice communication) capability between adjoining States for various ADS-B applications (including a sample letter of agreement); or -Establishing ADS-B avionics fitment mandates Identifying optimum coverage for ADS-B ground stations and associated VHF radio voice communication in the sub-regional FIR boundary areas.	2012	South East Asia (SEA) Sub-Regional ADS-B Implementation Working Group	In progress	Terms of co-operation developed; sample agreement of data sharing developed further updated Some location for ADS-B ground stations identified. CBA for SEA project has been completed; Implementation plan for Australia-Indonesia and South China Sea Data and VHF communication capacity sharing projects developed .
	• Develop an implementation plan for near- term ADS-B application in SEA which will deliver efficient airspace and increased safety on a sub-regional basis that includes: • Schedule and priority dates to bring into effect ADS-B based services taking into account: - Timing of any equipage mandates; - Timing of any ATC automation upgrades to support ADS-B; - Timing of commissioning of any ADS-B data sharing and associated VHF radio voice communication facilities; • Consideration of major traffic flows.	2013	South East Asia (SEA) Sub-Regional ADS-B Implementation Working Group	In progress	Major traffic flow from Australia to Singapore through Indonesia and Singapore to Hong Hong along L642 and M771 in South China Sea being progressed. Milestones and timelines have been established. ADS-B SITF/10 Proposed to rename SEA ADS-B WG into SEA/BOB ADS-B WG

linkage to GPIs	GSI-12 Use of Technology to Enhance Safety; GPI/9 Situational Awareness; GPI/5: RNAV and RNP, GPI/7: dynamic and flexible ATS route management, GPI/17: data link applications and GPI/22: Communication Infrastructure;
References	• *Report of AN CONF/11;* • *Global ATM Operational Concept (Doc 9854);* • *Global Air Navigation Plan (Doc 9750);* • *Technical Provisions for Mode S Services and Extended Squitter (Doc 9871)* • *APANPIRG/16, 17, 19, 20,21 reports on ADS-B* • *ADS-B related regional guidance materials adopted by APANPIRG*

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended July 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 18* **IMPLEMENTATION OF ICAO PERFORMANCE BASED NAVIGATION PROVISIONS FOR TERMINAL AREA OPERATIONS**	
Implement ICAO Performance Based Navigation (PBN) provisions for terminal area operations in collaboration with stakeholders based on the Regional PBN Implementation Plan agreed by APANPIRG, to improve terminal area safety and efficiency by use of advanced navigation specifications for SIDs, STARs and instrument approach procedures.	
Benefits	
Environment	• reduction in fuel consumption and resulting emissions
Safety	• enhance safety by use of modern capabilities onboard aircraft; • implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows; • increased airspace safety through the implementation of continuous and stabilized descent procedure using vertical guidance; • improved airport and airspace arrival paths in all weather conditions; and • decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the need for ATC-pilot communication and radar vectoring
Efficiency	• allows for more efficient use of airspace and increase airspace capacity through reduction of lateral and longitudinal separation between aircraft; • increase of predictability of the flight path; • reduced delays in high density airspace and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas; • reduces the possibility of missed approaches due to lower approach minima and straight-in procedures; • ability of air navigation service providers to make maximum use of aircraft capabilities; • ability of aircraft to conduct flights more closely to their preferred trajectories; • reduced aircraft flight time due to the implementation of optimal flight paths; • facilitate utilization of advanced technologies thereby increasing efficiency; • optimized demand and capacity balancing through the efficient exchange of information; • reduces the need to maintain sensor-specific route and procedures, and their associated costs; • avoids the need for developing sensor-specific operations with each new evolution of navigation system, which would be cost prohibitive; • GNSS and area navigation based PBN reduces the need for expensive ground-based navigation aids; • clarifies how RNAV systems are used; and • facilitate the operational approval process for operators by providing a limited set of navigation specifications intended for global use.

SAFETY COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
APANPIRG Conclusion 18/52	**Establishment of a Regional Performance Based Navigation Task Force (PBN/TF)** An Asia/Pacific PBN Task Force, with terms of reference as outlined in Appendix A to the APANPIRG/18 Report on Agenda Item 3.5, be established to develop a PBN implementation plan for the Asia/Pacific Region and address related regional PBN implementation issues.	**PBN TF –** As soon as practicable Regional PBN Implementation Plan – by 2008 (Before APANPIRG-19)	APANPIRG PBN Task Force	Regional PBN/TF established in 2007. PBN T/F meetings: 1st 9–11 Jan 2008 2nd 1 – 3 April 2008 3rd 14-17 July 2008 4th 4-6 March 2009 5th 15-17 July 2009 6th 3-5 Feb..2010 7th 1-3 Sep.2010 8th 12-13 May 2011 APANPIRG/19 approved the Regional PBN Plan Interim Edition RASMAG reviewed the Plan in Dec 2008 suggested some changes. PBN/TF 4 reviewed RASMAG proposals and incorporated comments in the Version 0.2 of the Plan Plan was further reviewed by: ATM/AIS/SAR/SG/19 ; and CNS/MET/SG /13 Asia/Pac Regional PBN Plan Ver.1.0 was adopted by APANPIRG/20 PBN TF/6 developed revision to the Plan Ver.2.0 PBN TF/8 developed PBN Plan Ver. 3.0

APANPIRG Conclusion 18/53	**Development of State PBN Implementation Plans** The Regional Office should encourage States to begin development of their State PBN implementation plans in harmony with the development of the Asia/Pacific Regional PBN implementation plan being coordinated by the Asia/Pacific PBN Task Force for submission to APANPIRG/19 (2008).	**State PBN Implementation Plan -** 2009	STATES PBN TF APAC Office	State PBN Implementation Plan/Road map received from 21 States prior to PBNTF/7. 9 national PBN plans assessed by the PBN Plan Review Team as robust by TF/8, 12 plans reviewed. States have not done so, were encouraged to provide their plan in 2010.
APANPIRG Conclusion 18/55	**Designation of Contact Person for PBN Implementation** States designate a focal contact person responsible for performance based navigation implementation and provide details of the contact person to ICAO Asia/Pacific Regional Office accordingly.	31 December 2007	STATES APAC Office	28 States and 3 Int'l Organizations have nominated Focal Points As at PBN TF/8, 13 administrations have not provided their PBN Point of Contact (POC). Of these administrations, 12 are small Pacific Island/Rim States.
PBN/TF Report	**Develop detailed Status (database) regarding current and planned implementation of PBN terminal instrument procedures (SIDs and STARs) and Approaches** **Data Collection – Runway ends /International Aerodromes** **Data Collection – Runway ends /Domestic Aerodromes**	 30 June 2008 31 December 2008	 STATE Focal Point STATE Focal Point	ONLY 8 States have provided information Reminders are being sent regularly PBN TF/8 developed an implementation response form to provide information on States PBN procedure development
PBN Report	**Template developed by PBN TF for reporting progress:** **- Common Template will help in harmonizing the reporting process;** **- States requested to submit PBN Implementation Progress Report by 15 August 2009 for submission to APANPIRG 20.**	15 August 2009 and prior to each future PBN/TF Meeting	STATE	18 States have submitted PBN Implementation Progress on the new Template.

Strategy **Short term (2008 – 2012)**				
• **TMA– Arrival**	1. RNAV 1 in radar environment and with adequate navigation infrastructure. 2. Basic-RNP 1 in non-radar environment	RNAV 1 STAR for 50% of international airports by 2010 and 75% by 2012. Priority should be given to airports with RNP Approach	STATES APANPIRG PBN TF	
• **TMA- Departure**	1. RNAV 1 in radar environment and with adequate navigation infrastructure. 2. Basic-RNP 1 in non-radar environment	RNAV 1 SID for 50% of international airports by 2010 and 75% by 2012. Priority should be given to airports with RNP Approach	STATES APANPIRG PBN TF	
• **Approach**	1. RNP APCH with Baro-VNAV in most possible airports 2. RNP AR APCH in airport where there are obvious operational benefits.	RNP APCH (with Baro-VNAV) in 30% of instrument runways by 2010 and 50% by 2012. Priority should be given to airports with operational benefits	STATES APANPIRG PBN TF	

Strategy **Medium Term (2013 – 2016)**				
SAFETY COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
• **TMA– Arrival**	1. Expand RNAV 1 or RNP 1 Application 2. Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	RNAV 1 or RNP 1 STAR for 100% of international airports by 2016 RNAV 1 or RNP 1 STAR for 70% of busy domestic airports where there are operational benefits	STATES PBN TF APANPIRG	
• **TMA-Departure**	1. Expand RNAV 1 or RNP 1 Application 2. Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	RNAV 1 or RNP 1 SID for 100% of international airports by 2016 RNAV 1 or RNP 1 SID for 70% of busy domestic airports where there are operational benefits	STATES PBN TF APANPIRG	
• **Approach**	1. Expansion of RNP APCH (with Baro-VNAV) and APV 2. Expansion of RNP AR APCH where there are operational benefits 3. Introduction of landing capability using GNSS and its augmentations	RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016	STATES APANPIRG PBN TF	This requirement has been modified by Assembly Resolution A37-11, which allows LNAV procedures for airports with no VNAV capable aircraft 5700kg+

Strategy **Long Term (2016 and beyond)**	
In this phase, GNSS is expected to be a primary navigation infrastructure for PBN implementation. States should work co-operatively on a multinational basis to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated research and development programmes on GNSS implementation and operation. During this phase, States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance. With the expectation that precision approach capability using GNSS and its augmentation systems will become available, States are encouraged to explore the use of such capability where there are operational and financial benefits.	
GPIs	GPI/5: Performance based navigation, GPI/9: Situational awareness, GPI/11: RNP and RNAV SIDs & STARs,
References	• *APANPIRG Decisions and Conclusions n* • *ICAO Guidance Material – Performance-Based Navigation Manual Doc 9613 AN/937 Third Edition – 2008* • *Assembly Resolution 36-23; Resolution A37-11*

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 22 July 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 12*

IMPLEMENT INTERNATIONAL AIRWAYS VOLCANO WATCH (IAVW), INTERNATIONAL TROPICAL CYCLONE WATCH (ITCW), AND IMPROVE THE QUALITY OF METEOROLOGICAL WARNINGS AND ADVISORIES

Benefits	
Safety Efficiency	• Improve in-flight safety by providing information on volcanic ash, tropical cyclone and other hazardous weather by way of meteorological advisories and warnings • Improve pre-flight planning by optimizing flight routes with respect to volcanic ash, tropical cyclone and other hazardous weather phenomena by way of meteorological advisories and warnings

Strategy
Short term (2011-2012)/Medium term (2013 - 2016)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
MET	• Monitor and provide assistance in the regional implementation of meteorological warnings and advisories that include volcanic ash (VA) and tropical cyclone (TC) advisories and meteorological warnings and advisories based on current and future requirements	2011 - 2016	METWARN/I TF	In progress
	• Track and investigate deficiencies in the format and dissemination of meteorological advisories and warnings and propose remediation plans and provide information to ICAO and WMO groups for possible assistance	2011-2016	METWARN/I TF OPMET/M TF	In progress
	• Conduct periodic tests for SIGMET on VA, TC, and phenomena other than VA and TC in view of assessing improvements in their implementation	2011 – 2016	METWARN/I TF & RODB & VAACs & TCACs & OPMET/M TF	In progress
	• Provide guidance and/or training related to the implementation of meteorological advisories and warnings, including the Regional SIGMET Guide as they relate to the Annex 3 amendment cycle	2013	METWARN/I TF & OPMET/M TF & RO	In progress

	• Develop framework for emergency plan for specific phenomenon including VA, radioactive cloud, TC and Tsunami. with consideration to global ICAO groups and WMO developments	2011-2012	METWARN/I TF & MET/ATM TF	To begin
Linkage to GPIs	GPI/19 – Meteorological Systems			
References	• *Annex 3* • *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds (Doc 9691)* • *Handbook on the International Airways Volcano Watch (IAVW) Operational Procedures and Contact List (Doc 9766)* • *Manual on Low-level Wind Shear (Doc 9817)* • *Asia/Pacific Regional SIGMET Guide*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(amended 27 July 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 13* **IMPLEMENT WAFS AND ASSOCIATED DEVELOPMENTS**	
Benefits	
Safety **Efficiency**	• Improve the regional implementation of weather forecasts (including upper-winds and upper-air temperatures, direction, speed and height of maximum winds and tropopause heights, as well as turbulence, icing, cumulonimbus) used by airlines and ATM needed to optimize flight routes which will provide an increase in efficiency and reduced carbon emissions

Strategy
Short term (2011-2012)/Medium term (2013 - 2016)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
MET	• Assist the regional implementation of new gridded products for turbulence, icing and CB forecasts	2011-2014	WAFS/I TF	In progress
	• Facilitate in organizing regional training of new gridded products for turbulence, icing and cumulonimbus forecasts	2011-2014	WMO & ICAO	In progress
	• Monitor the operational use of WIFS noting the planned cessation of ISCS-G2 broadcast on 1 July 2012	2011-2016	WAFS/I TF	In progress
	• Monitor the operational use of Secure SADIS FTP service noting the planned cessation of SADIS FTP on 30 November 2012	2011-2016	WAFS/I TF	In progress
	• Maintain and distribute WAFS service reference document to ASIA/PAC States	2011-2016	WAFS/I TF	In progress
	• Monitor the implementation status of WAFS within the ASIA/PAC Regions, and report to CNS/MET SG	2011-2016	WAFS/I TF	In progress

	• Report WAFS training needs of ASIA/PAC States to CNS/MET SG	2011-2016	WAFS/I TF	In progress
Linkage to GPIs	GPI/19 – Meteorological Systems			
References	• *Annex 3* • *http://www.icao.int/anb/wafsopsg/* • *http://www.icao.int/anb/sadisopsg/* • *Asia/Pac WAFS Implementation Plan and Procedures*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 22 July 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 14*

DEVELOP REGIONAL MET REQUIREMENTS TO SUPPORT ATM

Benefits	
Safety Efficiency	• Improve efficiency of ATM and airlines by providing tailored regional MET products needed to optimize flight routes in all weather conditions

Strategy
Short term (2011-2012)/Medium term (2013 - 2016)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
MET	• Conduct MET ATM meeting in 2009 to determine actions needed to obtain regional MET requirements to support ATM	2009	MET/ATM TF	complete
	• Conduct survey on regional ATM requirements for MET information	2012	MET/ATM TF	Possibly discuss at next MET/ATM event
	• Conduct MET seminar in coordination with WMO in 2011 to further develop list of possible regional MET requirements to support ATM	Jan 2011	MET/ATM TF	complete
	• Assess aviation meteorological services, systems and architecture in the region and how they can integrate weather information into decision support tools	2011-2016	MET/ATM TF	In progress
	• Investigate sub-regional exchange of MET information and associated agreements that facilitate ATM operations particularly over busy routes that overlap different FIRs	2011-2016	MET/ATM TF	In progress
	• Facilitate implementation of Meteorological Services for the Terminal Area (under development by WMO)	2013-2015+	MET/ATM TF	future
	• Monitor global policy associated with source data and delivery of MET products for ATM	2011-2016	MET/ATM TF	future

Linkage to GPIs	GPI/19 – Meteorological Systems Note that the MET/ATM TF will provide input to the METWARN/I TF in the developing a framework for contingency plan for specific phenomenon including VA, radioactive cloud, TC and Tsunami
References	• *Manual on co-ordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377)*

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended 22 July 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 15* **IMPROVE OPMET EXCHANGE EFFICIENCY**				
Benefits				
Safety Efficiency	• Increase OPMET availability and reliability needed for flight planning (efficiency) and in-flight re-planning (safety)			
Strategy **Short term (2011-2012)/Medium term (2013 - 2016)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
MET	• Improve the availability of OPMET data at the Regional OPMET Data Banks (RODB)	2011 - 2016	OPMET/M TF	In progress
	• Improve the inter-regional OPMET exchange	2011 - 2016	OPMET/M TF	In progress
	• Improve the availability of OPMET data in the Pacific	2011 - 2016	OPMET/M TF &TCB & PASO & States	In progress
	• Review and update regional ROBEX tables and guidance material	2011 - 2016	OPMET/M TF & RO	In progress
	• Facilitate and provide guidance to the implementation new/modified standards before applicability date and carry out post implementation review to ensure that standardized procedures are followed	2011 - 2016	OPMET/M TF	In progress
	• Conduct periodic quality checks and OPMET monitoring to improve the quality and timeliness of OPMET in the Asia/Pac Region	2011 – 2016	OPMET/M TF & IATA	In progress
	• *Facilitate and monitor the migration to AIM and new MET codes (e.g. XML) for METAR/SPECI, TAF and SIGMET*	*TBD*	*OPMET/M TF & RO*	*TBD*

Linkage to GPIs	GPI/19 – Meteorological Systems (Note: the OPMETM TF will assist the METWARN/I TF in SIGMET test coordination and deficiency tracking of the format and dissemination of meteorological advisories and warnings and noted in the PFF of the METWARN/I TF)
References	• *SADIS User Guide* • *ROBEX Handbook* • *Asia/Pacific OPMET Data Banks Interface Control Document*

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ASIA/PACIFIC REGION-PERFORMANCE FRAMEWORK FORM
(REGIONAL)

REGIONAL PERFORMANCE OBJECTIVE: APAC Objective 16 *ENHANCE SAFETY AND EFFICIENCY OF AERODROME OPERATIONS*				
Benefits				
Safety	• Ensure continued safety, regularity and efficiency of aircraft operations at aerodromes • Ensure the aerodromes are in compliance with the relevant ICAO SARPS and Civil Aviation Regulations. • Prevention of accidents • Reduction/elimination of deficiencies • Uniform conditions for aircraft of all other contracting states			
Efficiency	• improved aerodrome capacity			
Strategy **Short term (2009-2012)/medium term (2009-2015)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
AO (Aerodrome operations)**,** **CM** (conflict management)**,** **TS** (Traffic synchronization)**,** **AUO** (Airspace user operations)	AERODROME CERTIFICATION			
	• Facilitate the implementation of Aerodrome Certification by conduct of courses and seminars.	2009 , 2010, 2011 & 2012	ICAO APAC Office	Completed in 2009/10
	• Establish a regulatory framework specifying the criteria for the certification of aerodromes.	2009-2011	State	In Progress[30 States have confirmed the existence of a basic aviation law
	• Establish a regulatory authority [CAA]	2009-2012	State	In progress
	• Develop and approve aerodrome certification regulations and standards	2009-2012	State	In progress [Aerodrome certification regulations have been promulgated in 28 States, including 1 Territory (French Polynesia) and one Administration (Hong Kong).
	• Develop, issue and maintain guidance material and Advisory circulars on aerodrome certification for service providers.	2009-2012	State	In progress

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
	• Develop, issue and maintain guidance material and Advisory circulars on aerodrome certification for service providers.	2009-2012	State	In progress
	• Establish an entity within CAA responsible for aerodrome safety oversight and staffing requirements. Develop Manual of Aerodrome oversight procedures and Aerodrome Inspector Handbook	2009-2012	State	In progress
	SMS AT CERTIFIED AERODROMES			
	• Facilitate the implementation of SMS by the conduct of courses	2010, 2013	ICAO	ICAO SMS Course conducted from 20 to 24 June 2011
	• Develop SMS regulations & guidance material for the implementation of SMS, staff training, enforcement policy and communication means;	2009-2014	State	In progress [. SMS regulations have been promulgated in 16 States, including one Territory and one Administration.
	• Develop and establish the action plan on safety targets, hazard reporting, staff training, safety oversight, guidance material and accepted level of safety	2009-2015	State	In progress
	WILDLIFE HAZARD CONTROL AND REDUCTION			
	• Survey to collect information on state's practices with respect to airport wildlife control	2010	ICAO APAC Office	Completed
	• Establishment of a national procedure for recording and reporting wildlife strikes to aircraft;	2010 -2012	State	In progress[17 States including one Administration have informed that a National Bird control committee has been established

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
	• Establishment of a national bird control committee	2009-2012	State	In progress
	• Conduct wildlife assessments and Implement wildlife control programmes. Airports develop and professionally implement management plan to reduce the risk of strikes.	2009-2012	State	In progress
	• Land use management inside and in the vicinity of airport	2010 - 2015	State	In progress
	• States collect wildlife strike reports and forward to ICAO for inclusion in the ICAO IBIS (data base)	2009-2012	State	In progress
	• Seminar on wildlife assessment /reduction	2011	ICAO APAC Office	Completed in Dec 2010
	• Wildlife hazard management training for airport personnel	Continuous basis	State	In progress
	<u>AERODROME SAFETY MEASURES</u>			
	• Monitoring the height of buildings or structures within the boundaries of OLS;	2009-2015	State	In progress
	• Measurement and reporting of friction characteristics of wet paved runways	2011	State	In progress
	▪ procurement of a friction measuring device	2011	State	In progress
	▪ establishment of maintenance friction level below which corrective action should be initiated; and	2011	State	In progress
	▪ establishment of minimum friction level below which information that a runway may be slippery when wet is made available.	2011	State	In progress
	• Provision of runway end safety area;	2014	State	In progress

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
	• Provision of runway end safety area;	2014	State	In progress
	• Provision of enhanced visual aids and markings to help prevent runway incursions	2014	State	In progress
	• Seminar on runway surface friction measurement	2011	ICAO	Targeted for 2013
Linkage to GPIs	GPI/13 Aerodrome Design and Management and GPI/14 Runway operations			
References	• *Annex 14, Volume I* • *Doc 9774 – Manual on certification of Aerodromes* • *Doc 9859 – Safety Management Manual* • *Doc 7300 – convention on International civil Aviation* • *Doc 9137 – Airport Services Manual, Part 3, bird control and reduction;* • *Doc 9332 – Manual on the ICAO Bird Strike information System(IBIS)* • *Doc 9184 – Airport Planning Manual Part 2, Land Use and Environmental Control.* • *Doc 9157 – Aerodrome Design Manual, Part 1, Runways* • *Doc 9157 – Aerodrome Design Manual, Part 3, Pavements* • *Doc 9157 – Aerodrome Design Manual, Part 4, Visual Aids* • *Doc 9137 – Airport Services Manual, Part 2, Pavement surface Conditions* • *Doc 9137 – Airport Services Manual, Part 6, Control of Obstacles* • *Doc 9137 – Airport Services Manual, Part 8, Airport Operational Services* • *Doc 9137 – Airport Services Manual, Part 9, Airport Maintenance Practices*			

ASIA/PACIFIC REGION-PERFORMANCE FRAMEWORK FORM
(REGIONAL)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 17* *IMPROVE CONTINGENCY MEASURES FOR AERODROME OPERATIONS*				
Benefits				
Safety	• *Ensures better coordination between the different airport agencies and of those agencies in the surrounding community* • *Minimizes the effects of an emergency particularly in respect of saving lives and maintaining aircraft operations.* • *Safe continuation of aircraft operations*			
Efficiency	• *Prompt response by RFF, police/security, medical services and other agencies*			
Strategy *Short term (2009 - 2012)*				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
AO (Aerodrome operations), **CM** (conflict management), **TS** (Traffic synchronization), **AUO** (Airspace user operations)	AERODROME EMERGENCY PLANNING			
	• Initiate a survey to assess the level of implementation on aerodrome emergency planning	2012	ICAO APAC Office	
	• Establish aerodrome emergency plan document	2009-2011	State	In progress
	• Conduct full scale aerodrome emergency exercise at intervals not exceeding two years; and	2009- 2012	State	In progress
	• Partial emergency exercises in the intervening year to ensure that any deficiencies found during the full scale aerodrome emergency exercise have been corrected	2009- 2012	State	In progress

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
	• Establish procedure for emergencies in difficult environments at those airports located close to water and/or swampy areas or difficult terrain.	2009-2011	State	**In progress**
	• Conduct seminar on AEP	2011	ICAO	Rescheduled to 2013
Linkage to GPIs	GPI/13 Aerodrome Design and Management and GPI/14 Runway operations			
References	• *Annex 14, Volume I* • *Doc 9137 – Airport Services Manual, Airport emergency Planning, Part 7*			

REGIONAL PERFORMANCE FRAMEWORK

TASKS	Australia	Hong Kong, China	Fiji Islands	Japan	Maldives	Malaysia	Mongolia	New Zealand	Pakistan	Philippines	ROK	Singapore	Thailand	ICAO
APAC Objective 16 **AERODROME CERTIFICATION**														
Facilitate the implementation of Aerodrome Certification by conduct of courses and seminars.														2009 & 10
Establish a regulatory framework specifying the criteria for the certification of aerodromes.	Yes	Yes	Yes	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	In progr ess	
Establish a regulatory authority [CAA]	Yes	Yes	Yes	Yes	In progres s	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Develop and approve aerodrome certification regulations and standards	Yes	Yes	In progress	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes. Revie w ongoi ng	In progr ess	
Develop, issue and maintain guidance material and Advisory circulars on aerodrome certification for service providers.	Yes	Yes	In progress	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	On-going	In progr ess	
Establish an entity within CAA responsible for aerodrome safety oversight and staffing requirements. Develop Manual of Aerodrome oversight procedures and Aerodrome Inspector Handbook	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	In progr ess	
SMS AT CERTIFIED AERODROMES														
Facilitate the implementation of SMS by the conduct of courses														June 2011
Develop SMS regulations & guidance material for the implementation of	Yes	Yes	In progress	Yes. 2013 with ICAO	Yes	Yes	SSP In progress	In progr ess 2013	-	Yes	Yes	Yes	Yes. GM in progr	

TASKS	Australia	Hong Kong, China	Fiji Islands	Japan	Maldives	Malaysia	Mongolia	New Zealand	Pakistan	Philippines	ROK	Singapore	Thailand	ICAO
SMS, staff training, enforcement policy and communication means;				SMS 2nd editio n									ess	
Develop and establish the action plan on safety targets, hazard reporting, staff training, safety oversight, guidance material and accepted level of safety	Yes	Yes	In progress	Yes. As abov e	SSP 2012	Yes	SSP manual In progress	In progr ess 2015	-	Yes	Yes	Yes		
WILDLIFE HAZARD CONTROL AND REDUCTION														
Survey to collect information on state's practices with respect to airport wildlife control														2010
Establishment of a national procedure for recording and reporting wildlife strikes to aircraft;	Yes	Yes	In progress	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	
Establishment of a national bird control committee	Yes	Yes	YES. 2010	Yes	Yes 2008	Yes 2009	2012	Yes	Yes	In prog ress	Yes	Yes 2010	Yes	
Conduct wildlife assessments and Implement wildlife control programmes. Airports develop and professionally implement management plan to reduce the risk of strikes.	Yes	Yes	Yes, under review	Yes	in progr ess	In progr ess 2012	2012	Yes	In prog ress	On-going	Yes	Yes		
Land use management inside and in the vicinity of airport	Yes	Yes	Yes	Yes	Yes	In prog ress 2013	2012-2015	Yes	-	On-going	Yes	Yes		
States collect wildlife strike reports and forward to ICAO for inclusion in the ICAO IBIS (data base)	Yes	Yes	In progress	On going	yes	In prog ress 2012	Yes. In progr ess		In prog ress	On-going	yes	yes		
Seminar on wildlife														2010

TASKS	Australia	Hong Kong, China	Fiji Islands	Japan	Maldives	Malaysia	Mongolia	New Zealand	Pakistan	Philippines	ROK	Singapore	Thailand	ICAO
assessment/reduction														
Wildlife hazard management training for airport personnel	Yes	Yes	In progress	On going	Yes	On going	-	Yes	In prog ress	On-going	Yes	On-going		
AERODROME SAFETY MEASURES														
Monitoring the height of buildings or structures within the boundaries of OLS;	Yes	Yes	Yes	Yes	In progr ess 2012	Yes	Yes	Yes	In progr ess 2015	yes	Yes	On-going		
Measurement and reporting of friction characteristics of wet paved runways	Yes	Yes	Jan 2011	Yes	In progr ess	Yes	yes	Yes	Yes	yes	Yes	On-going		
procurement of a friction measuring device	Yes	Yes	Jan 2011	Yes	In progr ess Sep 2011	Yes	yes	Yes	Yes	In prog ress	Yes	Yes		
establishment of maintenance friction level below which corrective action should be initiated	Yes	Yes	Jan 2011	Yes	In progr ess	Yes	In progr ess	Yes	-	NIL	Yes	Yes		
Establishment of minimum friction level below which information that a runway may be slippery when wet is made available.	Yes	Yes	Jan 2011	Yes	In progr ess	Yes	In progr ess	Yes	-	In prog ress	Yes	Yes		
Provision of runway end safety area;	Yes	Yes	In progress	Yes	2014	Yes	2011-2014	Yes	In prog ress	Yes	Yes	Yes		
Provision of enhanced visual aids and markings to help prevent runway incursions	In prog ress	Mid 2011	In progress	Yes	In progr ess	Yes	2011-2014	Yes	In prog ress	Yes	Yes	Yes 2009		
Seminar on runway surface friction measurement														2012
APAC OBJECTIVE 17-AERODROME EMERGENCY PLANNING														

TASKS	Australia	Hong Kong, China	Fiji Islands	Japan	Maldives	Malaysia	Mongolia	New Zealand	Pakistan	Philippines	ROK	Singapore	Thailand	ICAO
•Initiate a survey to assess the level of implementation on aerodrome emergency planning														
Establish aerodrome emergency plan document	Yes	Yes	Implemented under review	Yes	MIA-yes GIA-in progress	Yes	Yes	Yes	-	On-going	Yes	Yes		
Conduct full scale aerodrome emergency exercise at intervals not exceeding two years; and	Yes	Yes	yes	Yes	MIA-yes GIA-in progress	Yes	2010-2012	yes	-	On going	Yes	Yes Every year		
Partial emergency exercises in the intervening year to ensure that any deficiencies found during the full scale aerodrome emergency exercise have been corrected	Yes	Yes	In progress	Yes	Yes	yes	2010-2012	Yes	-	On-going	Yes	Not Applicable		
Establish procedure for emergencies in difficult environments at those airports located close to water and/or swampy areas or difficult terrain.	Yes	Yes	In progress	Yes	MIA: Yes, GAN: in progress	In progress		Under review	-	Yes	Yes	Yes		
Conduct seminar on AEP														2013

AGENDA ITEM 3.1 : AOP

Agenda Item 3: Performance Framework for Regional Air Navigation Planning and Implementation

3.1 Aerodrome Operations and Planning (AOP)

3.1.1 Update on the ICAO Runway Safety Programme (WP/8)

3.1.1.1 The meeting recognizing the importance of runway safety took note of the Assembly Resolution 37-6 and urged States to take initiatives to enhance runway safety through the establishment of runway safety programmes in order to prevent and mitigate runway accidents and serious incidents.

3.1.1.2 The meeting noted the outcomes of the Global Runway Safety Symposium held in Montreal from 24 to 26 May 2011. As a follow up on the symposium outcomes the meeting noted that ICAO and its Runway Safety Programme Partners [ACI, CANSO, EASA, Eurocontrol, FAA, Flight Safety Foundation, IATA, IBAC, ICCAIA, IAOPA, IFALPA and IFATCA] agreed and started working together on a series of collaborative measures to minimize the risks of Runway Incursions, Runway Excursions and other events linked to runway safety by establishing, promoting and enhancing multi disciplinary runway safety teams at individual airports.

3.1.1.3 In addition the meeting also noted that at this Symposium International Organizations have agreed to partner with ICAO to improve runway safety outcomes, through the delivery of a series of Regional Runway Safety Seminars (RRSS) to promote best practices including the establishment of Runway Safety Teams. The first RRSS will be held in Delhi, India in December 2011. The meeting urged States to participate and contribute to the seminar and to visit the newly established ICAO Runway Safety Site at: http://www2.icao.int/en/RunwaySafety/default.aspx.

3.1.2 Aerodrome Maintenance Programme (WP/9)

3.1.2.1 The meeting recognized that airport were an important part of the aeronautical infrastructure, which had to meet high safety standards. The meeting noted that the required level of safety can only be achieved by proper maintenance of all the elements composing an airport. A proper maintenance of airport facilities was important both for the safe operation of aircraft and extending the life of the facilities and therefore it is essential that these are kept in good operational condition. To this end, the meeting urged States to establish a maintenance programme including preventive maintenance where appropriate at an aerodrome to maintain facilities in a condition which does not impair the safety, regularity or efficiency of air navigation.

3.1.2.2 The meeting noted from the ICAO survey on the States practices, current status and procedures concerning their maintenance practices, as follows:

- 9 States had in place an established maintenance program in accordance with the standard in Para 10.1.1 of Annex 14, Volume I;
- 11 States had in place an established procedure for the inspection and monitoring of the movement areas in accordance with the standard in Para 10.2.1 of Annex 14, Volume I;
- 11 States had reported maintenance of the runways in accordance with the standard in Para 10.2.2 of Annex 14, Volume I;
- 9 States had in place an established procedure for the measurement of friction characteristics in accordance with the standard in Para 10.2.3 of Annex 14, Volume I;

- 10 States had in place established procedures for taking corrective maintenance action when the friction characteristics are below a minimum friction level specified by the State in accordance with the standard in Para 10.2.4 of Annex 14, Volume I;
- 10 States had reported maintenance of the surface condition of the paved runway so as to provide good friction characteristics and low rolling resistance as stated in Para 10.2.8 of Annex 14, Volume I and have in place established procedures for the rapid and complete removal of snow, slush, ice, standing water, mud, dust, sand, oil, rubber deposits and other contaminants to minimize accumulation;
- 4 States had guidelines on the chemicals to be used to remove or to prevent the formation of ice/frost on aerodrome pavements, as some chemicals may have harmful effects on aircraft or pavements or may have toxic effects on the aerodrome environment;
- 9 States had employed a system of preventive maintenance and checks for visual aids to ensure lighting and marking system reliability, as stated in Para 10.4.2 of Annex 14, Volume I; and
- 7 States had established guidelines and methods for in-field measurement of intensity, beam spread and orientation of lights included in approach and runway lighting systems.

3.1.2.3 The meeting expressed appreciation for the Civil Aviation Authority of Macao China's offer to host a workshop from 2 to 4 November 2011 on Airport Pavements- Design and Evaluation and FAA for graciously accepting to provide speakers for conducting the workshop.

3.1.3 Amendment Proposals to Annex 14, Volume I - Aerodrome Design and Operations (WP/11)

3.1.3.1 The meeting noted that the ANC at the first meeting of its 187th Session (3 May 2011) considered the proposals developed by the second meeting of the Aerodromes Panel (AP) to amend the SARPs in Annex 14, Volume I - *Aerodrome Design and Operations*, Annex 15 - *Aeronautical Information Services*, and *Procedures for Air Navigation Services- Air Traffic Management* (PANS-ATM, Doc 4444) relating to operations of aerodromes, SNOWTAM format and ATC phraseologies.

3.1.3.2 The meeting urged States and international organizations to review and provide their comments on the proposals in reply to State letter AN 4/1.1.52-11/41 dated 30 May 2011.

3.1.3.3 The meeting also noted that amendment proposals to Annex 14, Volume I include amendments in regard to maximum tire pressure category in the reporting of strength of pavements; runway surface friction measurements and reporting; runway end safety areas (RESA) and arresting systems; strength of blast pads; visual aids for navigation, including simple touchdown zone lights, enhanced taxiway centre line marking, stop bars, Runway Guard Lights (RGLs) and Obstacle Lighting; Rescue and Fire Fighting (RFF); including performance level C foam; sitting of equipment and installations on operational areas and aerodrome maintenance.

3.1.3.4 The proposed amendments to Annex 15 relates to SNOWTAM format concerning runway surface conditions, including friction characteristics.

3.1.3.5 The amendment proposal to PANS ATM covers ATC phraseologies with respect to runway surface condition and aircraft breaking action.

3.1.3.6 The meeting noted that the proposed amendments to i) Annex 14, Volume I is envisaged for applicability on 15 November 2012, ii) Annex 15 on 14 November 2013 and iii) PANS ATM on 13 November 2014.

3.1.4 Amendment Proposals to Annex 14, Volume II - Heliports (IP/6)

3.1.4.1 The meeting noted that the Air Navigation Commission at the eight meeting of its 186th Session (15 April 2011) considered the proposals developed by the second meeting of the Aerodromes Panel (AP) to amend the SARPs in Annex 14, Volume II – Heliports, relating to heliports. In State Letter AN 4/1.1.51-11/31 dated 20 April 2011 ICAO requested Contracting States and appropriate international organizations for comments to reach by 31 July 2011.

3.1.4.2 The meeting also noted that the amendment proposals to Annex 14, Volume II address the second part of a two part comprehensive review and updating of the document. As such there are multiple proposals covering various subjects, including definitions, heliport data, physical characteristics, obstacle restriction and removal and visual aids.

3.1.4.3 The meeting further noted that the proposed amendment to Annex 14, Volume II is envisaged for applicability on 15 November 2012.

3.1.5 Wildlife Hazard Reduction Measures (IP/8)

3.1.5.1 The meeting noted the various measures initiated by India for reduction of wild life hazard for safe aircraft operations and to make the airfield less attractive to birds and animals. The meeting also noted the measures taken to reduce bird activity outside the airport which includes- Prevention of illegal de-skinning of dead animals in the open, establishment of modern carcass processing plant, removal of dairy farms, piggeries and poultry farms within 10 km. area of airport and observance of proper hygienic conservancy, removal of slums from the environs of the airports, creation of closed garbage collection bins and their disposal, relocation of sanitary landfills from the approach funnel of airports, creation of incinerators or garbage processing plants, creation of modern slaughter houses, covered markets for meat, fish and chicken products and proper disposal of all wastes and frequent joint inspection of areas around airports (10 km. Radius).

3.1.6 SMS and Aerodrome Licensing in India (IP/12)

3.1.6.1 The meeting noted the progress made by India in the implementation of Annex 14 requirements on Aerodrome Certification. The meeting also noted the progress on the implementation of SMS at their certified airports- the first phase of SMS Implementation has been successfully completed and second phase of SMS Implementation is in progress.

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Agenda Item 3.2: ATM/AIS/SAR

Agenda Item 3: Performance Framework for Regional Air Navigation Planning and Implementation Issues

3.2 ATM/AIS/SAR

Report of the 21st Meeting of the ATM/AIS/SAR Sub-Group (WP/14)

3.2.1 APANPIRG/22 reviewed the Report of the 21st Meeting of the Air Traffic Management/ Aeronautical Information Services/Search and Rescue Sub-Group (ATM/AIS/SAR/SG/21, Bangkok, 27 June to 01 July 2011). The ATM/AIS/SAR/SG/21 formulated seven draft Conclusions and two draft Decisions for consideration by APANPIRG/22.

3.2.2 Outstanding Conclusions and Decisions and the subsequent follow-up actions from APANPIRG/21 in the ATM/AIS/SAR fields were reviewed by ATM/AIS/SAR/SG/21, which noted that each action was completed or being dealt with and was the subject of a Sub-Group Working Paper.

3.2.3 With regard to Conclusion 21/1 (*States air navigation modernization plans*), India provided information on the modernization of India's system, including automation features and safety nets, covering six major and 38 secondary airports. The system would provide complete radar and VHF coverage over Indian continental airspace, and the plan was to integrate radar and Automatic Dependent Surveillance – Broadcast (ADS-B). India urged States with adjoining centres to implement ATS Inter-facility Datalink Communications (AIDC).

3.2.4 With respect to Conclusion 21/7 (*Use of Global database for allocation of five-letter name codes in the Asia and Pacific Regions*), there were only 12 States/Administrations using the ICAO International Codes and Routes Designators (ICARD) system out of 42 administrations. ATM/AIS/SAR SG/21 noted that it was disappointing that many APAC States had not registered for ICARD and urged action from administrations on this matter.

Data-link Performance Monitoring

3.2.5 As a result of issues such as lack of CRA oversight and use of incorrect standards, ATM/AIS/SAR/SG/20 had felt that a region-wide safety monitoring arrangement for data link operations with oversight by RASMAG would be preferred. However, APANPIRG/21 was of the view that while RASMAG's responsibility was to oversee safety in the region, the arrangement for the establishment and operations of CRAs was the responsibility of the FIT and ATM/AIS/SAR/SG.

3.2.6 Notwithstanding this, ATM/AIS/SAR/SG/21 discussed the APANPIRG/21 response and agreed that the original ATM/AIS/SAR/SG/20 Draft Conclusion was still appropriate, as RASMAG was the only suitable oversight safety body for datalink performance monitoring agencies. Recognizing that this needed to be further discussed by RASMAG/15, the ATM/AIS/SAR/SG Secretariat was tasked with coordinating with RASMAG, with a view to formulating a coordinated Draft Conclusion to APANPIRG/22.

ICAO Flight Plan & ATS Messages Implementation Task Forces and Seminar (FPL & AM/TF/3, FPL & AM/TF/4 and Seminar)

3.2.7 The outcomes from the Asia/Pacific ICAO Flight Plan & ATS Messages Task Force (FPL&AM/TF/3, 23–24 August 2010, and FPL&AM/TF/4 and Seminar 01–03 June 2011), responsible for overseeing implementation of Amendment 1 to the *Procedures for Air Navigation Services — Air Traffic Management, Fifteenth Edition* (PANS-ATM, Doc 4444) were presented.

3.2.8 APANPIRG Conclusion 21/13 emphasised the need for urgent and appropriate coordination with neighbouring States and FIRs. Most States that responded to the State Letter indicated compliance with the transition dates. Almost all airlines surveyed confirmed their readiness.

3.2.9 Many States had not completed the safety assessment for the change and had also not developed their system requirements. States needed to assess the safety risks of the transition as part of their Safety Case under Annex 11. Some administrations were yet to engage vendors, or commence in-house software development. Singapore advised that some vendors were ready with converter solutions, although vendors varied as to their preparedness. It was noted that sharing of information was required between ANSPs regarding vendors and their testing programmes.

3.2.10 The Task Force considered that a transitional switchover to NEW format plan was preferable to a simultaneous 'big bang', implementation. Also of concern were converters, which may affect forwarded downstream data, and may not support the advanced PBN features.

3.2.11 A review of the flight plan related material in the Regional Supplementary Procedures (SUPPs, Doc 7030) compared to Amendment 1 of PANS-ATM (Doc 4444) was completed. Australia agreed to develop a FPL 2012 Training Template for Amendment 1 training. An inter-regional contact group headed by ICAOHQ would discuss areas of inconsistency of interpretation in the application of the changes and clarify these for FPL & AM TF/5.

3.2.12 Almost all APAC States had now submitted information for the Flight Plan Implementation Tracking System (FITS) website. There were 12 administrations that had not completed the 1 July FPL 2012 questionnaire responses, which were used to track implementation progress and update the FITS website (refer **Appendix A** to the Report on Agenda Item 3.2).

3.2.13 The ATM/AIS/SAR/SG/21 meeting was asked if there was a go/no-go date for FPL 2012 implementation. The Secretariat advised there was no 'Plan B', as this may cause some administrations to be less motivated. IATA stated that the airlines were ready and expected the same from ANSPs. Moreover, IATA stated that if one State did not comply then it could potentially affect a lot of other States, so this is the reason why the question of contingency had not been formally discussed.

3.2.14 At the ATM/AIS/SAR/SG/21 the United States observed (as a member of multiple groups dealing with the changes from Amendment 1) that there was a lot of diverse discussion and different interpretations; thus they proposed the creation of a multi-regional flight plan coordination group to facilitate harmonized implementation and coordinate a globally harmonized approach to filing flight planning information which may not be explicitly covered by Amendment 1.

3.2.15 The ATM/AIS/SAR/SG/21 meeting noted that there was an ICAOHQ resource coordinating FPL 2012 regional implementation efforts, and that Regional Officers were informally coordinating as required. Notwithstanding this, and the short time before the testing regime was due to start on 1 January 2012, it was considered necessary to highlight the importance of formal coordination at this critical juncture. IFATCA supported the need for such coordination.

3.2.16 The ATM/AIS/SAR SG 21 meeting noted that there were significant differences in interpretation. Hong Kong, China noted that States may be reluctant to invest in changes if there were inconsistencies that had not been identified to date.

3.2.17 The meeting noted that the intention of the Sub-Group was to focus the attention of APANPIRG on this important issue. ICAOHQ was concerned about the lack of clarity of the words 'key personnel' and organisations' and suggested that this coordination was already on-going. The meeting agreed to the following Conclusion:

Conclusion 22/1 – FPL 2012 Implementation Co-ordination

That, ICAO be urged to emphasise inter-regional coordination by ensuring regular dialogue, information-sharing and meetings between key personnel and organisations managing the FPL 2012 implementation process.

AIS-AIM Implementation Task Force (AAITF/6)

3.2.18 The SG meeting was presented with the outcomes of the 6th Meeting of the Aeronautical Information Services – Aeronautical Information Management Implementation Task Force (AAITF/6), held at Bangkok, from 15 to 17 March 2011. The AAITF/6 had reviewed their TOR and proposed a minor amendment in terminology to implement Quality 'Management' Systems.

3.2.19 The AAITF noted that the AIS-AIMSG were reviewing the Electronic Terrain and Obstacle Data (eTOD) SARPs, as these currently placed the responsibility for determining which obstacles are hazards to air navigation on the State as the provider of the data, rather than on the users of the data. This had significant liability issues, as it was only the end user that understands the context in which they will use the data and the impact of obstacles on their operations. In particular there were issues with Area 2 and 3 data standards, regarding the lack of operational purpose.

3.2.20 AAITF/6 determined that a survey should be conducted to gain a better understanding of the current status of AIM implementation of States. The results were presented to the Sub-Group to indicate survey's progress, but were intended to be analyzed by AAITF/7.

3.2.21 The AAITF agreed to a table based on the three stages of the Roadmap implementation plan and updated by States to give an overall indication of States' progress towards transition from AIS to AIM and to identify regional deficiencies.

3.2.22 The Sub-Group agreed to the following Decision:

ATM/AIS/SAR Sub-Group Decision 21/1 – AAIF Terms of Reference

That the AAITF TOR be amended by amending c) to read: 'assist States to implement Quality Management Systems for aeronautical information in an expeditious manner', to reflect the changes introduced in Amendment 36 to Annex 15.

3.2.23 The meeting agreed to the following Conclusion:

Conclusion 22/2 − AIM Transition Table

That, the ICAO APAC Regional Office maintains the AIM Transition Table as a means of tracking State transition to AIM, and to provide current details on AIM capability for interoperability, by publishing the State AIS – AIM Transition Table at **Appendix B to Report on Agenda item 3.2** on the APAC web site.

Asia/Pacific ATFM Steering Group (ATFM/SG/1)

3.2.24 The First Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFMSG/1) was held in Tokyo, Japan from 8-10 December 2010.

3.2.25 The ATFMSG considered that each of the Major Traffic Flows (MTF) should have ATFM planning (conducted by States and ATM coordination groups), regardless of traffic density, to cater for contingency operations in addition to traffic loading. It was emphasized that ATFM measures were a positive, designed to optimize airspace and aerodrome capacity, especially in support of Seamless ATM initiatives. Thus, ATFM was viewed as maximizing capacity and minimizing inefficiencies.

3.2.26 There did not appear to be any outstanding tasks for the Steering Group, so a formal Task List was not developed. However, a draft Terms of Reference (TOR) was developed in case the Steering Group needed to be reconstituted, and these were endorsed by the Sub-Group.

3.2.27 The meeting agreed to the following Decision:

Decision 22/3 − ATFMSG Terms of Reference

That, the ATFMSG TOR at **Appendix C to Report on Agenda item 3.2** be adopted, noting that the ATFMSG was a forum that develops high-level regional guidance material and regional ATFM policies, which would meet in the future only when required.

3.2.28 The ATFM/SG/1 developed a draft APAC ATFM Regional Concept of Operations, which were reviewed in detail by the Sub-Group. IATA stated that the Concept was a very good document, and suggested a minor text change.

3.2.29 The meeting agreed to the following Conclusion:

Conclusion 22/4− APAC ATFM Regional Concept of Operations

That, the APAC ATFM Regional Concept of Operations appended at **Appendix D to Report on Agenda item 3.2** be adopted and provided as reference material on the APAC web site as planning guidance.

EURASIA RVSM Task Force

3.2.30 The Fourth and Fifth Meetings of the EURASIA RVSM Task Force were managed by the ICAO EUR/NAT Office, but were of considerable interest to APAC States, as the implementation of RVSM would be a significant improvement for Afghanistan and Mongolia, and their neighbours such as Pakistan and China.

3.2.31 The Eurasia RVSM Task Force agreed that RVSM should be simultaneously implemented in Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russian Federation, Tajikistan, Turkmenistan and Uzbekistan on 17 November 2011. The flight level orientation scheme (FLOS) to be used was feet (Appendix 3a, Annex 2), except for Mongolia, which was intending to use metres (Appendix 3b, Annex 2) at the end of 2013 before changing to feet.

3.2.32 The RMA EURASIA was established in Moscow and was expected to be responsible for the monitoring of the height-keeping performance of aircraft flying in Kazakhstan, Kyrgyzstan, Russian, Tajikistan, Uzbekistan, and Turkmenistan RVSM airspace. Afghanistan and Mongolia were expected to use the MAAR (Monitoring Agency for Asia Region). The RMA EURASIA provided the initial safety assessments that indicated the overall technical risk was 0.2015×10^{-9} and the overall risk level was 2.029×10^{-9}, which were below the ICAO RVSM Target Levels of Safety (TLS)[1]. Mongolia stated that they were taking steps to reduce operational errors. Buffer zones would be created on the FIR boundary at six points to accommodate the transition from feet to metres and vice-versa.

FANS Implementation Team - Bay of Bengal (FIT-BOB/13)

3.2.33 The Thirteenth Meeting of the FANS Implementation Team for the Bay of Bengal (FIT-BOB/13) was held in Bangkok from 07 to 08 February 2011. Unfortunately, there was no central reporting agency (CRA, provided by Boeing in the BOB area) represented at the meeting.

3.2.34 It was noted by the meeting that there had been a lack of Problem Reports (PRs), which should be encouraged as these were a vital part of the safety oversight of data link operations. FIT-BOB recognized that it was necessary for FIT-BOB as a technical oversight body, to be provided with datalink safety data from each concerned States and for appropriate technical experts to assess this data from a sub-regional perspective. States should be encouraged to continue providing such data to each FIT meeting.

3.2.35 FIT-BOB recognised that a review of the meeting's Terms of Reference (TOR) was necessary to clarify that it was a technical assessment forum, which was intended to deal with data link system issues and was not a safety monitoring steering body, and that such a review should take into account the possibility that FIT-BOB and FIT-SEA may be combined in future.

3.2.36 The SG meeting discussed the possibility of combining FIT-BOB and FIT-SEA to reduce meeting costs and make one 'FIT-Asia' which would include more experts that deal with similar issues, and enable lessons learnt in one sub-region to assist other areas. This body would address these issues as a separate body from the BBACG itself, which was mainly composed of ATM people.

3.2.37 The Sub-Group discussed this, recognizing the benefits of reducing the number of meetings and the knowledge transfer. The ATM/AIS/SAR/SG/21 noted that it might be useful to hold a FIT-Asia meeting immediately prior to RASMAG. Thus the safety performance output could be provided directly to this body, and then safety recommendations could be made to appropriate ATM Coordination Groups. The Sub-Group decided that the Secretariat should discuss this with the RASMAG and FIT-BOB and FIT-SEA chairs, in order to determine if a common position could be agreed, and thus a Draft Conclusion could be developed by RASMAG/15.

FANS Implementation Team for South-East Asia (FIT-SEA/11)

3.2.38 The 11th Meeting of FIT-SEA was held at Bangkok on 03 May 2011. The key issues were as follows:

- PRs were from a single source; the meeting encouraged all States and airline operators to submit PRs to the CRA (at that time, the Japan CRA);

[1] The Safety Assessment for Mongolia presented to RASMAG/15 indicated that the Regional TLS was not being satisfied in Mongolian airspace

- there were performance issues for downlinks in both the Singapore and the Ho Chi Minh FIR, which was a known issue attributed to the B777 type (Boeing had since provided a fix to operators);
- from 14 February 2011, Manila progressed to the Phase 1B[2] of ADS-C and CPDLC trial operations with seven airlines; and
- CRA-Japan had terminated its services to the South China Sea area at the end of March 2011 at which time CRA services could be provided by Singapore.

South-East Asia ATS Coordination Group (SEACG/18)

3.2.39 SEACG/18 was held in May 2011 in Bangkok, Thailand, following the 11th Meeting of FANS Implementation Team for Southeast Asia (FIT-SEA/11).

3.2.40 A side-bar meeting was held during the SEACG/18 with Indonesia, the Philippines, Singapore, Viet Nam, MAAR and the Secretary, which dealt with the Category E (ATC coordination) issues identified at RASMAG/14.

3.2.41 SEACG urged its members to enhance coordination between area control supervisors and requested Indonesia, the Philippines, Singapore and Viet Nam to implement AIDC as soon as possible. IATA noted that no ICAO group had responsibility for conducting an overall review of the Southeast Asia/Northeast Asia route structure (AR-9).

3.2.42 With the implementation of ADS-B in the Singapore FIR, there would be seamless surveillance coverage from end-to-end on South China Sea routes, so States were urged to discuss reductions of longitudinal spacing for ADS-B equipped flights. Singapore would apply ADS-B surveillance separation at or above FL350 on opportunity basis as the first phase of a trial and then in Phase Two offer priority at or above FL350 to ADS-B aircraft.

South East Asia Route Review Task Force (SEA-RR/TF/3 and SEA-RR/TF/4)

3.2.43 The Third and Fourth meetings of the South-East Asia Route Review Task Force (SEA-RR/TF), had been held in August and November 2010. There have been no further meetings of the Task Force, and the next meeting was scheduled to take place from 03 to 05 October 2011.

3.2.44 The Sub-Group noted that the overall achievements of this Task Force had been somewhat discouraging, with no specific deliverables. However, a number of route proposals had been developed and a route concept had been established, including the use of unidirectional routing in the South China Sea area for crossing routes.

3.2.45 The Sub-Group meeting had an extensive discussion on whether the Task Force should be terminated. The Secretariat suggested that the SEA-RR/TF/5 must produce a plan with each ATS route assigned a conceptual outcome, priority, milestones, State stakeholders, and the means by which the route would be consulted. The latter could be by bilateral discussion, through the 'Mekong' ATM Coordination Group[3], or a Small Working Group under SEACG itself.

[2] This trial was subsequently terminated for an unspecified period of time
[3] Cambodia, Hong Kong China, Laos PDR, Thailand and Viet Nam

3.2.46 IATA had no issue with reassigning reporting lines, or conducting the Task Force and SEACG in the same week. Hong Kong, China was in support of the alternative means of delivering results, especially as the complexity of the task regarding each route varied. Singapore agreed with the Secretariat's plan, and emphasized that the stakeholders must try and meet the identified timeline. Thailand did not mind which format was used to deliver the results.

India-Myanmar-Thailand ATM Coordination Meeting (IMT-ATM/CM/1)

3.2.47 The First India-Myanmar-Thailand ATM Coordination Meeting (IMT-ATM/CM) was held in Bangkok, Thailand between 13 and 14 January 2011. The meeting focused on enhancing ATM cooperation between the three ANSPs concerned, while harmonizing with adjacent regions. The Sub-Group noted that it was very encouraging work.

Bay of Bengal ATS Coordination Group (BBACG/21)

3.2.48 The Bay of Bengal ATS Coordination Group (BBACG/21) was held in Bangkok from 7-10 March 2011.

3.2.49 Bangladesh and India met during BBACG/21 to improve the coordination processes between Kolkata and Dhaka ATC Centres. Indonesia had a side-bar discussion with Malaysia, which resulted in good progress towards solutions to the issue of major traffic routes crossing RNAV route P627. Sri Lanka and India also met regarding the need for eastbound aircraft overflying Colombo from Africa to be descended from high level before they entered Chennai airspace.

3.2.50 Malaysia advised that all area radar and non- area radar controllers in Kuala Lumpur ACC were now trained and ready for ADS-C and CPDLC (Automatic Dependent Surveillance – Contract). The ADS-C/CPDLC installation in Kuala Lumpur was not yet operationally stable however this matter was being worked for implementation of reduced horizontal separation standards.

3.2.51 Thailand presented information on the enhanced data capability being developed for BOBCAT Operations, to enhance capability of BOBCAT software and CDM development, allowing slot swapping, slot compression and the ability to allow airline CDM.

3.2.52 It was recognized by the BBACG that the definition of Major Traffic Flows was outdated and did not include an important routes such as from the Middle East to Australia and SE Asia. India suggested the inclusion of a new traffic flow (AR-10) to represent the traffic from the Middle East to both Australia and Southeast Asia.

3.2.53 The BBACG agreed to an IATA proposal of 'connector' routes in the Mumbai FIR as a first stage towards User Preferred Routes (UPR). Seamless ATM initiatives promoted discussion on the need for BBACG to increase its scope to include Major Traffic Flows AR-1 and AR-4. As a result, the BBACG agreed to a change in its TOR to include the AR-1 and AR-4 MTF. The Sub-Group noted this, and after some discussion preferred the new name South Asia Indian Ocean ATM Coordination Group.

3.2.54 The APANPIRG/22 meeting agreed to the following Conclusion and Decision:

Conclusion 22/5 − Major Traffic Flow (New)

That, the traffic flow between the Middle East airports such as Dubai and Abu Dhabi to Australasian or South East Asian airports such as Sydney and Singapore be recognized as APAC Major Traffic Flow AR-10 and recommended as an amendment to the Global Air Navigation Plan (Doc 9750).

Decision 22/6 – Establishment of SAIOACG

That, the BBACG be renamed as the South Asia Indian Ocean ATM Coordination Group – SAIOACG to cover a geographical area which includes Major Traffic Flows AR-1, AR-4 and AR-10, and that the TOR as appended at **Appendix E to Report on Agenda item 3.2** be adopted**.**

Bay of Bengal Reduced Horizontal Separation Implementation TF (BOB-RHS/TF/5)

3.2.55 The Fifth Meeting of the Bay of Bengal Reduced Horizontal Separation Implementation Task Force (BOB-RHS/TF/5, Bangkok, 08-11 February 2011) focussed on Phase One to implement Reduced Horizontal Separation (RHS).

3.2.56 A new ATS route ASARI-SAMAR-LAJAK (India-Pakistan) was developed that would provide a link with L509 mainly for aircraft operating to/from Bangkok during BOBCAT hours only, limited to flight levels at or above FL300.

3.2.57 The longitudinal collision risk was estimated by the Bay of Bengal Arabian Sea Monitoring Agency (BOBASMA, with assistance from the Southeast Asia Monitoring Agency SEASMA) as being 3.80×10^{-10}, which did not exceed the 5×10^{-9} fatal accidents per flight hour TLS.

3.2.58 The SG meeting unanimously agreed that Phase One implementation would go ahead on AIRAC date 30 June 2011 for the implementation of 50NM longitudinal separation on selected ATS routes. States were reminded that necessary items should be addressed using a special Check List that was required to be returned to the Regional Office prior to implementation, including information on:

- ATC training in 50NM longitudinal separation;
- ATC Human Factors issues;
- contingency operations in the event of loss of system integrity; and
- ATC procedures for handling non-compliant aircraft.

3.2.59 States involved in the RHS project reported satisfactory progress in their preparation to accept 50NM longitudinal separation, either in Phase 1 or Phase 2 of the project[4]. The ATFM/BOBCAT system would be adjusted to cater for the implementation of 50NM longitudinal spacing across the Bay of Bengal and transiting the Kabul FIR in a phased manner.

[4] Phase 1 implementation was subsequently reduced to two ATS routes: N571 and P762

Bay of Bengal, Arabian Sea and Indian Ocean ATM Coordination Group (BOBASIO)

3.2.60 The meeting was informed that the Bay of Bengal, Arabian Sea and Indian Ocean ATM Coordination Group (BOBASIO) had been formed by India, and the first meeting of the Group had been held during 5-6 May 2011. The Sub-Group encouraged the work that had been conducted.

Cross Polar Trans-East ATM Providers Working Group (CPWG/11)

3.2.61 The Cross Polar Trans-East Air Traffic Management Working Group (CPWG) met at St. Petersburg, Russia, from 7-10 June, 2011. The CPWG was composed of representatives from Asia/Pacific States China and Japan, and Canada, Iceland**,** Norway, Russia, the United States and organizations such as IATA representing airlines that operate in Polar airspace.

Informal Pacific ATC Coordinating Group (IPACG/33 & IPACG/34)

3.2.62 The 33rd Meeting of the Informal Pacific Air Traffic Control (ATC) Coordinating Group (IPACG/33) was held in Okinawa, Japan from 15-19 November 2010 and the 34th IPACG Meeting (IPACG/34) was held in Honolulu, Hawaii from 23-27 May 2011. Key discussion included:

- operational trials related to the implementation of 10 minute longitudinal separation without Mach Number Technique (MNT);
- RNP 4 30NM lateral/longitudinal distance-based separation implementation in Anchorage airspace and the NOPAC (North Pacific) by the end of 2011;
- ADS-B In-Trail Procedures (ITP) trials due to start in mid-2011 and ADS-C Climb Descent Procedures (CDP) were on-going until February 2012;
- User Preferred Route (UPR) implementation;
- Dynamic Airborne Reroute Procedures (DARP) operations, which must be requested at least 60 minutes prior to the FIR boundary to allow for adequate ATC coordination;
- Tailored Arrivals (TAs) in San Francisco began in 2007; Los Angeles International Airport (KLAX) began in 2009, and at Kansai Airport, Japan.

Informal South Pacific ATS Coordinating Group (ISPACG/25)

3.2.63 The 25th Meeting of the Informal South Pacific Air Traffic Services Coordinating Group (ISPACG/25), was held in Honolulu, Hawaii 24-25 March 2011.

3.2.64 Australia reported that ADS-B has been mandated for implementation in Australian Airspace by December 2013. A new CPDLC Editor was incorporated into the Australian Advanced Air Traffic System (TAAATS) in April 2010 and the implementation of the Flight Plan conflict function was planned for the third quarter of 2011.

3.2.65 Chile reported that it continued to work on implementation of required navigation performance (RNP10) in its oceanic airspace. Chile was also working to improve the reliability of CPDLC and ADS systems as current high frequency (HF) communications capability was very poor.

3.2.66 Airport Fiji Limited (AFL) reported that it completed its automation upgrade in May 2010 and would completed an upgrade on Aurora, its common flight data processor (FDP), for approach control and towers by May 2011. MLAT and ADS-B solutions would be implemented at Nadi Airport and others by the fourth quarter of 2013. Fiji planned for non-FANS 1/A equipped UPRs and was testing DARPs with Oakland, Brisbane and Auckland Centres.

3.2.67 New Zealand reported that performance of FANS-1A overall system was improving, and AIDC was operational with Nadi and Oakland Centre (KZOA).

3.2.68 Service d'Etat de l'Aviation Civile en Polynesie Francaise (SEAC-PF) reported that AIDC was now operational with the United States and New Zealand.

3.2.69 The United States advised that DARPs remain underutilized while User Preferred Routes were expanding rapidly in the South Pacific. San Francisco (KSFO) Oceanic Tailored Arrivals (TAs) continued to be successful with 33% of aircraft receiving full TA benefits and an even a higher percentage received a partial TA. At Los Angeles (KLAX), 17% of aircraft have received a full TA. The United States and Japan began cross boundary ADS-C based 30/30 separation in May 2011.

Kabul ACC Status Report and Overview of Significant Events

3.2.70 Radio communications throughout the Kabul FIR continued to improve with the installation of Very Small Aperture Telecommunication (VSAT) systems at 13 locations. The current VSAT communications system complied with the requirement for continuous communications over Afghanistan to facilitate RHS on primary transit routes within the Kabul FIR. VSAT system capability would determine the surveillance potential.

3.2.71 Three ASR8 radars had been installed and flight checked with plans for an additional fourth sensor. The radar feeds are currently being integrated into Kabul ACC. These systems would initially provide situational awareness of air traffic within the Kabul FIR for the Kabul ACC, however there were coverage difficulties due to mountainous terrain.

3.2.72 Through the efforts of Germany and contributions from Australia, a multilateration (MLAT) surveillance system was progressing rapidly. It was planned to have 30 sensors installed at different locations throughout Afghanistan to fill in radar blind spot areas. Sixteen of the planned 30 sensors had already been installed, with the remaining 14 due for completion in October-November 2011. Once the sensors were flight checked, Kabul ACC would be able to start planning for the implementation of enroute surveillance operations.

Future APAC Airspace Concept of Operations

3.2.73 IATA presented a future Concept of Operations, which was intended as a planning tool for ANSP and airlines. The Concept was not intended to compel States, although this framework was expected be followed unless there were compelling reasons to do otherwise. The Concept was likely to be iterative, although it was written in a generic fashion to minimize the need for updates.

3.2.74 Hong Kong, China asked about the apparent incongruity with the Asia/Pacific Regional PBN Plan, in terms of the suggested navigation specifications and what was already in the Regional PBN Plan. It was explained that the Concept of Operations was a longer-term objective than the Regional PBN Plan milestones, and in any case the PBN Plan would need updating to incorporate the new PBN specifications expected in 2012.

3.2.75 IFATCA advised the sub group that they were happy with the Concept but suggested a minor amendment to remove the specific examples of surveillance separation standards.

3.2.76 The meeting agreed to the following Conclusion:

Conclusion 22/7 − Asia/Pacific Air Navigation Concept of Operations

That, the Asia/Pacific Air Navigation Concept of Operations provided in **Appendix F to the Report on Agenda Item 3.2** be adopted and published on the APAC website as regional guidance material for navigation facility, service and avionics equipage planning.

ADS-B Mandate

3.2.77 The Sub-Group discussed the matter of priority for ADS-B aircraft, noting the work of the ADS-B Study and Implementation Task Force (ADS-B SITF/10). Previous APANPIRG ADS-B Conclusions had dealt with aircraft equipage but not the prioritization of ADS-B aircraft in airspace designated for the purpose of ADS-B.

3.2.78 The Sub-Group developed a Draft Conclusion, which enabled a mandate for the use of ADS-B equipped aircraft and priority for ADS-B equipped aircraft in designated airspace, if the State desired such a requirement (note: this would not compel a State to designate ADS-B airspace).

3.2.79 The meeting agreed to the following Conclusion:

Conclusion 22/8 − ADS-B Airspace Mandate

That, States intending to implement ADS-B based surveillance services may designate portions of airspace within their area of responsibility:

a) mandate the carriage and use of ADS-B equipment; or

b) provide priority for access to such airspace for aircraft with operative ADS-B as equipment over those aircraft not operating ADS-B equipment.

Regional Civil/Military Cooperation

3.2.80 The Sub-Group was presented with information on civil/military coordination, emphasising ‘cooperation’ as much as communications because of the crucial need for efficiency and safety in both civil and military ATM systems. The Sub-Group noted a Civil/Military Cooperation Seminar/Workshop was planned for 28 February to 02 March 2012, Bangkok, Thailand.

Search and Rescue Capability

3.2.81 The ATM/AIS/SAR/SG/21 noted the lack of discussion at APANPIRG/21 related to SAR matters. A paper was presented that provided information on State SAR preparedness:

- a current the List of SAR Agreements held at Regional Office;
- a SAR Agreement Matrix (indicating potential agreements that were not in place; and
- the SAR Capability Matrix Table.

3.2.82 The Secretariat agreed that a State Letter containing all three SAR tables would be circulated, and States would be asked to update these.

ATM Contingency Plan Task Force

3.2.83 The Sub-Group recalled that the 47th Conference of Directors General of Civil Aviation, Asia and Pacific Regions (DGCA/47, Macao, China, 25-29 October 2010) recognized the need for ATM Contingency Plans to be developed and implemented on a regional basis. DGCA/47 had requested the Regional Office to consider the establishment of a task force for planning, coordination and implementation of a regional ATM Contingency Plan (Action Item 47/1).

3.2.84 The SG meeting considered a summary of key steps in the development of a regional contingency planning forum, as well as policies and resources that could be relevant to a Task Force.

3.2.85 Hong Kong, China asked how level 1 (domestic) contingency planning fitted in. It was not expected that regional contingency planning would invalidate this, but would probably form the lower echelon of a three tiered approach, recognizing that level 2 meant bilateral arrangements, and level 3 was a much wider regional event. Japan expressed its concerns about the proposed TOR, stating that the concept and TOR should be focused on Annex 11 ATM Contingency planning. China supported the Task Force, as did India, Singapore and Thailand.

3.2.86 Australia was concerned about how effective this TF would be and were looking at the TF to operate in a similar fashion to the PBN TF to undertake a review of the State plans. Australia noted there was a need to be cautious about the cost of holding meetings. The Task Force would be small to set up the framework, details to be worked out multi-laterally. Singapore agreed that the TF needed to take an overall view. The Secretariat noted that the impression in the DGCA Conference was that other areas such as CNS were considered. The key areas were considered to be the framework (principles and practices, GM), GAP analysis to determine the level of harmonisation, and the assessment of State Plans.

3.2.87 The APANPIRG/22 Meeting reviewed the Report of the ATM/AIS/SAR SG and determined that there should be a link between the Regional ATM Contingency Task Force (RACP/TF) and the METWARN/I TF. Malaysia agreed that the RACP/TF was important and recommended that time be given to allow the Contingency Plan to be established.

3.2.88 IATA noted that guidance material and standards for volcanic ash during the Icelandic volcano incident were lacking. IATA supported the Contingency Task Force as it would allow a faster reaction to events.

3.2.89 Australia suggested that a single Task Force should adopt an ‘all hazards’ approach, and should be similar to Y2K, which had a core team of people working on whether State plans were adequate, and whether the plans integrated. Australia noted that the PBN TF actually rated State plans so that approach was desirable, noting that a small team of people could work with States to review the adequacy of their plans.

3.2.90 Hong Kong, China stated that this issue was raised as a DGCA/47 Action Item and assigned to APANPIRG for follow-up.

3.2.91 New Zealand was concerned that this Task Force could have a large amount of work with the large number of initiating actions. New Zealand’s plan had short, medium, and long term timeframes so the meeting needed to be clear about what the Task Force had to do, perhaps requiring a sub-regional representative approach.

3.2.92 IATA supported a comprehensive Task Force, which could allow the development of a checklist to be used whenever there was a disruption. The Chairman noted that whatever the causes, the issue was the affect on the ATM system. Singapore suggested starting with development of the necessary framework.

3.2.93 The meeting agreed to the following Conclusion:

Conclusion 22/9 − Regional ATM Contingency Plan Task Force

That, a Regional ATM Contingency Plan Task Force (RACP/TF) be formed, reporting to APANPIRG through the ATM/AIS/SAR Sub-Group for planning, coordination and implementation of a regional ATM contingency plan, with a link to the METWARN/I Task Force, in accordance with the Terms of Reference as provided in **Appendix G to the Report on Agenda Item 3.2**.

ATM Contingency Plan Requirements (WP/7)

3.2.94 India presented information on the ATS procedures and contingency route structure for safe and orderly flow of international air traffic through upper Indian airspace during ATM contingency operations, which was based on the Regional Model Contingency Plan. India had discussed the revised ATM Contingency Plan with neighbouring countries in the first ATS Coordination Meeting of BOBASIO. It was considered highly unlikely that all facilities would be out of service simultaneously in all Indian FIRs; therefore separate ATM Contingency Plans had been developed for Delhi, Mumbai, Chennai and Kolkata FIRs.

Implementation of Phase 1 of BOB RHS 50NM (WP/12)

3.2.95 India described their commitment to implement 50NM reduced longitudinal separation on ATS routes P628 and N571 in the Bay of Bengal, Arabian Sea and Indian Ocean. India requested the Meeting to consider the tangible post implementation benefits, and invited States to participate in the implementation of subsequent phases of reduced longitudinal separation in the region.

3.2.96 Malaysia stated that they were committed to the implementation of reduced longitudinal separation but had had technical difficulties that precluded 50NM operations until recently.

SAR Agreements with Neighbouring Countries (WP/13)

3.2.97 India had signed operational Letters of Agreement with one adjacent State and this Agreement had been functioning effectively. India noted the need for SAR Services Agreements with other neighbouring countries and urged these States to formalize these agreements.

3.2.98 India noted that Emergency Locator Beacons (ELT) beacons were vital components of the SAR System. India had created a database of 406 MHz ELT Beacons with details of the owner to expedite the identification of the ELT under distress to expedite the ability to find the probable location. India had registered 2,656 ELT beacons and encouraged ELT registration by an online facility with the Indian Mission Control Centre (INMCC).

ATFM – India's Initiative with Global Perspective (WP/15)

3.2.99 India presented a Working Paper on their development of ATFM, and the need for the States to adopt an integrated ATFM (I-ATFM) SYSTEM enabling seamless airspace and harmonized gate-to-gate operations. They noted that India was the ninth largest aviation market in the world and there was a growing need to implement ATFM to regulate air traffic.

3.2.100 The paper noted India's emphasis had been on provision of Air Traffic Services and Airspace Management, but now India was increasing its capabilities and capacity of the air traffic system and paying increasingly more attention to ATFM.

3.2.101 IATA stated that they supported sub-regional and regional ATFM, not localized ATFM. An early accommodation of international flows by the Indian ATFM system was requested. The Meeting discussed this further, and there was general agreement that local ATFM was necessary at times and supported India in the development of their ATFM system.

ATC Enhancements through Improved Automation (WP/16)

3.2.102 India described the improvements in Indian airspace and ATS routes to reduce adverse environmental impacts, and enhance the efficiency and regularity of flight operations through improved ATS automation.

Asia/Pacific Airspace Concept of Operation (WP/34)

3.2.103 IATA presented an Airspace Concept of Operations for Asia/Pacific (APAC) airspace. The concept had been endorsed by both the ATM/AIS/SAR/SG 21 and CNS/MET/SG 15 Sub-Groups.

3.2.104 CANSO supported the Concept, stating that it providing the basis of Seamless ATM development. The meeting supported the Concept and later endorsed a related Conclusion as part of the CNS-MET SG presentation.

ICAO Asia/Pacific ATS Route Catalogue (WP/35)

3.2.105 IATA presented information on the ICAO Asia/Pacific Region ATS Route Catalogue, which was developed in 2004 as a supplement to the Basic Air Navigation Plan and to assist with the amendment/tracking process. It was intended to be reviewed annually by ATM Coordination Group meetings. The paper suggested a Draft Conclusion that States should 'review the proposals within the ICAO Asia Pacific Route Catalogue and provide feedback to ICAO for new proposals pertaining to their State and then at least annually thereafter'.

3.2.106 The meeting noted that Chapter 5 of Route Catalogue was for user requirements and it may not be possible to review and agree with these proposals. It was noted that some routes extended beyond the Asia Pacific area, involving States outside the Asia/Pacific Regions. It was suggested to the Meeting that Task Forces and ATM Coordination Groups should deal with proposed route amendments as part of their Task Lists. The Draft Conclusion was not endorsed.

Safe Asian Skies (WP/36)

3.2.107 3.10.1 IATA proposed the further development of a regional safety framework that accounted for safety assessment, safety reporting and safety performance monitoring of en-route flight operations. They noted that many State ANSPs did not appear to have a functional Safety Management System (SMS) capable of the safety reporting, assessment and hazard analysis required for a performance-based environment.

3.2.108 CANSO stated that they had been conducting seminars on SMS.

3.2.109 Australia stated that in their view, RASMAG was the single monitoring agency, effectively contracting out functions, and coordinating with other organizations as necessary.

3.2.110 ICAOHQ noted that they were developing further horizontal and data-link safety metrics, and that there was a need to make an effort for greater implementation of SMS.

Transition from AIS to AIM (IP/11)

3.2.111 An update on the steps undertaken by India for transition from AIS to AIM was presented. The paper noted that WGS 84 was fully implemented in India. Quality Management Systems and an automated tool for the data integrity monitoring had been introduced. The AIS Automation System was confirmed as AICM/AIXM Version 4.5 compliant.

Pacific Project Update (IP/15)

3.2.112 IATA presented a summary of recent activities pertaining to the Pacific Project, following its endorsement by the Trans-Regional Airspace and Supporting ATM Systems Steering Group (TRASAS/3, Paris 19-20 October 2010). The IATA Pacific Project aimed at the creation of seamless and homogeneous airspace from North America to Asia, with the expansion of UPR for an improved operational/environmental efficiency. The Cross Polar Trans-East Air Traffic Management Providers' Working Group (CPWG) was invited to include the "Pacific Project" into its work programme.

Proposal for establishment of ATS route – DPRK (IP/16)

3.2.113 This paper was discussed at a side-bar meeting between concerned parties and would be followed up by the APAC Regional Office.

Global Hawk Operations in the Pacific (IP/19)

3.2.114 The United States Pacific Air Force (PACAF) in cooperation with the United States Department of Defense has based the Global Hawk Remotely Piloted Aircraft (RPA) in the Pacific Region. A similar paper was also presented to the 21st meeting of ATM/AIS/SAR Sub-Group.

Appendix A: APAC FPL 2012 Software Questionnaire

Flight Information region (s)

1. Has a FPL 2012 cost and resource capability assessment been conducted?
2. Has the FPL 2012 Safety Assessment commenced? a) If yes, what Safety Assessment step has been reached?
3. What other major changes to the ATM system are also being made?
4. Which agency is developing the FPL 2012 software?
5. What stage is the software development?
6. If a software vendor is contracted, advise which vendor?
7. Is your State using a front end converter? a) If yes, when is the converter going to be replaced by a FPL 2012 compliant FDPS?
8. When will the internal testing commence and when is it expected to be completed?
9. When will testing be able to be conducted with other ANSPs?
10. When will testing start with airlines/operators?

Updated 25 August 2011

	Q1 Cost & Resource	Q 2 Safety Assessment	Q2a Step	Q 3 Major Changes	Q 4 Software Agency	Q 5 Software Stage	Q 6 Software Vendor	Q 7 Frontend Converter	Q7a Converter Time	Q 8 Internal Testing	Q 9 ANSP External Test	Q 10 External User Test	Comments
Afghanistan • Kabul FIR													
Australia • YBBB Brisbane • YMMM Melbourne	Yes Business case has been agreed and Project work has commenced.	Yes A determination from the Regulator (CASA) has been made that a Safety Case is required	Work on a Safety Plan has commenced	Several systems require change and some will be decommissioned prior to the planned cutover	Airservices Australia (Australia's ANSP) and the Department of Defence are overseeing development of software by contractors.	Initial discussions and development of scope prior to contract finalisation.	Thales, Sensis/Nav Canada, Comsoft and Raytheon will be.	We are considering a converter to handle FPLs and associated messages into some systems.	Our FDPS will be compliant from July 2012. Internal FDPS not affecting other FIRs will continue as today and utilise the converter until replacement. This converter will be disabled after transition and once legacy systems are incorporated into our next generation Flight Plan management systems.	Internal testing is likely to commence in the 3rd quarter 2011 with our CADAS system and in 1st quarter 2012 for the balance of our ATM systems. It will be complete just prior to the commencement of transition in July 2012.	We are likely to be able to test some components late 2011 and most components in early 2012.	Testing planned to start in 1st Quarter of 2012.	Australia
Bangladesh													
Bhutan													
Brunei Darussalam													
Cambodia • Phnom Penh FIR	Yes	Yes	Will be started in Oct 2011	Expand RDP and FDP	Thales	Done by supplier	Thales	No	-	Oct 2011 – Jan 2012	Jan 2012	Jan 2012	Cambodia
China													
Hong Kong, China • Hong Kong FIR	Yes	Yes	Safety implications were identified, mitigated and documented	Front End Processors (FEP) system is developed to handle PRESENT/NEW FPL&AM message format conversion for existing ATM systems	In-house	System testing/ acceptance in progress	In-house	Yes	End of 2013	Q3/2011 – commence testing Q4/2011 – complete testing. FEP system will be ready by 1 Jan 2012 in compliance with Phase 1 of APAC 3-phase transition strategy.	1 Apr 2012 In compliance with Phase 2 of APAC transition strategy	1 Jul 2012 In compliance with Phase 3 of APAC transition strategy	Hong Kong, China
Macao, China	Yes	Yes	Analysis have been performed to trigger a software upgrade which has been completed in Dec	The internal ATC (RDP/FDP) system needs to be upgraded regarding the FPL 2012. The ATC system is	ComSoft	Completed	ComSoft	No The supplier ComSoft can provide such converter but not purchased. If situa-	N/A	System module upgrade completed and successfully tested in Dec 2010	Subject to readiness of other ANSPs and further coordination for arrangement of Tests	N/A Airlines/ Operators are using the same system	Macao, China

			2010	under quotation stage with the ATC system supplier.				tion evolves as necessary, it can trigger the purchasing process					
Cook Islands													
DPR Korea • Pyongyang FIR	Yes FPL 2012 cost and resource capability assessment has been conduct	Yes	The safety assessment for Present and Now mixed environment operations is undergoing.	No other major changes to the ATM system.	Aviation Technology Development Institution of GACA	The task force team has been organized and is developing the software.	No contract	No		The internal testing will commence from 3 January 2012 and it is expected to be completed on 31 March 2012.	From 1 April 2012 testing will be available to be conducted with other ANSPs.	From 1 April 2012 testing will start with airlines/ operators.	General Administration of Civil Aviation
Fiji													
France (French Polynesia) • NTTT	No	Not commenced We plan to conduct a safety assessment during the transition period	N/A	Briefing Office system We got a system named "ATALIS" dedicated to our briefing office to fulfil FPL. The system interface will be impacted to authorize legacy and new FPL	THALES Thales is provided DTI the same release than Mexico	Needs and Specifications state Thales and Egis Avia	Yes Thales and Agis Avia	No Our system will be upgraded according the ICAO 4444 specifications	N/A	March 2012 Tahiti is going to receive the ICAO 4444 release in march to begin internal testing and training	May 2012	May 2012	France
India • Delhi FIR • Mumbai FIR • Kolkata FIR • Chennai FIR	Yes	No		Delhi & Mumbai is switching over to Raytheon automation system - Auto Track –III; Chennai is switching over to new ATS automation system sourced from Raytheon	It is being developed in-house for AFTN message switch.	Software changes have been completed in the frontend as well as backend system of AMSS to accept and process new ICAO FPL and ATS Messages The application will be deployed at message switches at other airports in India shortly.	Raytheon, Selex, Indra, for ATM Automation system and Comsoft for AMHS.	No	N/A	Internal testing of AFTN (AMSS) system has been conducted between Delhi and Varanasi successfully.	TBN	TBN	
Indonesia • Jakarta FIR	Cost has been finished and capability assessment is still ongoing (see timetable 1)	On-going (see timetable 1)	On-going (see timetable 1)	Upgrading ADPS and using converter (short term)	Local vendor converter (short term)	On-going (tender) converter (short-term)	ELSA converter (short-term)	Yes (short-term)	Des 2013 new JATMS long-term (see table 2)	Jan to March 2012 (see time table 1)	April to June 2012 (see time table 1)	Jul to Sep 2012 (see time table 1)	Indonesia
• Ujung Pandang FIR	No, it hasn't It will be conducted by the end of this year (2011)	No, it hasn't. It will be commence on 1st quarter 2012		Major changes on ATC system (FDP)	•For converter by in-house developer •For System by vendor	Technical trial (for converter)	Contract planned by the end of 2012	Yes, it is	Temporary, during transition until end 2012	commence on 1st quarter 2012	Will be conducted on 2nd quarter 2012	As scheduled by DGCA	Indonesia
Japan • Fukuoka FIR	Yes	Yes	On-going	None	JCAB	On-going	NEC	Converter function is going to be installed to the front end system	On 15th November 2012	On 1st January 2012. To be completed on 31st March	On 1st April 2012	On 1st July 2012	Japan Civil Aviation Bureau (JCAB)
Kiribati													
Lao PDR • VLVT-Vientiane	On-going	Plan in October 2011		Not yet	Looking	Looking	Looking	On-going study		April 2012	May-Jun 2012	July 2012	Lao PDR
Malaysia • Kuala Lumpur FIR • Kota Kinabalu FIR	Yes	No Expect to be completed by Dec 2011	N/A	FDPS upgrade To make it compliant	TBN	N/A	N/A	No	N/A FDPS Upgrade	Jan-31Mar2012	1Apr-30Jun2012	1Jul-15Nov2012	Department of Civil Aviation, Malaysia
Maldives													
Marshall Islands													
Micronesia													

Mongolia • ZMUB	No	No	-	None	Avitech AG	Will be finished by October 2011	Avitech AG	Yes	Sept 2012	The internal testing will commence on 01 January 2012 and expected to be completed on 31 March 2012	Testing will be conducted from 01 April 2012	Testing with airlines/ operators will be conducted from 01 July 2012 to September 2012	CAA of Mongolia
Myanmar													
Nauru													
Nepal	Yes	None Not required due to non automated system		Yes	No	AMHS solution provider selection in progress	None Nepal does not have FDP, AIDB system	N/A		March 2012	May 2012	May 2012 In coordination with Indian FIR	Civil Aviation Authority of Nepal
New Zealand • NZZC • NZZO	No	No	N/A	N/A	Airways NZ In-house	NZZC Requirements have been written and software task being sized. NZZO Requirements completed and software design and coding commenced.	N/A	No	N/A	NZZC Internal testing to commence 1APR2012 and expected to be completed by 30JUN2012 NZZO Internal testing to 31MAR2012	NZZC-N/A NZZO-1APR2012	NZZC 1JUL2012 NZZO 1JUL2012	New Zealand
Niue (NZ)													
Pakistan • Karachi FIR • Lahore FIR	Yes	No Expected in October 2011			M/s COM soft & M/s Indra M/s COM soft has upgraded the system software for AMHS M/S Indra is being coordinated for the Upgradation of ATM.	AMHS was updated in March, 2011	M/s Indra For software Upgradation of ATM	No	-	Sept 2011-Dec 2011 For testing of AMHS software	- As per ICAO regional testing plan, which is awaited.	- 1. Airline / Operators using PCAA software of AMHS are already compliant. 2. Airlines using any other country / Company software /equipment are to be coordinated for upgrade. 3. Testing may be started in Oct. 2011.	Pakistan Civil Aviation Authority
Palau													
Papua New Guinea													
Philippines • Manila	No	No	N/A	None yet Once the Czech system for the New Manila ACC is commissioned, its FDPS will be upgraded.	None yet	No Information CS-Soft of the Czech Republic claims to have a converter	No	No	No	No date yet	As soon as any State requests it Declare if on-line or off-line testing	No date yet	Civil Aviation Authority of the Philippines
Republic of Korea													
Samoa													

Singapore • Singapore FIR	Yes	No	N/A	New ATM System which can accept and process NEW FPL will be installed Our new AIM System can receive and transmit both PRESENT and NEW FPL	Thales	In development for the new ATM system	N/A	Yes For the existing ATM system	By end of Year 2014	Between January and March 2012	Between April and June 2012	Between July and November 2012	
Solomon Islands													
Sri Lanka													
Thailand • Bangkok FIR	Yes We have already conducted both cost and capability assessment on the front-end system. Consequently, assessment on en-user systems (ATM Systems) has been planned.	In progress Partial assessment has been conducted on the front-end system. Consequently, assessment on end-user systems (ATM Systems has been planned)		Major changes have been made to the Flight Data Management System (Front-end system) and the Bay of Bengal Cooperative ATM System (BOBCAT). In addition technical refreshed on ATM systems within AEROTHAI has been planned for.	1.Front end-internally developed. 2.ATM System – to be determined.	1.Front end-under development. 2.ATM System – to be determined.	1.Front end-internally development. 2.ATM System – to be determined.	Yes	The FPL 2012 compliant Front-end system is planned to be implemented by Q1 2012. Replacement/upgrades of other end-user systems are to be determined.	Planning in progress	Planning in progress	Planning in progress	DCA Thailand
Timor Leste													
Tonga													
Vanuatu													
Viet Nam													
USA[1] • Oakland Oceanic (KZAK), New York Oceanic (KZWY) and Anchorage Oceanic (PAZN)	Yes	Yes (preliminary) All APAC region interfaces are with the Ocean 21 system used for these FIRs			FAA (via contractor)	Development is compete	Lockheed Martin	Not for this system		It is complete.	April 2012 Some early test opportunities might be available	Early to mid 2012	USA
• 20 Domestic U.S. FIRs (KZAB, KZAU, KZBW, KZDC, KZDV, KZFW, KZHU, KZID, KZJX, KZKC, KZLA, KZLC, KZMA, ZKME, ZKMP, KZNY, KZOA, KZOB, KZSE, KZTL)	Yes	No. Planning to start soon. Attempting to coordinate Safety Assessment across all affected systems.		Replacement of entire ATM System. Current Host and URET systems and new ERAM system will both have to be modified.	FAA (via contractor)	Preliminary Engineering complete S/W development starting July 2011	Lockheed Martin	Not for these systems, although see Remarks. Host and URET systems will accept and pass NEW content flight plans but controllers will view PRESENT content.	When ERAM deployment is complete, Host and URET systems will be gone. Currently projected for 2014 time frame.	Host- Feb 2012 thru April 2012 ERAM- June 201 thru Aug 2012	Host- April 2012, ERAM- August 2012 Note: These systems do not interface to any systems in the APAC region.	Host- July 2012, ERAM- Sept. 2012	USA
• Anchorage domestic ARTCC (PAZA) Uses FDP-2000 Flight Data Processing system	Yes	No		None	FAA	Currently in Engineering Expect S/W start in August 2011		No		Early 2012	Early to Mid 2012 Note: PAZA does not interface to any APAC FIRs	Mid 2012	USA
• Oakland Oceanic FIR (Honolulu Control Facility and Guam CERAP) Uses Offshore Flight Data Processing System (OFDPS)	Yes	No		None	FAA	Engineering to start in October 2011 Expect S/W start in January 2012		No		May 2012	N/A (no external interfaces)	August 2012	
France[2]													

[1] Includes American Samoa, Guam, Johnston, Kingman, Midway, Mariana, Palmyra, Wake

[2] Includes French Polynesia, New Caledonia, Wallis and Futuna Islands

Appendix B: State AIS AIM Transition Table

Phase 1

P-03 — AIRAC adherence monitoring
P-04 — Monitoring of States' differences to Annex 4 and Annex 15
P-05 — WGS-84 implementation
P-17 — Quality

Phase 2

P-01 — Data quality monitoring
P-02 — Data integrity monitoring
P-06 — Integrated aeronautical information database
P-07 — Unique identifiers
P-08 — Aeronautical information conceptual model
P-11 — Electronic AIP
P-13 — Terrain
P-14 — Obstacles
P-15 — Aerodrome mapping

Phase 3

P-09 — Aeronautical data exchange
P-10 — Communication networks
P-12 — Aeronautical information briefing
P-16 —Training
P-18 — Agreements with data originators
P-19 — Interoperability with meteorological products
P-20 — Electronic aeronautical charts
P-21 — Digital NOTAM
√

Date Last Amended: 13 June 2011

	Phase 1 Consolidation				Phase 2 Going Digital									Phase 3 Information Management							
	P-03	P-04	P-05	P-17	P-01	P-02	P-06	P-07	P-08	P-11	P-13	P-14	P-15	P-09	P-10	P-12	P-16	P-18	P-19	P-20	P-21
Afghanistan																					
Australia	√	√	√	90%	80%	√	√	√	60%	√	√	75%				10%	60%			90%	5%
Bangladesh																					
Bhutan																					
Brunei Darussalam																					
Cambodia	√	√	√																		
China	√	√		√													√			√	
Hong Kong, China	√	√	√	√	√	√															
Macao, China	√	√	√	√																	
Cook Islands																					
DPR Korea																					
Fiji	√	√	√				√	√		√		√	√		√	√	√				
India	√	√	√	√	√	√	√	√	√			√									
Indonesia	√	√	√		50%	50%	20%			50%					80%		60%	20%	10%	20%	
Japan	√	√	√	√	80%	80%	√	√	√	√	20%	20%		20%	20%	60%	80%	√		20%	20%
Kiribati																					
Lao PDR	√	√	25%																		
Malaysia	√	√	√							√											
Maldives																					
Marshall Islands																					
Micronesia																					
Mongolia	√	√	√	√	80%	80%	30%	√	√	√	10%	10%		60%	10%	50%	90%	√			
Myanmar	√	√	√				20%			80%	20%	20%				10%				25%	
Nauru																					
Nepal																					
New Zealand	√	√	√	√	√	√	√	√	75%	√	√	80%	15%	80%							
Niue (NZ)																					
Pakistan	√	√	√							√		√		√	√	√		√			√
Palau																					
Papua New Guinea	√	√	√	90%				√								10%					
Philippines	√	√	40%	√	√	√															
Republic of Korea																					
Samoa										√											
Singapore	√	√	√	√	√					√				√	√	√				√	
Solomon Islands																					
Sri Lanka	√	√	90%	90%						√					10%	25%	15%	25%			
Thailand	√	√	80%	10%						20%											
Timor Leste																					
Tonga										√											
Vanuatu																					
Viet Nam	√	√	√	25%	50%	50%	50%		√					√	√		70%	50%			
USA[1]	√			√	√		√	√	√	√	√	√	√	√	√					√	√
France[2]																					

% means the percentage progress towards achievement of the element

[1] Includes American Samoa, Guam, Johnston, Kingman, Midway, Mariana, Palmyra, Wake

[2] Includes French Polynesia, New Caledonia, Wallis and Futuna Islands

Appendix C:
Terms of Reference

AIR TRAFFIC FLOW MANAGEMENT STEERING GROUP (ATFMSG)

1. Having considered the *ATS Planning Manual* (Doc 9426), regional air traffic data and the Major Traffic Flows, and noting that recognized structural airspace capacity increasing measures have preference to use of ATFM, develop an Asia/Pacific Regional ATFM Concept of Operations(including principles and objectives);

2. Review and update the *ATFM Communications Handbook for the Asia Pacific Region* until superseded by Global Material;

3. Encourage and develop mechanisms for ATFM data gathering, collation and sharing between States, International Organizations and ICAO;

4. Research suitable and regionally harmonized benchmarks for airport acceptance rates (AAR) and the throughput of airspace (sector capacity) which may vary depending on weather conditions, and associated technique, e.g. the ground-delay programme and miles/minutes-in-trail (MIT).

5. Review the safety and efficacy of ATFM systems in the Asia and Pacific Region, and make specific recommendations regarding ATFM, including any adjacent airspace affecting the Asia and Pacific Regions;

6. Encourage the development of an ATFM web site by Asia and Pacific Region States with significant experience in ATFM, which contains information on regional ATFM, including *inter alia*, real time flight delay data.

7. The Group reports to the ATM/AIS/SAR Sub-Group.

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Appendix D:
Asia and Pacific Regional ATFM Concept of Operations

1. BACKGROUND

1.1 As a result of increasing regional Air Traffic Flow Management (ATFM) activities and the provisions of GPI- 6 (ATFM), the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/18, September 2007) adopted Conclusion 18/7 for the conduct of a regional ATFM Seminar. The ICAO Asia/Pacific ATFM Seminar/Workshop was hosted at Fukuoka, Japan by the Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure, Transport and Tourism from 7 to 9 October 2008.

1.2 As a result of the ATFM Seminar and Workshop, APANPIRG/20 (Bangkok, September 2009) made the decision to constitute an ATFM Steering Group (ATFMSG/1), which was also held in Japan at Tokyo, from 8 to 10 December 2010. One of the key deliverables from the ATFMSG/1 was expected to be a Regional ATFM Concept of Operations.

1.3 It was considered inappropriate at the ATFMSG/1 for the Regional ATFM Concept of Operations to closely analyse specific Major Traffic Flows (MTF) or to determine actual ATFM systems to be used on these flows, as this would impinge upon the individual State responsibilities to determine the type and level of air traffic service (ATS). Moreover, States have a greater knowledge of the operational requirements, limitations and safety risks of any given airspace that they provide ATS within. In addition, Air Traffic Management Coordination Groups (ATMACG) are better placed to closely monitor and assess the need for ATFM measures within sub-regions (such as the NOPAC - North Pacific), recognising that these are more likely to be implemented on MTFs and not on a regional basis.

1.4 For these reasons, the ATFMSG/1 developed this Regional ATFM Concept of Operations based on broad principles and recommended practises that are intended to provide a framework for desired regional outcomes. Moreover, it was considered that optimal ATFM is a subset of a seamless Air Traffic Management (ATM) system, so further development of the Regional ATFM Operational Concept should be considered within the context of the Seamless ATM Concept.

2. ATFM CHARACTERISTICS

2.1 The ATFMSG/1 recognized that ATFM had a number of important characteristics, which are detailed as follows.

a. ATFM is intended as a win-win enabler, to ensure the ATM system is compatible, balances capacity, and is responsive to user needs. ATFM supports the introduction of new technologies (such as probabilistic meteorological forecasting and ATS sector capacity assessment tools) and procedures that enhance airspace capacity.

b. ATFM is evolutionary in nature, in order to manage a changing aeronautical environment. Thus the nature of ATFM is one of a system that is constantly reviewed in terms of the airspace, ATS routes and aerodromes, and the ATFM system effectiveness itself.

c. ATFM is integral to world economies, as it maximises aviation economic efficiencies and returns, in turn supporting many other economic sectors such as tourism and freight carriage. ATFM supports predictability in terms of inventories, and the efficient carriage of passengers and freight.

d. ATFM assists international cooperation, leading to an optimal seamless ATM environment.

e. Even relatively simple ATFM systems such as slot management can be as effective as complex systems, to enable systems to cope with unexpected capacity deficiencies.

f. ATFM traffic data analysis can yield significant strategic benefits, especially when used in conjunction with airspace and ATS route planning, in terms of future ATM systems and procedure improvements. This is part of a continuous safety and service improvement loop (Figure 1).

g. Collaborative Decision-Making (CDM), as part of ATFM, ideally involves people skilled in facilitation.

h. CDM is about sharing knowledge, which allows an understanding of user and ATM requirements, in order to achieve buy-in, cooperation, and predictability. In effect, CDM allows the system to work smarter, not harder.

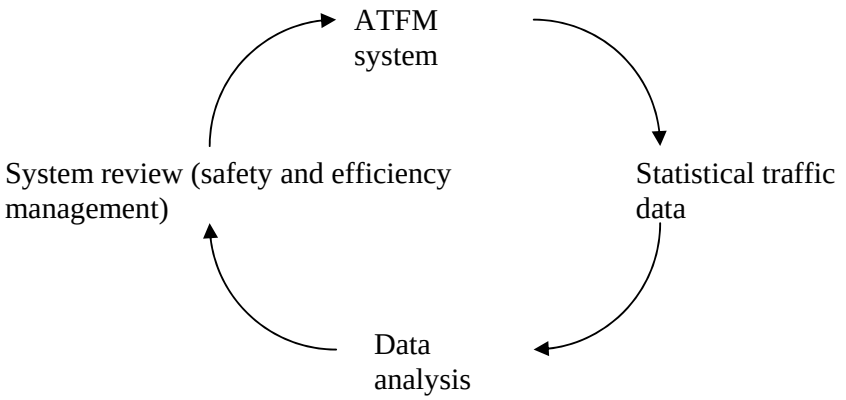

Figure 1: ATFM Cycle of Review and Improvement

3. REGIONAL ATFM OBJECTIVES

3.1 Asia and Pacific Regional ATFM has the following objectives:

a. without compromising safety, to ensure an optimum flow of air traffic during times when demand exceeds, or is expected to exceed, available capacity of the air traffic control (ATC) system (Doc 9426*);

b. to ensure the maximum utilisation of airspace, and balance the legitimate, but sometimes conflicting, requirements of all users (Doc 9426);

c. to develop a seamless and harmonised ATM system and ensure compatibility with international developments (CAR/SAM ATFM Project, Doc 9426);

d. to ensure that optimum capacity is provided in a flexible and timely manner (CAR/SAM ATFM Project); and

e. to minimise inefficiencies that affect ATM capacity (ATFMSG/1).

*Note: references in this document are not necessarily copied verbatim from the source, but have been amended in a minor manner from the original to ensure it is up-to-date, readable and in the correct context.

4 REGIONAL ATFM PRINCIPLES

4.1 ATFM in the Asia and Pacific Regions is expected to be implemented in accordance with the following principles:

a. ATFM must seek to optimise available aerodrome and airspace capacity without compromising safety (CAR/SAM ATFM Project);

b. ATFM must seek to balance the financial impact on stakeholders with safety, and operational and technical benefits, taking into account global interoperability (CAR/SAM ATFM Project);

c. ATFM applications must be consistent with the ICAO Regional Air Navigation Plan (CAR/SAM ATFM Project);

d. ATFM must entail timely and effective co-ordination with affected parties, including ATC units, aircraft operators, military authorities and aerodrome operators as appropriate. Civil/military co-ordination ideally results in airspace being shared, either simultaneously or on a time-share basis. ATFM must take into consideration the requirements of the military, law enforcement, and search and rescue (Doc 9426).

e. Military aircraft operating as general air traffic should be subject to ATFM (CAR/SAM ATFM Project).

f. ATFM recognises that airspace is a common resource for all users, ensuring fairness and transparency, while taking into account security and defence needs (CAR/SAM ATFM Project).

5. RECOMMENDED PRACTICES

a. ATFM planning should be prioritised for appropriate major sub-regional traffic flows, instead of a focus on regional ATFM. ATFM WS and ATFMSG

b. December traffic sample data used by all States to satisfy airspace safety monitoring analysis may be utilised for airspace planning and implementation purposes. APANPIRG 20

c. Recognising that the most efficient utilization of available airspace and airport capacity can be achieved only if all relevant elements of the air traffic system had been considered during the planning stage, applying a systems approach (Doc 9426). Quantitative data should be moderated by qualitative assessment using subject matter experts to ensure the following factors, inter alia, are taken into account:

- airspace and airway complexity, structure and volume;
- adjoining ATC sectors;
- amount of climbing/descending traffic;
- terrain;
- military operations; and
- special use airspace. ATFM Survey/ATFMSG

d. When flow management measures are necessary for certain areas, they should be applied in a timely manner only for the period when expected air traffic demand will exceed the capacity in those areas. ATFM measures should be kept to the minimum and, whenever possible, be applied selectively only to that part of the system that is constrained (Doc 9426).

e. Advance information on overload situations should be provided to ATC and aircraft/aerodrome operators (Doc 9426).

f. Relevant air traffic statistics should be generated in order to promptly identify bottlenecks in the system (Doc 9426). Accurate and timely data should be continuously available to support implementation and ongoing ATFM operations in the form of:

- Static data identifying historical traffic loadings, for use as strategic planning and trend analysis, and
- Dynamic real-time data used for the tactical management of traffic in terms of commencement of ATFM measures (ATFM Workshop/Seminar);

g. Flow control measures should be established and coordinated in such a way that they will not cumulatively interact with each other on the same flights (Doc 9426);

h. The following types of flights should be granted exemption from flow control measures:

- emergency flights, including aircraft subjected to unlawful interference;
- flights operating for humanitarian reasons;
- medical flights specifically declared by medical authorities;
- flights on search and rescue missions;
- flights with “Head of State” status; and
- other flights as specifically required by State authorities (Doc 9426).

i. The use of appropriate automated tools should allow effective application of ATFM (ATFM Workshop/Seminar);

j. Formalised CDM should be utilised to promote increased information sharing, awareness and acceptance (ATFMSG/1);

k. States should ensure the use of the English language in a concise, non-verbose manner in ATFM operations, utilising the *Air Traffic Flow Management Communications Handbook for the Asia/Pacific Region* (ATFMSG/1)*;*

l. Whenever measures to control the flow of air traffic have to be applied in the form of delays, they should, if possible, be applied by ATC to aircraft on the ground rather than to aircraft in flight (Doc 9426).

m. Whenever application of ATFM in the form of delays to airborne aircraft becomes unavoidable, the flights concerned should be informed as soon as possible (Doc 9426).

n. The ATFM service should have the following basic strategic and tactical functions:

- collection, collation and analysis of data on air traffic, the air navigation infrastructure and on the capacities of the ATS system and selected aerodromes (Doc 9246);
- determination of available airspace, ATS and aerodrome capacity (ATFMSG/1);
- determination of a coherent picture of expected traffic demand (Doc 9426);
- identification of areas and time periods of expected critical traffic loadings (Doc 9426); and
- in order to accommodate the growth of air traffic, an appropriate ATFM plan should be established, aimed at optimising the airspace utilisation (Doc 9426).

6. GUIDANCE MATERIAL

6.1 Additional ATFM Guidance Material may be derived from the following sources:

a. ICAO Annex 11 (Section 3.7.5)

b. ICAO Doc 4444 (Section 3.2);

c. ICAO Doc 9426 (Part II, Chapter 1);

d. ATFM Communications Handbook for the Asia/Pacific Region (*http://www.bangkok.icao.int/edocs/ATFMComms_Handbook.pdf*); and

e. FAA ATFM web site (http://www.fly.faa.gov).

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Appendix E: South Asia/Indian Ocean ATM Coordination Group (SAIOACG) Terms of Reference

1) The scope and objective of the SAIOACG is to identify, plan and implement Air Traffic Management improvements within airspace serving the Asian Regional Major Traffic Flows:

- AR-1 (Africa – Southeast Asia/Australia);
- AR-4 (Europe – Southeast Asia);
- AR-10 (Middle East – Southeast Asia/Australia).

2) To meet this objective the Task Force shall:

a. review and recommend improvements to relevant airspace and ATS route structures, in order to optimize the safety and efficiency of ATC operations;

b. review and recommend improvements to ATS facilities such as communication and surveillance capability in support of flight operations;

c. research and plan airspace and facility requirements based on future technologies, Performance Based Navigation and other capabilities that enhance flight operations;

d. coordinate with other bodies to establish appropriate navigation specifications;

e. identify ATM deficiencies with respect to ICAO Standards and Recommended Practices (SARPs), and make recommendations to achieve compliance;

f. cooperate with other bodies as required, to facilitate Seamless ATM;

g. create working groups as required to manage specific ATM-related projects; and

h. research and recommend appropriate means of minimizing the environmental consequences of flight operations.

3) The SAIOACG reports to the ATM/AIS/SAR Subgroup of APANPIRG.

The membership of the SAIOACG is open to States that provide ATS within the scope of airspace of SAIOACG, International Organizations and ICAO. The membership is also open to participants from outside the airspace or organizations that can contribute to SAIOACG by invitation from SAIOACG (such as military organizations that can facilitate civil/military cooperation).

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Appendix F: Asia/Pacific Air Navigation Concept of Operations

1.1 The following principles supporting an APAC Concept of Operations are intended to be the 'default' operations environment so that States can specify expected facilities and standards in accordance with a specified timeframe, so airlines could plan for the appropriate equipage.

- The delivery of CNS/ATM services should be based primarily on the CNS/ATM capability. It is understood that a transition period for the enablement of capabilities and or enhancements may be necessary.

- **Flight Information Regions**: FIR boundaries should not limit the delivery of surveillance separation services (this requires Letters of Agreement and data sharing to facilitate seamless Transfer of Control). Where possible the number of FIRs should be minimized particularly along traffic flows. FIRs should not necessarily be based strictly on the boundaries of sovereign territories.

- **Special Use Airspace:** SUA should only be established[1] after due consideration of the impact on civil air traffic, and must be regularly reviewed by the appropriate State Airspace Authority to ensure that it is:
  - being used for the purpose that it was established;
  - being used regularly;
  - as small as possible; and
  - activated only when it is being utilised in accordance with the Flexible Use Airspace concept.

- **Communication**: areas where VHF (Very High Frequency) communications are not possible must be provided with a minimum communications services based on CPDLC (Controller Pilot Datalink Communications) capability, backed up by HF (High Frequency) or SATVOICE (Satellite Voice Communications).

- **Navigation**: air-routes above FL195 and within terminal controlled airspace (CTA and CTR) associated with major international aerodrome must be PBN based with an appropriate specification determined by the Airspace Authority (such as en-route RNP2, terminal RNP1/0.3) based on the GANP and the Regional Navigation Strategy.

- **Surveillance**: in areas where the provision of direct ATS surveillance is possible, ATC separation must be based on these surveillance systems (i.e. radar, multilateration and ADS-B). In areas where direct surveillance is not possible, ADS-C surveillance (and associated CPDLC capability) must be enabled providing reduced horizontal separations (i.e. RNP4 30/30 and planning for RNP2).

- Establishing equipage mandates requiring operators to equip with a specific technology is an acceptable concept provided the timeline for compliance is developed after due consultation and the benefits in equipage are clearly identified and agreed[2].

[1] Restricted areas must not be established over the high seas or over waters of undetermined sovereignty (reference: Annex 11 definition of restricted areas).

[2] Examples of this concept are the ADS-B mandate established by Australia, and those being established by Hong Kong China and Singapore.

- **Safety Nets**: powered aeroplanes operating above FL195 and within terminal controlled airspace (CTA and CTR) associated with major international aerodrome must have an operable mode S transponder, ACAS (airborne collision avoidance system), and the ATS surveillance systems must be fitted with STCA (Short Term Conflict Alert) and MSAW (Minimum Safe Altitude Warning).

- **Priority**: in each case where a minimum aircraft equipage is specified for this Concept, any aircraft that does not meet these requirements should receive a lower priority, except where prescribed (such as for State aircraft). States should require State aircraft to conform with the Concept of Operations wherever possible.

- **ATM Systems:** ATM system design should enable appropriate ATC capabilities including Conflict Prediction and Resolution (CPAR), AIDC (ATS Inter-facility Datalink Communications), and A/D-MAN (Arrival/Departure Management).

- **ATFM**: flow management requirements to enhance capacity should be implemented for all major traffic flows and major aerodrome terminal operations, using bi-lateral and multi-lateral agreements, as well as CDM (Collaborative Decision-Making) procedures.

1.2 The APAC Concept of Operations should be applied against the Major Traffic Flows identified in the GANP (Global Air Navigation Plan). The following table is not part of the Concept of Operations itself but is an example of how concepts could be applied with the expectation that the navigation specification would deliver appropriate separation standards.

Areas (AR)	**Homogeneous ATM areas/ Major Traffic Flows/Routes**	**Operational Concept**
AR1	Asia/Australia and Africa	RNP4 based on ADS-C/CPDLC and planned RNP 2
AR2	Asia (Indonesia north to China, Japan and the Republic of Korea), Australia/New Zealand	RNAV5/RNAV2 based on direct surveillance/ VHF and planned RNAV1/RNP2
AR3	Asia and Europe via north of the Himalayas	RNAV5/RNAV2 based on direct surveillance/ VHF and planned RNAV1/RNP2
AR4	Asia and Europe via south of the Himalayas	Combination of: • RNP4 based on ADS-C/ CPDLC and planned RNP 2 • RNAV5/RNAV2 based on direct surveillance/ VHF and planned RNAV1/RNP2
AR5	Asia and North America via the Russian Far East and the Polar Tracks via the Arctic Ocean and Siberia	RNP4 based on ADS-C/CPDLC and planned RNP 2
AR6	Asia and North America via the Central and North Pacific	RNP4 based on ADS-C/CPDLC and planned RNP 2
AR7	New Zealand/Australia and South America	RNP4 based on ADS-C/CPDLC and planned RNP 2
AR8	Australia/New Zealand, the South Pacific Islands and North America	RNP4 based on ADS-C/CPDLC and planned RNP 2
AR9	South-East Asia and China, Republic of Korea, and Japan	RNAV5/RNAV2 based on direct surveillance/ VHF and planned RNAV1/RNP2

Appendix G:
Terms of Reference

Regional ATM Contingency Plan Task Force
(RACP/TF)

1) The objective of the Regional ATM Contingency Plan Task Force is:

In collaboration with affected stakeholders and ensuring inter-regional harmonization, develop and implement a Regional ATM Contingency Plan that:

i) provides a contingency response framework for States;

ii) ensures a timely, harmonised and appropriate response to events that affect the provision of Air Traffic Services (ATS), or which ATS is involved in; and

iii) provides a greater degree of certainty for airspace and aerodrome users during contingency operations.

2) To meet this objective the Task Force shall:

a) Review the current status of ATM Contingency Plans and the contingency preparedness of Asia and Pacific Region States;

b) Identify areas where ATM contingency planning requires improvement in terms of compliance with Annex 11 and accepted best practice, and to make recommendations on those areas of improvement;

c) Analyse contingency procedures in use in other ICAO Regions, and cooperate with other groups which are involved with similar work in adjacent airspaces, in order to achieve harmonized inter-regional solutions;

e) Develop a Regional ATM Contingency Plan that:

i) takes into account the varying levels of contingency response necessary, commensurate with precipitating events;

ii) takes into account the varying levels of State contingency capability;

iii) provides principles for Regional ATM Contingency planning;

iv) details recommended Regional contingency practices to events such as severe meteorological and geological phenomena, health emergencies (pandemics, etc), military conflicts and industrial relations issues; and

v) where practical, provides contingency planning templates for States.

The Task Force reports to APANPIRG through the ATM/AIS/SAR Sub-Group for planning, coordination and implementation of a regional ATM contingency plan, with a link to the METWARN/I Task Force.

Agenda Item 3.3: RASMAG

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.3 Regional Airspace Safety Monitoring Advisory Group (RASMAG)(WP/17)

3.3.1 APANPIRG/22 reviewed a consolidated report of the 14th and the 15th Meetings of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/14 and 15, February and August 2011, respectively). RASMAG/14 and RASMAG/15 formulated three draft Conclusions and three draft Decisions for consideration by APANPIRG/22.

Asia/Pacific Vertical Safety Assessments

3.3.2 The meeting recalled that the assessment of the safety performance of Reduced Vertical Separation Minimum (RVSM) airspace was provided by specialist assessment bodies known as Regional Monitoring Agencies (RMAs), which are specifically established to undertake the on-going monitoring of RVSM operations in order to meet ICAO Standards. For Asia/Pacific Region, APANPIRG-endorsed RMA services were provided by:

a) Australian Airspace Monitoring Agency (AAMA), operated by Airservices Australia;

b) China RMA, operated by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC);

c) JCAB RMA, operated by Japan Civil Aviation Bureau (JCAB);

d) Monitoring Agency for the Asia Region (MAAR), operated by Aeronautical Radio of Thailand (AEROTHAI); and

e) Pacific Approvals Registry and Monitoring Organization (PARMO), operated by the United States Federal Aviation Administration (FAA).

3.3.3 To facilitate ongoing vertical safety assessment, the Asia/Pacific Regional RVSM airspaces are broadly divided into the following nine sub-areas:

a) Brisbane, Melbourne, Honiara and Nauru FIRs (AAMA);

b) Port Moresby FIR (AAMA);

c) Indonesian FIRs (AAMA),

d) sovereign airspaces of China (China RMA);

e) Fukuoka FIR (JCAB RMA);

f) Bay of Bengal FIRs (MAAR);

g) Western Pacific/South China Sea FIRs (MAAR);

h) Pacific Area (PARMO); and

i) Northeast Asia Incheon FIR (PARMO).

3.3.4 RASMAG/15 reviewed a consolidated report of the RVSM safety performance across the Asia/Pacific Region. The meeting recognized that this summary of RVSM safety performance comprised the reporting called for by Asia/Pacific Safety Metric 1 *"Percentage of RMA sub- regions achieving the regional Target Level of Safety (TLS) for RVSM operations, as of April each year"* that had been adopted by APANPIRG/20, and noted that:

a) With the exception of the Kabul and the Ulaanbaatar FIRs, RVSM had been implemented throughout the Asia/Pacific Region. Kabul and Ulaanbaatar FIRs were scheduled to implement RVSM on 17 November 2011, with the pre-implementation safety assessments indicating the Kabul FIR was meeting the TLS, while Ulaanbaatar was unable to meet the TLS (refer **Appendix A to the Report on Agenda Item 3.3**);

b) RVSM safety monitoring in Asia/Pacific is undertaken as a regional programme in accordance with Annex 11 requirements;

c) Safety monitoring for RVSM operations in Asia/Pacific was undertaken by five APANPIRG approved RMAs – AAMA, China RMA, JCAB RMA, MAAR and PARMO;

d) In general terms, the regional TLS for RVSM operations was being satisfied across much of the Asia/Pacific Regions;

e) The regional TLS, however, was not being satisfied in Indonesian, Japanese and Western Pacific/South China Sea airspace. Remedial actions were being undertaken in all of these sub-areas, including *inter alia*, the expedition of ATS Inter-facility Data-link Communication (AIDC) operations to reduce ATC coordination errors caused by human factors;

f) Persistent examples of RVSM non-approved flights 'incorrectly' filing flight plans showing RVSM approval in Field 10 have been identified through the work of AAMA, China RMA and PARMO. This may lead to the incorrect application of ATC separation minima;

g) The single biggest cause of Large Height Deviations (LHD) in the Asia/Pacific RVSM operational environment remains that of errors in the ATC to ATC coordination interface, although the incidence of flight crews failing to correctly follow ATC clearances remains significant.

3.3.5 The meeting noted that the result of APAC Metric 1 – the percentage of RMA sub-regions achieving the regional TLS for RVSM operations, referenced as of April, was 66.7%[1], less than the 77.8% that had been achieved in 2010.

Non-RVSM-Approved Aircraft Operating in Asia/Pacific RVSM Airspace

3.3.6 The issue of non-RVSM approved aircraft operating in Asia Pacific RVSM airspace while flight planning as RVSM 'approved' had been the subject of previous discussion in RASMAG and APANPIRG. This matter was of significant concern expressed by the global monitoring agencies through the Regional Monitoring Agency Coordination Group (RMACG).

[1] On the basis of 38 of 52 FIRs being compliant, this would improve to 73%.

3.3.7 Given the risk that such activity posed to the safety of RVSM operations, RASMAG had tasked RMAs to identify so called 'rogue' operators so that States could work to resolve the issue. The meeting recognised that a number of the identified aircraft may in fact have the appropriate approvals but processing of that information to RMAs by State authorities could be delayed.

3.3.8 RASMAG/15 was informed that the AAMA had now extended the process it used to undertake a crosscheck of RVSM approvals data against Australian flight plan data to include a comparison of all RVSM approval databases from the global RMAs. The meeting noted that the comparison for June 2011 identified 250 individual airframes in the data set, with airframes from India showing the highest number (56). The next highest State was the Philippines with 39 aircraft. MAAR had also undertaken an assessment using the available Traffic Sample Data (TSD) for the month of December 2010, but commented that in a number of cases the aircraft registration was not available in the data provided by States and therefore use of that specific data proved difficult.

3.3.9 PARMO provided an assessment of non-State-approved operators using the RVSM airspace overseen by PARMO in the Pacific and the Incheon FIR for the period of December 2010 that identified the operators who flight planned as having State RVSM approval, but for whom a record of RVSM approval was not found. The assessment revealed that a total of five unique airframes required further follow up action. Some airframes identified by PARMO were also noted in the recent AAMA WP/56 to the RMA CG/6 meeting. One of these airframes (registration YJAV1 B738) was observed many times in both the Auckland and Nadi TSD and had been identified by the AAMA analysis.

3.3.10 RASMAG/15 discussed the need for airworthiness authorities to provide RVSM approval data to the appropriate RMA in a timely manner, so that RVSM approvals databases were complete and current. The meeting noted that some RMAs relied on the December TSD to identify non-compliant aircraft, and this may not be reliable enough to identify errant aircraft. However, the AAMA was able to obtain flight-plan data, on a monthly basis, allowing it to undertake more frequent assessments of non-compliant aircraft. The AAMA was therefore able to provide the Australian ANSP with current, validated lists of apparently non-compliant aircraft. Using an automated process, the ANSP was able to use this data to identify non-compliant aircraft and take appropriate action.

3.3.11 The RMACG had been discussing the need to establish a Central Registry for RVSM approvals. The RMACG proposed to amend Annex 6 to ensure the effective analysis of RVSM data and ensure a current record was available to RMAs.

3.3.12 RASMAG/15 agreed that, wherever possible, ANSPs should provide details to their RMA on a monthly basis of all flight plans filed showing RVSM approval, in order to enhance the currency and quality of data available to the RMAs. On the basis of the validated data provided by their RMA, States were encouraged to take appropriate action.

3.3.13 It would take time for some RMAs to enable their systems to receive and process this enhanced data and it may require a degree of automation and good quality of data to reduce the workload of RMAs. The timeline for delivery of data was discussed, and it was suggested that data should be delivered by the 20th of each month if possible.

3.3.14 RASMAG/15 was informed that the intention was not to burden ANSPs and RMAs with a significant additional workload. The use of standard data formats should allow a degree of automation and quality assurance practices could be expected to reduce RMA workload, while the amount of data required for each aircraft was minimal (not the complete flight plan).

3.3.15 Noting that there was a significant number of flight plans submitted by operators indicating RVSM approval without such approval being evident, RASMAG/15 developed the following Decision:

Decision RASMAG 15/6 − Distribution of RVSM Approvals Data

That, the RMAs are urged to utilise monthly flight plan data to undertake frequent assessments of non-compliant aircraft and to provide this information to States for onward transmission to ANSPs.

3.3.16 The meeting discussed the matter of non-approved RVSM flights, noting that there were a large number of aircraft that were actually RVSM approved but which had not had their details made available to RMAs. However the meeting also noted that there were a significant number of non-approved aircraft that had filed as RVSM approved but which did not have such approval. The Meeting agreed to the following Conclusion:

Conclusion 22/10– RVSM Approvals

That, the States are urged to:

a) ensure that they provide point of contact details and complete RVSM approval data to the appropriate RMA in a timely manner; and

b) encourage their ANSP to provide details to their RMA, on a monthly basis, of all flight plans filed showing RVSM approval; and

c) take appropriate action regarding non-compliant aircraft, on the basis of the data provided by their RMA.

Endorsement of Amended Minimum Monitoring Requirements

3.3.17 RASMAG/15 was informed that the Regional Monitoring Agency Coordination Group (RMACG/6, June 2011) had undertaken an extensive discussion on a range of issues related to RMA activity and procedures that included a revised globally standardised Minimum Monitoring Requirements (MMR) Table.

3.3.18 The meeting received information on coordination efforts employed by the North American Approvals Registry and Monitoring Organization (NAARMO), PARMO and FAA Flight Standards to achieve the implementation of long term monitoring requirements. In particular in relation to the Annex 6 monitoring requirement, the meeting noted that the United States has regulated that it will be up to the operator to provide sufficient information to the State authority that they operated less than 1000 hours in the respective 2 year period. The meeting agreed that all RMAs should consider a similar approach for long term monitoring requirements.

3.3.19 RMACG/6 noted that some States do not maintain a centralised RVSM database and that often acquiring relevant approval data has been difficult particularly to enable RMA checking for rogue aircraft. In addition, ICAO provisions, such as Annex 6, should include a requirement to maintain central records of RVSM approvals and ensure that information is updated with relevant RMAs. A draft proposal of a new paragraph 7.2.9 of Annex 6 addressing a State requirement to establish and maintain a database of RVSM approvals was developed.

3.3.20 In reviewing the information provided by Australia, RASMAG/15 responded to the actions identified in the paper as follows:

a) In relation to the draft amendment proposal to Annex 6, it was agreed that text would be included in RASMAG's report to APANPIRG for that group's information.

b) RASMAG/15 agreed that non-approved operations present a risk to RVSM airspace safety and that Asia/Pacific RMAs should continue their work to identify rogue operators. The meeting did not support submitting rogue operator reports to APANPIRG but agreed that other actions put in place by RASMAG would assist in efficient processing of rogue operator information within the Region.

c) RASMAG/15 agreed that information concerning the United States regulation in regards to the 1,000 hours period for long term height-keeping monitoring should be forwarded to APANPIRG, noting that States should be informed of the information and decide whether or not to adopt the United States procedure.

3.3.21 The meeting agreed to the following Conclusion:

Conclusion 22/11− Minimum Monitoring Requirements Amendment

That, the updated Minimum Monitoring Requirements (MMR) Table attached in **Appendix B to the Report on Agenda Item 3.3** be endorsed for Regional application.

Implementation of the use of ADS-B Height-Keeping Monitoring in Australia

3.3.22 RASMAG/15 recalled that RASMAG had been supportive of work to assess the viability of using ADS-B geometric height data as a means of estimating ASE. Australia informed the meeting that to progress this work, both Airservices Australia and the FAA worked cooperatively in a formally recognized research project that utilized data available from the extensive ADS-B network in Australia, and the software and expertise available in the United States used for estimating ASE.

3.3.23 At the Separation and Airspace Safety Panel (SASP) in May 2011 and the RMACG in June 2011, Australia and the United States presented working papers (SASP/WGWHL/19 WP/16 and RMACG/6 WP/49) that provided results from a year-long, continent-wide capture of ADS-B data. Both the SASP and RMACG had endorsed the use of ADS-B as a height monitoring system. Australia was now implementing this system in accordance with the Asia/Pacific Long Term Height Keeping Monitoring Plan endorsed by APANPIRG.

3.3.24 Australia advised that an extensive network of ADS-B ground stations was not required, nor was integration of ground stations into an ATM system. Depending on the local geoid surface, recordings from three well sited ADS-B receivers may suffice. Australia offered to provide advice to RMAs and States who were considering ADS-B as a height keeping monitoring system.

LHD Taxonomy Amendment

3.3.25 RASMAG/14 had agreed with an Australian proposal to amend the current taxonomy used to categorise LHD reports and that the amendment proposal should be provided to the RMACG/6 meeting in June 2011 for global endorsement. RASMAG/15 meeting was informed that with one minor amendment, RMACG/6 had endorsed the proposal and asked that the RMA Manual (Doc 9937) to be amended accordingly. RASMAG/15 agreed that the new taxonomy should be made

available to States by the Asia/Pacific RMAs (**refer Appendix C to the Report on Agenda Item 3.3**).

Asia/Pacific Horizontal Safety Assessments

3.3.26 The Japan RMA provided details of the safety assessment for the application of 10-minute longitudinal separation without Mach Number Technique (MNT) in the oceanic airspace of Fukuoka FIR, assisted by the Electronic Navigation Research Institute (ENRI). The Study resulted in various safety estimates for different airspaces, with the highest level being 2.4706 x 10^{-9}, which was below the endorsed TLS of 5.0 x 10^{-9}.

3.3.27 The South East Asia Safety Monitoring Agency (SEASMA) provided a periodic assessment report on whether flight operations on the six major South China Sea routes (L642, M771, N892, L625, N884 and M767) complied with the TLS values for lateral and longitudinal separation standards. The period assessed was from 1 May 2010 until 30 April 2011, with the lateral risk estimated at 0.83 x 10^{-9}, longitudinal risk estimated at 1.18 x 10^{-9}, both well below the TLS.

3.3.28 RASMAG/14 and 15 reviewed safety assessment for the 50NM implementation in the Bay of Bengal by India to demonstrate the credentials of the Bay of Bengal Arabian Sea Airspace Safety Monitoring Agency (BOBASMA) in its desire to be endorsed as an Enroute Monitoring Agency (EMA). The safety assessment and Airspace Analysis had been carried out by a team of ATM professionals of Airports Authority of India (AAI), mathematical experts from Indian Statistical Institute and the regulator (DGCA). The lateral collision risk was estimated to be 0.621694 x 10^{-9} and the longitudinal collision risk 0.964658 x 10^{-9}, both of which were well below the TLS.

Data-link Performance Monitoring Results

3.3.29 New Zealand presented a detailed analysis of datalink performance within the Auckland Oceanic FIR. The Informal South Pacific ATS Coordinating Group Central Reporting Agency (CRA) published data-link monitoring data at http://www.ispacg-cra.com/performance.asp. The analysis indicated that the continuity for both Actual Communications Performance (ACP) and Actual Technical Communications Performance (ATCP) using all Remote Ground Stations (RGS) were well above the target for TT 95%, but the only Expiry Time (ET) that reached the target 99.9% was that for ACTP 400.

3.3.30 Regarding Controller Pilot Data-link Communications (CPDLC), the continuity easily met the target for Delivery Time (DT) 95%; however, while it almost meets the target for RSP400 Overdue Time (OT, 99.96%), only 99.97% was achieved against the RSP180 OT. While the safety targets for network availability were being achieved, it was clear that considerable improvement was necessary for the efficiency target to be met. The nominal times for CPDLC and ADS-C continuity were also being achieved, but some improvement was necessary to reach the target for ET. RASMAG/15 noted that the analysis indicated data link performance was improving, and that this was probably largely due to the efforts of the ISPACG/FIT and Central Reporting Agency (CRA).

3.3.31 Australia informed RASMAG/15 that it had undertaken work to enhance the reporting of data-link performance in Australian airspace, and provided an analysis of ADS-C data for the Brisbane and Melbourne FIRs during January to June 2011. The data showed that the performance of ADS-C down-link messages in both the Brisbane and Melbourne FIRs met the Global Operational Data Link Document (GOLD) metric for SPT180 nominal DT of 95% within 90 seconds. Notably performance in the Brisbane FIR in this regard was slightly lower than in the Melbourne FIR. While both FIRs were performing well in terms of the required continuity metric, neither met the stringent OT metric of 0.999 within 180 seconds.

3.3.32 Monitoring of data link performance was a most important element of the provision of data link applications such as CPDLC, ADS-C and AIDC, especially where these applications were used as a basis for reduced separation minima. The efficiency benefits arising from reduced separation can only be achieved if specific data link performance criteria are met, and this can only be determined by regular monitoring of data link traffic and analysis of the resulting data.

3.3.33 While the guidance material includes information on performance data that ANSPs were expected to provide to CRAs, to date the CRAs have received minimal data. Consequently, little was known of data link performance in much of the Region, with the inevitable corollary that poor performance may not be detected or corrected. It is therefore important that all ANSPs, whether state agencies or independent organisations, collect data link performance data and pass it to the appropriate CRA for analysis, investigation and initiation of any required corrective action.

3.3.34 Accordingly, the meeting agreed to the following Conclusion:

Conclusion 22/12 - Provision of Datalink Performance Data to CRA

Noting the pre- and post-implementation system performance monitoring required by Annex 11[2], the Global Operational Data Link Document (GOLD) and the Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service Data Link Systems in the Asia/Pacific Region, States are urged to ensure that the appropriate data link performance monitoring is undertaken and reported to CRAs/FITs, as required, in a timely manner.

Data-link Performance Monitoring Body

3.3.35 The Thirteenth Meeting of the FANS Implementation Team for the Bay of Bengal (FIT-BOB/13, Bangkok, 07 to 08 February 2011) recognised that BOB and FIT-SEA (Southeast Asia) could be combined in order to include more experts, enable lessons learnt in one sub-region to assist other areas, and to reduce meeting costs.

3.3.36 The ATM/AIS/SAR/SG/21 discussed this and agreed to refer the matter to RASMAG, after noting that there had been a lack of Problem Reports (PRs) provided to the FITs. RASMAG itself had previously raised concerns about the piece-meal nature of datalink performance data that had been made available to RASMAG.

3.3.37 RASMAG/15 agreed with the combining of the two FIT meetings to strengthen the expertise and data assessment, and a change of reporting to RASMAG. RASMAG developed the combined body's Terms of Reference (TOR) and a Draft Decision was formulated.

3.3.38 The meeting agreed to the following Decision:

Decision 22/13 − Datalink Performance Monitoring Body

That, the FANS Implementation Team - Bay of Bengal (FIT-BOB) and Southeast Asia (FIT-SEA) be combined as a new body (FIT-Asia), reporting to RASMAG, in accordance with the Terms of Reference appended in **Appendix D to the Report on Agenda Item 3.3.**

[2] – *Air Traffic Service* (Para 2.26.5)

RASMAG List of Competent Airspace Safety Monitoring Organizations

3.3.39 RASMAG/15 updated the list of *Competent Airspace Safety Monitoring Organizations*, including the endorsement of India and Japan as an EMA, and amended contact details as appropriate. The list is included as **Appendix E to this Report on Agenda Item 3.3**.

3.3.40 India had made a number of changes to the assessment and modelling of the original BOBASMA assessment as a result of a peer review by the FAA Technical Center. Notwithstanding this, there was significant discussion on concerns raised by the FAA Technical Center, and the Chairman and the Secretary met with Indian representatives to discuss these concerns. The Chairman informed the meeting that as a result of the meeting with the Indian representatives he was satisfied that most of the concerns raised by the FAA could or would be readily resolved in the short term, such as the establishment of Letters of Agreement, the database and website.

3.3.41 The issue of significance that needed to be addressed was in relation to the additional training that had previously been identified that India needed to undertake before it could be endorsed as an EMA. While India informed the meeting that they had undertaken direct liaison visits with SEASMA since the last meeting in an attempt to better learn how an EMA is to undertake its functions, there were still concerns raised as to the adequacy of any training undertaken.

3.3.42 As a result, and considering all the activity already undertaken by India to date, the Chairman proposed that this aspect of further training could be resolved if India were to accept a period of mentoring by another EMA and peer review of any safety assessments undertaken. To that end it was proposed that the meeting endorse India as an EMA and that India enters into a 12 month period of mentoring by SEASMA with added assistance in peer review of safety assessments by the AAMA. India and the RASMAG/15 meeting agreed to this proposal.

3.3.43 The meeting agreed to the following Decision:

Decision 22/14 − Bay of Bengal and Arabian Sea Airspace Safety Monitoring Agency (BOBASMA) Endorsement

That, the Bay of Bengal and Arabian Sea Airspace Safety Monitoring Agency (BOBASMA) be endorsed as an En-Route Monitoring Agency (EMA).

3.3.44 Japan informed the RASMAG/5 meeting in June 2006 of its intention to fulfill the responsibility of providing airspace safety assessment and monitoring services for RVSM and RNAV/RNP within the Fukuoka FIR, and to be recognized as an RMA and an EMA.

3.3.45 At RASMAG/13 (August 2010) Japan had presented an RVSM-PBN combined database, and the safety assessment of the reduced horizontal separation applied in the international oceanic airspace of the Fukuoka FIR. RASMAG/15/WP23 further described the on-going collaboration between ENRI, PARMO and JCAB in order to develop safety assessment expertise.

3.3.46 On the basis that all requirements within the EMA Handbook had been fulfilled and taking note of Japan's role in ICAO technical panels over many years, including participating in the development of 50NM and 30NM minima, and the continued peer relationship with PARMO in particular, RASMAG agreed to endorse the Japanese monitoring agency.

3.3.47 The meeting agreed to the following Decision:

Decision 22/15 − Japan Airspace Safety Monitoring Agency (JASMA) Endorsement

That, the Japan Airspace Safety Monitoring Agency (JASMA) be endorsed as an En-Route Monitoring Agency (EMA), which will also undertake the current Japan Regional Monitoring Agency (RMA) functions.

3.3.48 The Republic of Korea presented a paper on the results of the preliminary analysis of the airspace characteristics in the Incheon Flight Information Region (FIR) and of the Air Traffic Service (ATS) route B576 for safety assessment. The Chairman thanked Korea for their detailed work, noting it was the intention of the Republic of Korea to apply for EMA status in the future on the basis of further assessment. Commenting on this, the Chairman stated that RASMAG had previously agreed that the number of monitoring agencies should be expected to decrease and consolidate, noting that only the Asia/Pacific had multiple RMAs and EMAs compared to other regions.

3.3.49 The meeting noted that the intent of the establishment of RMAs and EMAs was to help facilitate regional and sub-regional implementations and not for specific implementations that only affected a single FIR. To that end, the Meeting also noted that while it was unlikely that any future endorsements of RMAs and EMAs for a single FIR would occur, a future implementation that affects a group of FIRs in the Region may require an EMA to undertake safety assessments and on-going monitoring. This should not deter a State from developing safety assessment capabilities to ensure the safe implementation of new standards and procedures.

ATS Inter-Facility Data-link Communications Implementation

3.3.50 Japan informed RASMAG/14 that it has analyzed the trend of Category E LHD occurrences before and after the Japan - Republic of Korea ATS Inter-Facility Data-link Communications (AIDC) implementation. The official implementation of AIDC commenced in February 2010. Comparing the 22 month reports of LHDs before and after the implementation of AIDC, 16 Category E/F LHDs occurred between 1 August 2008 and 15 June 2009, whereas 10 LHDs occurred between 16 June 2009 and 30 May 2010. These outcomes appeared to vindicate the use of AIDC to reduce error and were a ‘good news story’ in that it demonstrated the effectiveness of AIDC in controlling coordination errors which impacted on the airspace risk.

Deputy Chairman

3.3.51 RASMAG/15 discussed the fact that there was no Deputy Chairman, unlike the CNS-MET Sub-Group. Thailand nominated Mr. Peter Rabot of Singapore as a suitably experienced member of RASMAG for the Deputy Chairmanship, and this nomination was duly accepted.

Frequency of RASMAG Meetings

3.3.52 RASMAG/15 discussed whether it was necessary to hold one or two RASMAG meetings per year, given the need to be efficient in terms of time and the cost of the meeting attendance. It was suggested that the August RASMAG meeting was most important, as this allowed the assessment of safety reports up until the month of April, and reporting to APANPIRG one month later. Meeting participants were asked to consider if it was necessary to hold the RASMAG meeting normally held in February, and in 2012 this matter would be further formally discussed.

HMU Implementation in Japan (IP/14)

3.3.53 Japan was preparing for implementation of height monitoring services by the first Height Monitoring Unit (HMU), which was officially named Setouchi HMU after the location of antennas, situated within Fukuoka FIR. The accuracy of the altitude is calculated automatically when the aircraft flies within the measurable coverage of the HMU. JCAB was planning to operate Setouchi HMU officially from 22 September 2011, however this had been delayed.

RVSM Implementation in Mongolian Airspace (IP/22)

3.3.54 Mongolia provided a brief on preparation of RVSM implementation in Mongolian airspace on 17 November 2011. The paper noted the different flight level allocation schemes and ATM systems in neighbouring countries, and airspace transition arrangements. RVSM training for instructors and air traffic controllers had been conducted in Russia, Thailand and the Civil Aviation Training Center, Ulaanbaatar.

Central Reporting Agency – Singapore (IP/24)

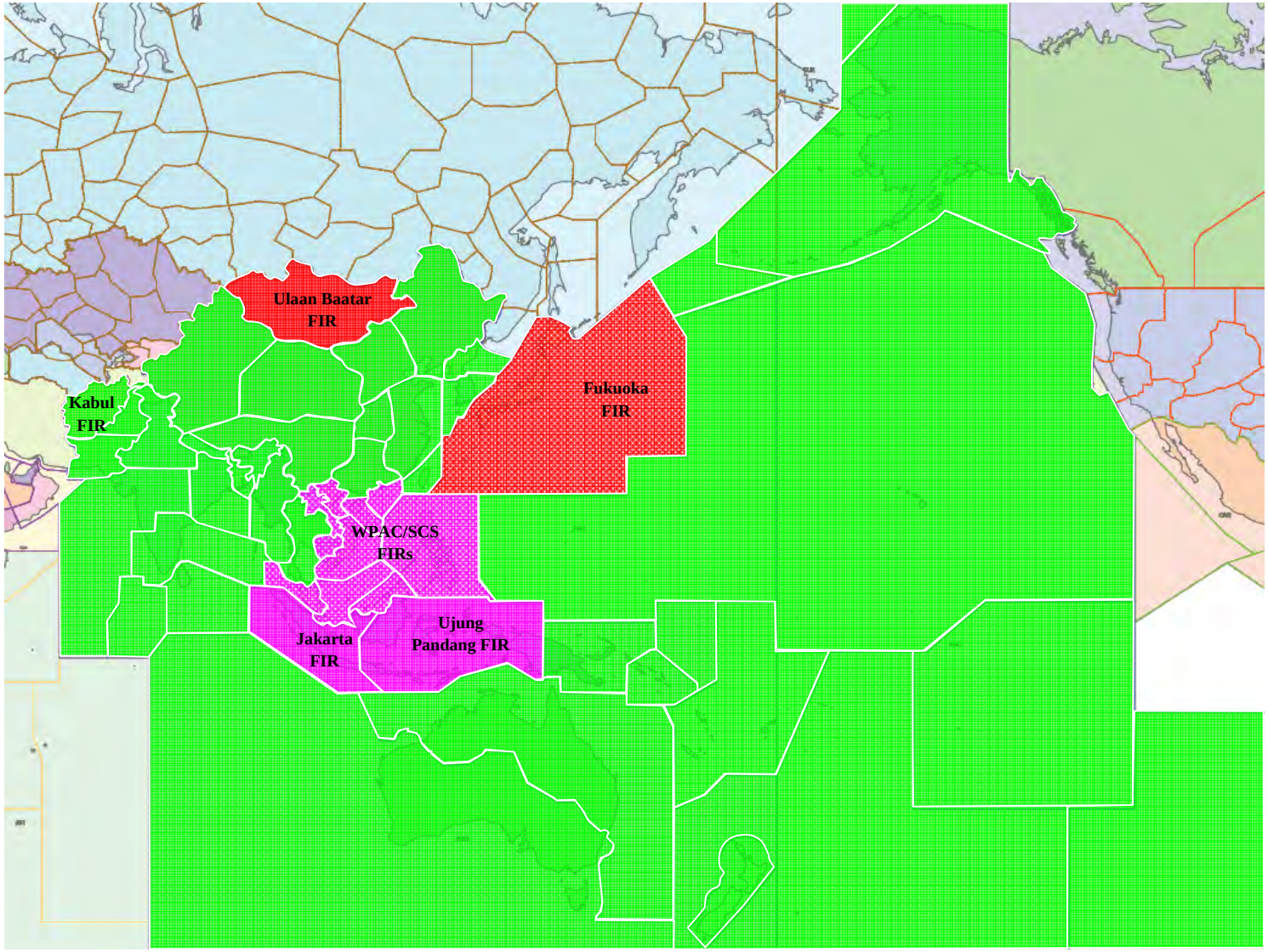
3.3.55 Singapore offered to set up and fund an alternative CRA arrangement for the South China Sea area from 1 April 2011 after the Japan CRA was not able to conduct this function. CRA-Singapore was supported by Boeing to provide the additional technical expertise in the provision of CRA services. This arrangement would be for a period of three years, after which a review would be carried out.

3.3.56 All States providing data link services in South East Asia (which includes Vietnam for Ho Chi Minh FIR, Indonesia for Ujung Padang FIR and Singapore FIR) should provide monthly ATS data link performance reports to CRA-Singapore for analysis. CRA-Singapore would be writing to States individually to seek regular monthly updates of the data link performance reports.

3.3.57 The contact person for CRA-Singapore was:

Mr Kwek Chin Lin [email: kwek_chin_lin@caas.gov.sg].

Appendix A: APAC FIR RVSM TLS Compliance



RMACG/6-WP/63
08/06/11

REGIONAL MONITORING AGENCIES(RMA)

SIXTH SPECIAL COORDINATION MEETING

Cornwall, Canada, 6 – 10 June 2011

Agenda Item 4: Coordination and Harmonization issues

Review of Minimum Monitoring Targets Table by EUROCONTROL and FAA

(Presented by A Lewis – European Regional Monitoring Agency)

SUMMARY

This paper presents the results of the 2011 review of the RVSM Minimum Monitoring Requirements table conducted by EUROCONTROL and FAA for endorsement by the RMA Coordination Group

1. INTRODUCTION

1.1 All operators of RVSM approved aircraft are required to participate in regional height monitoring programmes. The global minimum height monitoring requirement is specified in ICAO Annex 6 and states that a minimum of 2 aircraft of each RVSM monitoring group type should be monitored every 2 years or 1,000 flying hours whichever is the greater.

1.2 It has been accepted by many regions that the global minimum requirement only applies to aircraft monitoring groups for which the RVSM MASPS has been fully satisfied including long term ASE stability. Groups which have not met this requirement are required to meet a higher level of monitoring, typically 60% of fleet until the verification of MASPS has been satisfied. Aircraft approved for RVSM on an individual basis and aircraft types for which no common MASPS compliance method exists are classified as non-group and it is necessary for all these aircraft to be height monitored every 2 years.

1.3 These 3 categories of aircraft; MASPS fully verified, MASPS not yet fully verified and non-group, are combined in a table of Minimum Monitoring Requirements. EUROCONTROL and FAA have undertaken to maintain this table on behalf of all the global RMAs on an annual basis and submit revisions to the RMACG for endorsement. The majority of aircraft groups are contained in category I which equates to groups that have fully demonstrated compliance with MASPS and are required to meet the global minimum height monitoring requirement defined in ICAO Annex 6. Category II contains those aircraft groups which have yet to satisfy MASPS and category III contains groups without a common compliance method.

1.4 EUROCONTROL and FAA currently hold approximately 90% of the global height monitoring results and this data is reviewed to determine if a group can be moved from category II to category I. On rare occasions it may be necessary to move a group from category I to category II.

1.5 The structure of the monitoring groups themselves is reviewed and new aircraft types are added and groups modified when appropriate.

1.6 This paper presents the results of the 2011 MMR review to the RMACG for endorsement.

2. AMENDMENT TO MMR

2.1 At the review of the MMR held in May 2011 14 new aircraft groups were added to the MMR. These were all placed in category II requiring operators to meet a 60% monitoring target until compliance with the RVSM MASPS is fully verified. This process takes a minimum of 2 year to ensure ASE stability.

2.2 A number of aircraft types for which no common compliance method exists were included in category III. Category III also applies to all aircraft approved on an individual basis even though the generic aircraft type may be contained in category I or II. However it is not practical to list these aircraft within the MMR.

2.3 Some minor changes to the monitoring group structure are made but these primarily relate to consolidation of ICAO type definitions. The complete list of MMR and monitoring group definitions are contained in Appendix A. Changes from the 2010 MMR are highlighted in bold.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) Note the contents of this paper;

b) Review the recommended changes and supply additional information that may be required to improve the accuracy of the table, and

c) Endorse the final version for publication by all RMAs.

— END —

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE

MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS **NOT** A REQUIREMENT

CATEGORY		AIRCRAFT GROUP	MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP
1	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS	A124, A300, A306, A310-GE, A310-PW, A318, A320, A330, A340, A345, A346, A3ST, AVRO, B712, B727, B737CL, B737C, B737NX, B747CL, B74S, B744-5, B744-10, B752, B753, B767, B764, B772, B773, BD100, CL600, CL604, CL605, C17, C525, C560, C56X, C650, C680, C750, CARJ, CRJ7, CRJ9, DC10, E135-145, E170-190, F100, F900, FA10, GALX, GLEX, GLF4, GLF5, H25B-800, J328, KC135, LJ40, LJ45, LJ60, MD10, MD11, MD80, MD90, PRM1, T154	Two airframes from each fleet* of an operator to be monitored
2	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT	Other group aircraft other than those listed above including: A148, **A158**, A380, **A400, AC90**, AC95, AN72, ASTR, ASTR-SPX, B701, B703, B703-E3, B731, B732**, B787**, BD700, BE20, BE30, BE40, B744-LCF, B748, C130, C500, C25A, C25B, C25C, C441, C5, C510, C550-552, C550-B, C550-II, C550-SII, **CRJ10**, D328, DC85, DC86-87, **DC91**, DC93, **DC94** DC95, E50P, **E55P**, EA50, F2TH, F70, FA20, FA50, FA7X, G150, **G250**, GLF2, GLF2B, GLF3, **GLF6**, H25B-700, H25B-750, H25C, HA4T, IL62, IL76, IL86, IL96, L101, **LJ23, LJ24, LJ25, LJ28**, L29B-2, L29B-731, LJ31, LJ35-36, LJ55, MU30, P180, **PAY4**, PC12, SB20, SBR1, SBR2, T134, T204, T334, TBM, WW24, YK42	60% of airframes (round up if fractional) from each fleet of an operator **or** individual monitoring
3	Non-Group	**Aircraft types for which no generic compliance method exists:** **BA11, R722, SJ30, STAR, B720, A225, GLEX-ASTOR, GLF5-AEW, VC-10, GSPN, B74S-SOFIA**	100% of aircraft shall be monitored

Table 1: MONITORING REQUIREMENTS TABLE

Table 2: MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL REQUIREMENTS

Monitoring Group	A/C ICAO	A/C Type	A/C Series
A124	A124	AN-124 RUSLAN	ALL SERIES
A148	A148	AN-148	100
A158	**A158**	**AN-158**	
A300	A30B	A300	B2-100, B2-200, B4-100, B4-100F, B4-120, B4-200, B4-200F, B4-220, B4-220F, C4-200
A306	A306	A300	600, 600F, 600R, 620, 620R, 620RF
A310-GE	A310	A310	200, 200F, 300, 300F
A310-PW	A310	A310	220, 220F,320
A318	A318	A318	ALL SERIES
A320	A319 A320 A321	A319 A320 A321	CJ , 110, 130 110, 210, 230 110, 130, 210, 230
A330	A332 A333	A330 A330	200, 220, 240 300, 320, 340
A340	A342 A343	A340 A340	210 310
A345	A345	A340	500, 540
A346	A346	A340	600, 640
A380	A388	A380	800, 840, 860
A3ST	A3ST	A300	600R ST BELUGA
A400	**A400**	**A400M**	
AC90	**AC90**	**COMMANDER 690 COMMANDER 840 COMMANDER 900**	
AC95	AC95	AERO COMMANDER 695	A
AN72	AN72	AN-72 AN-74	ALL SERIES
ASTR	ASTR	1125 ASTRA	ALL SERIES
ASTR-SPX	ASTR	1125 ASTR SPX, G100	ALL SERIES
AVRO	RJ1H RJ70 RJ85	AVRO AVRO AVRO	RJ100 RJ70 RJ85
B701	B701	B707	100, 120B
B703	B703	B707	320, 320B, 320C

Monitoring Group	A/C ICAO	A/C Type	A/C Series
B703-E3	**E3TF**	B707	E-3
B712	B712	B717	200
B727	B721 B722	B727 B727	100, 100C, 100F,100QF 200, 200F
B731	B731	B737	100
B732	B732	B737	200, 200C
B737CL	B733 B734 B735	B737 B737 B737	300 400 500
B737NX	B736 B737 B738 B739	B737 B737 B737 B737	600 700, BBJ 800, BBJ2 900
B737C	B737	B737	700C
B747CL	B741 B742 B743	B747 B747 B747	100, 100B, 100F 200B, 200C, 200F, 200SF 300
B74S	B74S **B74R**	B747	SR, SP
B744-5	B744 **B74D**	B747	400, 400D, 400F (With 5 inch Probes up to SN 25350)
B744-10	B744 **B74D**	B747	400, 400D, 400F (With 10 inch Probes from SN 25351)
B744-LCF	B744	B747	LCF
B748	B748	B747	8F, 81
B752	B752	B757	200, 200PF, 200SF
B753	B753	B757	300
B767	B762 B763	B767 B767	200, 200EM, 200ER, 200ERM, 300, 300ER, 300ERF
B764	B764	B767	400ER
B772	B772 **B77L**	B777	200, 200ER, 200LR, 200LRF
B773	B773 **B77W**	B777	300, 300ER
B787	**B788** **B789**	**B787-8** **B787-9**	
BD100	CL30	CHALLENGER 300	ALL SERIES
BD700	GL5T	GLOBAL 5000	ALL SERIES
BE20	BE20	200 KINGAIR	ALL SERIES
BE30	BE30 **B350**	B300 SUPER KINGAIR B300 SUPER KINGAIR 350	ALL SERIES
BE40	BE40	BEECHJET 400 BEECHJET 400A	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
		BEECHJET 400XP HAWKER 400XP	
C130	C130	HERCULES	H, J
C17	C17	C-17 GLOBEMASTER 3	ALL SERIES
C441	C441	CONQUEST II	ALL SERIES
C5	C5	C5	ALL SERIES
C500	C500	500 CITATION 500 CITATION I 501 CITATION I SINGLE PILOT	ALL SERIES
C510	C510	MUSTANG	ALL SERIES
C525	C525	525 CITATIONJET 525 CITATIONJET I 525 CITATIONJET PLUS	ALL SERIES
C25A	C25A	525A CITATIONJET II	ALL SERIES
C25B	C25B	CITATIONJET III 525B CITATIONJET III	ALL SERIES
C25C	C25C	525C CITATIONJET IV	ALL SERIES
C550-552	C550	552 CITATION II (USN)	ALL SERIES
C550-B	C550	550 CITATION BRAVO	ALL SERIES
C550-II	C550	550 CITATION II 551 CITATION II SINGLE PILOT	ALL SERIES
C550-SII	C550	S550 CITATION SUPER II	ALL SERIES
C560	C560	560 CITATION V 560 CITATION V ULTRA 560 CITATION V ENCORE	ALL SERIES
C56X	C56X	560 CITATION EXCEL	ALL SERIES
C650	C650	650 CITATION III 650 CITATION VI 650 CITATION VII	ALL SERIES
C680	C680	680 CITATION SOVEREIGN	
C750	C750	750 CITATION X	ALL SERIES
CARJ	CRJ1 CRJ2 CRJ2 CRJ2	REGIONALJET REGIONALJET CHALLENGER 800 CHALLENGER 850	100, 100ER, 200, 200ER, 200LR ALL SERIES ALL SERIES
CRJ7	CRJ7	REGIONALJET	700, 700ER, 700LR
CRJ9	CRJ9	REGIONALJET	900, 900ER, 900LR

Monitoring Group	A/C ICAO	A/C Type	A/C Series
CRJ10	**CRJ10**	**REGIONALJET**	**1000ER**
CL600	CL60	CL-600 CL-601	CL-600-ALL SERIES CL-601- ALL SERIES,
CL604	CL60	CL-604	CL-604- ALL SERIES
CL605	CL60	CL-605	CL-605- ALL SERIES
DC10	DC10	DC-10	10, 10F, 15, 30, 30F, 40, 40F
D328	D328	328 TURBOPROP	100
DC85	DC85	DC-8	50, 50F
DC86-87	DC86 DC87	DC-8 DC-8	61, 62, 63 71, 72, 73
DC91	**DC91**	**DC-9**	**10, 15**
DC93	DC93	DC-9	30, 30F
DC94	**DC94**	**DC-9**	**40**
DC95	DC95	DC-9	51
E135-145	E135 E145	EMB-135 EMB-145	ALL SERIES
E170-190	E170 E170 E190 E190	EMB-170 EMB-175 EMB-190 EMB-195	ALL SERIES
E50P	**E**50P	PHENOM 100	ALL SERIES
E55P	**E55P**	**PHENOM 300**	**E55P**
EA50	EA50	ECLIPSE	ALL SERIES
F100	F100	FOKKER 100	ALL SERIES
F2TH	F2TH	FALCON 2000 FALCON 2000-EX FALSON 2000LX	ALL SERIES
F70	F70	FOKKER 70	ALL SERIES
F900	F900	FALCON 900 FALCON 900DX FALCON 900EX	ALL SERIES
FA10	FA10	FALCON 10	ALL SERIES
FA20	FA20	FALCON 20 FALCON 200	ALL SERIES
FA50	FA50	FALCON 50 FALCON 50EX	ALL SERIES
FA7X	FA7X	FALCON 7X	ALL SERIES
G150	G150	G150	ALL SERIES
G250	**G250**	**G250**	
GALX	GALX	1126 GALAXY G200	ALL SERIES
GLEX	GLEX	BD-700 GLOBAL EXPRESS	ALL SERIES
GLF2	GLF2	GULFSTREAM II (G-	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
		1159)	
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	ALL SERIES
GLF3	GLF3	GULFSTREAM III (G-1159A)	ALL SERIES
GLF4	GLF4	GULFSTREAM IV (G-1159C) G300 G350 G400 G450	ALL SERIES
GLF5	GLF5	GULFSTREAM V (G-1159D) G500 G550	ALL SERIES
GLF6	**GLF6**	**G650**	
H25B-700	H25B	BAE 125 / HS125	700A, 700B
H25B-750	H25B	HAWKER 750	ALL SERIES
H25B-800	H25B	BAE 125 / HS125 HAWKER 800XP HAWKER 800XPI HAWKER 800 HAWKER 850XP HAWKER 900XP HAWKER 950XP	800A, 800B ALL SERIES
H25C	H25C	HAWKER 1000	ALL SERIES
HA4T	HA4T	HAWKER 4000	ALL SERIES
IL62	IL62	ILYUSHIN-62	ALL SERIES
IL76	IL76	ILYUSHU-76	ALL SERIES
IL86	IL86	ILYUSHIN-86	ALL SERIES
IL96	IL96	ILYUSHIN-96	ALL SERIES
J328	J328	328JET	ALL SERIES
KC135	B703	KC-135	ALL SERIES
L101	L101	L-1011 TRISTAR	ALL SERIES
L29B-2	L29B	L-1329 JETSTAR 2	ALL SERIES
L29B-731	L29B	L-1329 JETSTAR 731	ALL SERIES
LJ23	**LJ23**	**LEARJET 23**	
LJ24	**LJ24**	**LEARJET 24**	
LJ25	**LJ25**	**LEARJET 25**	
LJ28	**LJ28**	**LEARJET 28** **LEARJET 29**	
LJ31	LJ31	LEARJET 31	ALL SERIES
LJ35-36	LJ35	LEARJET 35 LEARJET 36	ALL SERIES ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
LJ40	LJ40	LEARJET 40	ALL SERIES
LJ45	LJ45	LEARJET 45	ALL SERIES
LJ55	LJ55	LEARJET 55	ALL SERIES
LJ60	LJ60	LEARJET 60	ALL SERIES
MD10	MD10	MD-10	ALL SERIES
MD11	MD11	MD-11	COMBI, ER, FREIGHTER, PASSENGER
MD80	MD81 MD82 MD83 MD87 MD88	MD-80 MD-80 MD-80 MD-80 MD-80	81 82 83 87 88
MD90	MD90	MD-90	30, 30ER
MU30	MU30	MU-300 DIAMOND	1A
P180	P180	P-180 AVANTI	ALL SERIES
PAY4	**PAY4**	**PA-42**	**1000 CHEYENNE**
PC12	PC12	PC-12	ALL SERIES
PRM1	PRM1	PREMIER 1	ALL SERIES
SB20	SB20	SAAB 2000	ALL SERIES
SBR1	SBR1	SABRELINER 40 SABRELINER 60 SABRELINER 65	ALL SERIES
SBR2	SBR2	SABRELINER 80	ALL SERIES
T134	T134	TU-134	A, B
T154	T154	TU-154	A, B, M, S
T204	T204	TU-204 TU-224 TU-234	100, 100C, 120RR 200, 214, C
T334	T334	TU-334	ALL SERIES
TBM	TBM7 TBM8	TBM-700 TBM-850	ALL SERIES
WW24	WW24	1124 WESTWIND	ALL SERIES
YK42	YK42	YAK-42	ALL SERIES

Appendix C: Amended LHD Taxonomy

Code	LHD Cause
	Operational Errors
A	Flight crew failing to climb/descend the aircraft as cleared *Example: Aircraft A was at FL300 and assigned FL360. A CLAM alert was seen as the aircraft passed FL364. The Mode C level reached FL365 before descending back to FL360.*
B	Flight crew climbing/descending without ATC Clearance *Example: At 0648, Aircraft A reported leaving cruise level FL340. The last level clearance was coincident with STAR issue at 0623, when the flight was instructed to maintain FL340. ATC was applying vertical separation between Aircraft A and two other flights. The timing of the descent was such that Aircraft A had become clear of the first conflicting aircraft and there was sufficient time to apply positive separation with the other.*
C	Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc) *Example: The aircraft was maintaining a flight level below the assigned altitude. The altimeters had not been reset at transition. The FL assigned was 350. The aircraft was maintaining FL346 for in excess of 4 minutes.*
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message. Includes situations where ATC delivery of operational information, including as the result of hear back and/or read back errors, is absent, delayed, incorrect or incomplete, and may result in a loss of separation.) *Example: All communications between ATC and aircraft are by HF third party voice relay. Aircraft 1 was maintaining FL360 and requested FL380. A clearance to FL370 was issued, with an expectation for higher levels at a later point. A clearance was then issued to Aircraft 2 to climb to FL390, this was correctly read back by the HF operator, but was issued to Aircraft 1.* *The error was detected when Aircraft 1 reported maintaining FL390.*
E	Coordination errors in the ATC to ATC transfer or control responsibility as a result of human factors issues (e.g. late or non-existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters) *Example 1: Sector A coordinated Aircraft 1 to Sector B at FL380. The aircraft was actually at FL400.* *Example 2: The Sector A controller received coordination on Aircraft 1 for Waypoint X at FL370 from Sector B. At 0504 Aircraft 1 was at Waypoint X at FL350 requesting FL370.*
F	Coordination errors in the ATC to ATC transfer or control responsibility as a result of equipment outage or technical issues *Example: Controller in FIR A attempts to send AIDC message to coordinate transfer of aircraft at FL320. Messaging unsuccessful and attempts to contact adjacent FIR by telephone fail. Aircraft contacts adjacent FIR without coordination being completed.*

Aircraft Contingency Events	
G	Deviation due to aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure) *Example: Aircraft 1 descended from F400 to F300 with a pressurisation issue.*
H	Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level *Example: Aircraft 1 cruising at FL380. ATC receives alert indicating aircraft climbing through FL383. Flight crew advises attempting to regain cleared level with autopilot and navigation system failure.*
Deviation due to Meteorological Condition	
I	Deviation due to turbulence or other weather related cause *Example: During the cruise at F400, the aircraft encountered severe turbulence, resulting the aircraft descending 1,000 ft without a clearance.*
Deviation due to TCAS RA	
J	Deviation due to TCAS resolution advisory, flight crew correctly following the resolution advisory *Example: Aircraft 1 was cruising at FL350. Flight crew received "Traffic Alert" from TCAS and almost immediately after an "RA Climb" instruction. Flight crew responded and climbed Aircraft 1 to approx FL353 to comply with TCAS instruction. TCAS display indicated that opposite direction Aircraft 2 descended to approx FL345 and passed below Aircraft 1.*
K	Deviation due to TCAS resolution advisory, flight crew incorrectly following the resolution advisory.
Other	
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan) *Example 1: Original flight plan details submitted by FIR A for outbound leg showed Aircraft 1 as negative RVSM. Subsequent flight plan submitted by FIR B showed Aircraft 1 as RVSM approved. FIR A controller checked with aircraft shortly after entering FIR A and pilot confirmed negative RVSM.* *Example 2: Aircraft 2 cruising FL310 was handed off to the Sector X controller who noticed the label of Aircraft 2 indicated RVSM approval. The Sector X controller had controlled the aircraft the day before. It was then a non-RVSM aircraft. The controller queried the status of Aircraft 2 with the pilot who advised the aircraft was negative RVSM.*
M	Other – this includes situations where: i) There has been a failure to establish or maintain a separation standard between aircraft; or ii) Where flights are operating (including climbing/descending) in airspace where flight crews are unable to establish normal air-ground communications with the responsible ATS unit. *Example: Aircraft 1 cruising at FL350. At time xxxx Aircraft 1 advised "Negative RVSM" due equipment failure. At that time Aircraft 2 on converging reciprocal track FL360 less than 10 minutes prior to time of passing.*

Appendix D: Terms of Reference

FANS INTEROPERABILITY TEAM - ASIA (FIT-ASIA)

TERMS OF REFERENCE

FIT-Asia Objective and Scope

The FANS Interoperability Team - Asia (FIT-Asia) shall be responsible for overseeing system configuration and the end-to-end monitoring process of datalink systems to ensure they are implemented and continue to meet performance, safety, and interoperability requirements within the Asian Region.

The FIT-Asia shall:

Implementation

a) support the implementation and operational benefits of AIDC, CPDLC and ADS;

Reporting and problem resolution processes

b) establish a problem reporting system;
c) review de-identified problem reports, identify trends and determine appropriate resolution;
d) develop interim operational procedures to mitigate the effects of problems until resolution;
e) monitor the progress of problem resolution;
f) prepare summaries of problems encountered and their operational implications;

System performance and monitoring processes

g) determine and validate system performance requirements;
h) establish a performance monitoring system;
i) assess system performance based on information from the CRA;
j) coordinate system testing and trials;
k) identify accountability for each element of the end-to-end system;
l) develop, document and implement a quality assurance plan that will provide a stable system;
m) identify end-to-end system configurations that provide acceptable data link performance;
n) ensure that such configurations are maintained by all stakeholders;

New procedures

o) coordinate testing in support of implementation of enhanced operational procedures

Reporting

p) report safety-related issues to the appropriate State or regulatory authorities for action;
q) provide reports to relevant ATM coordinating groups; and
r) report to RASMAG.

Relevant Central Reporting Agencies (CRA) and States will report, as required, to the FIT-Asia. ICAO Secretariat will submit reports to appropriate sub-groups of APANPIRG.

Composition of FIT-Asia

The FIT-Asia will consist of representatives from States (ANS Providers) communication service providers (CSP), CRAs, IATA, CANSO, IFALPA and IFATCA. Aircraft and ancillary equipment manufacturers may also be requested to participate.

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Appendix E: APANPIRG Asia/Pacific Airspace Safety Monitoring

RASMAG LIST OF COMPETENT AIRSPACE SAFETY MONITORING ORGANIZATIONS

The Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG) is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services and to review and recommend on the competency and compatibility of airspace monitoring organizations. In order to assist in addressing these requirements, RASMAG updates and distributes the following list of competent airspace safety monitoring organizations for use by States requiring airspace safety monitoring services. In the context of the list, abbreviations have meanings as follows:

- RMA – Regional Monitoring Agency – safety assessment and monitoring in the vertical plane (i.e. RVSM);
- EMA – En-route Monitoring Agency – safety assessment and monitoring in the horizontal plane (i.e. RVSM, RNAV10, RNP4);
- CRA – Central Reporting Agency – technical performance of data link systems (i.e. ADS/CPDLC); and
- FIT – FANS 1/A Interoperability/Implementation Team – parent body to a CRA.

(Last updated 23 February 2011)

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
Australian Airspace Monitoring Agency (AAMA) - Airservices http://www.airservicesaustralia.com/organisations/aama/default.asp Mr. Robert Butcher, Operational Analysis Manager, Safety and Assurance Group email: robert.butcher@airservicesaustralia.com or aama@airservicesaustralia.com	Australia	APANPIRG RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang (including Timor-Leste) FIRs
		EMA	Current	Brisbane, Melbourne FIRs

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
China RMA - **Air Traffic Management Bureau, (ATMB) of Civil Aviation Administration of China (CAAC)** http://www.chinarma.cn (secure site) Mr. Tang Jinxiang, Engineer of Safety and Monitoring Technical Group, ATMB, email: tangjx@adcc.com.cn	China	RMA	Current	Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi, Wuhan, Sanya and Pyongyang FIR.
India Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) http://www.aai.aero/public_notices/aaisite_test/bobasma_index.jsp Mr. A. P. Udayanarayanan Joint General Manager (ATM) Phone No:+ 91 44 22561253 Fax No: +91 44 22561740 Email: bobasmachennai@gmail.com : bobasma@aai.aero	India	EMA as endorsed by RASMAG/15	Current	Chennai, Colombo, Delhi, Dhaka, Kabul, Karachi, Kolkata, Lahore, Male, Mumbai, Yangon,
Japan Airspace Safety Monitoring Agency (JASMA) Mr. Noritoshi Suzuki, Special Assistant to the Director, Flight Procedures and Airspace Program Office, Japan Civil Aviation Bureau, email: suzuki-n248@mlit.go.jp CRA function: Mr. Hironori Okayama, Deputy Director, Air Traffic Control Association Japan, Japan Civil Aviation Bureau, email: okayama@atcaj.or.jp	Japan	RMA and CRA, endorsed as an EMA at RASMAG/15	Current	Fukuoka FIR

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
Monitoring Agency for the Asia Region (MAAR) Aeronautical Radio of Thailand LTD (AEROTHAI) http://www.aerothai.co.th/maar Dr. Paisit Herabat Director, MAAR AEROTHAI Email: paisit@aerothai.co.th or maar@aerothai.co.th	Thailand	RMA	Current	Bangkok, Kolkatta, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Singapore, Taibei, Ulaan Bataar, Vientiane, Yangon FIRs
Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA) http://www.faa.gov/air_traffic/separation_standards/parmo/ Mr. Dale Livingston, Manager, Separation Standards Analysis Team, FAA, email: dale.livingston@faa.gov or aparmo@faa.gov	USA	RMA and EMA	Current	RMA for Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, New Zealand, Tahiti FIRs EMA for Anchorage Oceanic, Oakland Oceanic
South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS) Mr. Kuah Kong Beng, Chief Air Traffic Control Officer, email: KUAH_Kong_Beng@caas.gov.sg	Singapore	EMA and CRA	Current	EMA for Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala Lumpur, Manila, Jakarta, Sanya and Singapore FIRs CRA for Singapore, Viet Nam and Philippines

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
~~**FIT – BOB**~~ **FIT-ASIA** (endorsed by RASMAG/15) ~~ICAO Regional Office email icao_apac@bangkok.icao.int &~~ Mr. Bradley Cornell, Boeing Engineering email: Bradley.D.Cornell@Boeing.Com ~~**FIT - SEA**~~ ~~(ICAO Regional Office email icao_apac@bangkok.icao.int &~~	~~ICAO Regional Office &~~ Boeing USA	FIT & CRA	Current	FIRs in the Asian Region not covered by IPACG/FIT and ISPACG/FIT
IPACG/FIT Mr. Shoichi Kosugi, JCAB Co-Chair email: kosugi-s07vf@mlit.go.jp and Mr. Reed Sladen, FAA Co-Chair, email: reed.b.sladen@faa.gov	Japan and USA	FIT & CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs)
ISPACG/FIT Mr. Bradley Cornell, Boeing Engineering email: Bradley.D.Cornell@Boeing.Com	Boeing USA	FIT & CRA	Current	South Pacific FIRs and members of the Informal South Pacific ATS Coordination Group (ISPACG)

Agenda Item 3.4: CNS/MET

3.4 **CNS/MET Matters**

3.4.1 APANPIRG/22 reviewed the outcome of the Fifteenth Meeting of Communications, Navigation and Surveillance/Meteorology Sub-group (CNS/MET SG/15) of Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) held in Bangkok from 25 to 29 July 2011 as presented in WP/18. The meeting noted with appreciation work done by the Sub-group. The meeting also discussed the CNS/MET related issues and took following actions on the report of the CNS/MET SG/15.

Asia/Pacific Air Navigation Concept of Operations

3.4.2 The meeting noted that CNS/MET SG/15 supported the draft regional air navigation concept of operations proposed by IATA and endorsed by ATM/AIS/SAR SG/21. The meeting endorsed a revised version of the Asia/Pacific Air Navigation Concept of Operations which was adopted under agenda item 3.2.

Review outcome of the RASMAG/13 and RASMAG/14 Meetings

3.4.3 The CNS/MET SG/15 meeting noted outcomes of the Thirteenth and Fourteenth Meetings of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/13 and /14), which included termination of CRA datalink assessment services of Japan for Southeast Asian States, piecemeal report by CRAs/FITs, safety assessment of airspace, LHD block clearance carried out by Australia, significant reduction of Category E LHD consequent to AIDC implementation between Japan and ROK and RASMAG endorsement of ADS-B derived geometric height for monitoring. Noting the pre- and post-implementation system performance monitoring required by Annex 11 – *Air Traffic Service* (Para 2.26.5), the *Global Operational Data Link Document* (GOLD) and the *Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service Data Link Systems in the Asia/Pacific Region*, the CNS/MET SG/15 meeting endorsed RASMAG Draft Conclusion 14/1 urging the States to provide results of data link performance monitoring to CRAs/FITs in a timely manner.

3.4.4 Recognizing the significant benefits derived from implementation of AIDC in reduction of Category E errors, States were urged to work towards implementation of compatible AIDC capabilities between neighbouring ATS facilities as soon as possible in accordance with the regional air navigation plan and the available ICAO guidance material on AIDC. In this connection, the CNS/MET SG recommended that the ATM/AIS/SAR SG and/or RASMAG develop a priority list for implementation of AIDC between ATC pairs based on statistical data.

Aeronautical Fixed Service (AFS)

Review Report of the Sixth Meeting of ATNICG (ATNICG/6)

3.4.5 The CNS/MET SG/15 meeting noted the tasks accomplished by the Sixth Meeting of Aeronautical Telecommunication Network Implementation Coordination Group (ATNICG/6) Meeting which was hosted by the Office of Civil Aviation, Ministry of Land, Transport and Maritime Affairs (MLTM) and Korea Airports Corporation (KAC) from 16 to 20 May 2011.

3.4.6 The meeting, after reviewing the updates proposed by ATNICG/6 to the Terms of Reference and the Subject/Tasks list, adopted following Decision formulated by the ATNICG/6 and recommended by CNS/MEG SG/15:

Decision 22/16 - Revised TOR and Subject/Tasks List of ATNICG

That, the revised Terms of Reference and the updated Subject/Tasks List of ATNICG provided in **Appendix A** to the Report on Agenda item 3.4 be adopted.

ATNICG Working Group Meetings

3.4.7 The CNS/MET SG/15 meeting was informed about the outcome of the Eighth Working Group Meeting of ATNICG hosted by Airways New Zealand in Christchurch from 29 September to 1 October 2010 and the Ninth Working Group Meeting hosted jointly by Aeronautical Radio of Thailand (AEROTHAI) and ICAO Asia and Pacific Office in Bangkok from 25 to 26 January, 2011. The meeting reviewed the progress achieved in the two meetings and appreciated the assistance and support provided by Airways New Zealand and AEROTHAI.

Amendment to FASID Tables CNS 1B, CNS 1C and CNS 1E

3.4.8 The meeting noted that CNS/MET SG/15 Meeting had reviewed the updated Asia and Pacific Regions Air Navigation Plan (Doc 9673) Volume II, FASID Table 1B – Aeronautical Telecommunication Network (ATN) router plan, Table 1C – ATS Message Handling System (AMHS) routing plan and Table 1E – ATS Inter-facility Data Communication (AIDC) routing plan and adopted following Conclusion adopting the updated tables.

Conclusion 22/17 - Amendment to FASID Tables – CNS 1B, 1C and 1E

That, FASID Tables CNS 1B – Aeronautical Telecommunication Network (ATN) router plan**,** Table CNS 1C – ATS Message Handling System (AMHS) routing plan and Table CNS 1E – ATS Inter-facility Data Communication (AIDC) routing plan be replaced with the updated Tables provided in **Appendices B, C and D** to the Report on Agenda item 3.4 in accordance with the established procedure.

AMHS Planning Documents and Implementation Status in other Regions

3.4.9 The Fifteenth Meeting of EUR/NAT Aeronautical Fixed Services Group (AFSG/15) identified following operational requirements which need to be addressed in the AFS field:

a) Amendment 1 to PANS ATM Doc 4444 – FPL 2012 (15 Nov 2012);
b) xNOTAM using XML (planned in 2012 – 2016); and
c) XML based OPMET (planned 2012/2013)

3.4.10 Following AFTN requirements were identified by AFSG, which will be essential to meet the requirement of new ATM enhancements:

a) Capability for handling long messages (length to be defined);
b) Extended line length (more than 69 characters); and
c) Extended character set (restrictions concerning some control characters)

3.4.11 ATNICG agreed with AFSG view that the current AFTN/CIDIN/AMHS would be able to meet the evolving operational requirements and no other network/technology would be needed, ATNICG however did not agree with AFSG's contention that some of these requirements had already been accommodated on the basis of bilateral agreement and/or had been included in ICAO Annex 10.

3.4.12 Sixth Meeting of ICAO South American Regional Implementation Group (SAM/IG/6) (18 to 22 October, 2010) concluded that implementation dates committed were being shifted thus delaying the project and adopted a conclusion urging States to request support from system providers to complete successful connection and to get their staff trained.

3.4.13 AMHS Implementation Task Force in AFI region was established by the AFI Planning and Implementation Regional Group (APIRG) through Conclusion 17/17 and a Workshop on AMHS and the First Meeting of the Task Force was organized from 17 to 20 May 2011 at ICAO Nairobi office.

Directory Service Requirements

3.4.14 Application of Directory Service (using X.500) will involve a number of operational aspects including management of data, local availability, synchronization, manageability, support for regional structures and transition. Ideal structure proposes to have three levels: global level, regional level and national level. It was confirmed that AMC service will continue to be used in the near term and States are required to follow the guidelines provided on the subject. The CNS/MET SG/15 meeting was informed about many other issues like maintenance of AIRAC cycle, distribution management, routing table etc. which were discussed in ATNICG meeting.

ATN/AMHS Documentation Tree

3.4.15 The CNS/MET SG/15 meeting noted that the ATN/AMHS Documentation Tree was updated by ATNICG/6. The updates had been reflected on the APAC website and the updated documentation tree can be accessed at the following webpage: http://www.bangkok.icao.int/apac_projects/atn/chart/atn_doctree.asp.

AMHS Technical Specifications

3.4.16 ATNICG had identified that Asia/Pacific requirements for AMHS had been published in several manuals based on different versions of Doc 9705 and EUROCONTROL AMHS Manual. The meeting supported ATNICG's proposal to adopt a single document that captures the AMHS requirements for the region and that is based on the latest ICAO specifications in this regard. The meeting expressed appreciation for the efficient and good work completed by an Ad Hoc Working Group with members from India, Japan, Singapore, Thailand and USA. The meeting reviewed the APAC AMHS Technical Specifications and adopted following Conclusion:

Conclusion 22/18 – Asia/Pacific AMHS Technical Specifications

That, the Asia/Pacific AMHS Technical Specifications provided in the **Appendix E** to the Report on Agenda item 3.4 be adopted.

Note of appreciation

3.4.17 The CNS/MET SG/15 meeting expressed its gratitude to the MLTM and KAC for hosting ATNICG/6 meeting, the excellent arrangements made and the activities organized during the meeting including a technical visit to the Aeronautical Communication Center at GIMPO Airport. The meeting also noted India's offer to host the next ATNICG Working Group meeting in Jaipur in end September, 2011 and placed on record its appreciation for the offer.

Status of ATN implementation in Mongolia (IP/23)

3.4.18 Mongolia informed the meeting about the status of Mongolia's ATN/AMHS implementation and 2 Mbyte high speed circuit implemented in October 2010 between Mongolia and China over optical fiber cable. The newly commissioned ground circuit supports AFS including AFTN and ATS direct speech circuit between Ulaanbaatar and Beijing. The circuit will also be employed to conduct ATN/AMHS based AIDC pre-operational trials involving comprehensive connection tests. The planned AMHS and AIDC connection will use the ground circuit which has become part of the Aeronautical Fixed Service infrastructure. This improvement is achieved as a result of continuous efforts made by both CAA Mongolia and CAAC in accordance with APANPIRG Conclusion 11/15.

ATN/AMHS Implementation and Operational status in Republic of Korea

3.4.19 Republic of Korea informed CNS/MET SG/15 meeting about the completion of ATN/AMHS implementation between Seoul and Beijing on 1 June 2011 and that the implementation between Seoul and Fukuoka, as per regional Air Navigation Plan will be coordinated with Japan. Republic of Korea was congratulated for this achievement and meeting was reminded about the completion of ATS/AMHS implementation between Singapore and India in March 2011.

ATN/AMHS Implementation in India (WP/06)

3.4.20 India informed the meeting that ATS Message Handling Service between Mumbai and Singapore, commenced from 23 March 2011 has demonstrated reliable interoperability for the exchange of aeronautical messages. Interoperability tests on AMHS interconnection between Mumbai and Beijing (BBIS) were recently completed. The test results conformed to the defined requirements. The preoperational trials for AMHS interconnection between Mumbai and Karachi (BIS) are also in final phase of completion and efforts are being made for commencing regular operation for both the circuits in the 4th quarter of 2011.

3.4.21 Regarding inter-regional connection between Mumbai and Muscat (Oman), the traffic is presently carried on AFTN over TCP/IP through AMHS gateway. Efforts are being made to coordinate with Oman for commencing AMHS trials. India is keen to commence AMHS trials immediately with Thailand (BBIS) and other BIS stations in Sri Lanka, Nepal, Bhutan and Kenya. However, readiness is awaited from these States. Action has been initiated to install software for AMHS AMC files import function and New FPL-2012 Format to implement ICAO Amendment 1 of PANS-ATM Doc-4444 to be completed before the end of October 2011.

3.4.22 India will host 10th Working Group Meeting of ATNICG in Jaipur from 26th to 29th September 2011. India urged other BBIS/BIS States to complete the implementation for compatible operation in line with ICAO APAC Regional Implementation Plan. The meeting appreciated efforts and initiatives taken by India and adopted following Conclusion.

Conclusion 22/19 – Expedite ATN/AMHS Implementation

That, States be urged to expedite the implementation of ATN/AMHS interconnection for compatible operation in accordance with ICAO Asia/Pacific Regional Implementation Plan in a time bound manner.

Special Implementation Project (SIP) AIDC Seminar

3.4.23 The CNS/MET SG/15 meeting noted that a Special Implementation Project (SIP) Seminar on ATS Inter-Facility Data Communication (AIDC) was held at ICAO Regional Office, Bangkok, Thailand from 12 to 13 October 2010. The objective of the Seminar was to assist the States in the APAC Region in implementing AIDC as it would have significant favorable effects on the safety of operations and efficiency of air traffic management.

3.4.24 It was recognized that complexities of implementation of AIDC require common efforts of a team consisting of members with both technical and operational background. It was also noted with interest that flexibility of implementation exists in the form of a dedicated standalone AIDC server or processor installed separately interconnecting with other ATCC via the AFTN. It fetches the Flight Plan information from the ATM system. A sample of such kind of implementation was presented to the Seminar by Hong Kong China.

3.4.25 The Seminar recommended implementation of AIDC in accordance with the regional air navigation plan and the ICD for AIDC. Noting very limited data contained in the AIDC Implementation Planner presented to the seminar and that a main ACC in a State would have no more than 5 AIDC links with ACCs in the neighboring States, the CNS/MET SG/15 meeting did not recommend the planner for adoption by APANPIRG and, the secretariat was requested to urge States to provide required data through a state letter.

Pan Regional ICD for AIDC

3.4.26 USA provided to CNS/MET SG/15 Meeting updates on the process to consolidate the Interface Control Document (ICD) for the North Atlantic and Asia/Pacific (APAC) Regions, to provide a harmonized Air Traffic Services Inter-facility Data Communications (AIDC). A draft ICD version 0.4 was consolidated based on Version 3 of APAC ICD for AIDC and NAT CC ICD, v1.2.7 May 2009. The coordinated draft *"Pan Regional Interface Control Document for ATS Interfacility Data Communications (PAN ICD)"* with thorough bi-directional tracking of content was presented to the meeting. The comment resolution form was also noted. The NAT CNSG/5 will review the draft in its next meeting scheduled for 26 to 30 September 2011 in Bodo, Norway.

3.4.27 The CNS/MET SG/15 meeting encouraged the States to provide comments on the draft version. Meeting also noted one of the principles agreed by NAT SPG as follows: "Since the ICD would apply to oceanic regions only, the title of the future document should be "Pan Regional ICD for Oceanic AIDC". In this regard, the meeting recalled that APANPIRG/21 had adopted Conclusion 21/26 to inform NAT SPG that the title "Pan-regional ICD for Oceanic AIDC" is unacceptable as the Asia/Pacific ICD for AIDC is applicable for use by all ATS and ATM facilities in both the oceanic and the continental areas within the Asia Pacific Region and that the document should be titled "Pan-Regional ICD for AIDC". USA was requested to forward this comment to the drafting group for further consideration. It was suggested that the specific use of the ICD for Oceanic Area in the NAT Region may be included in the "FORWARD" of the document.

Aeronautical Mobile Service (AMS)

Second Satellite Data-link Operational Continuity (SOCM/2) meeting

3.4.28 To meet the requirements of APANPIRG Conclusion 19/24, First Satellite data-link Operational Continuity Meeting (SOCM/1) was held from 26 to 28 August, 2009. Based on the recommendation made by SOCM/1 to organize second SOCM after receiving inputs from FANS System Improvement Team (FSIT), APANPIRG adopted Conclusion 20/32 inviting ICAO to organize the second meeting in 2010. SOCM/2 meeting could not be organized, because FSIT did not

hold its meeting and hence no updates could be received for review by the SOCM/2. Subsequently, APANPIRG decided that the meeting should be organized even if no input from FSIT is received. The meeting also noted that a considerable progress had been made in improving the performance of satellite data-link communication. In view of foregoing, the SOCM/2 meeting has now been scheduled for 15-18 November 2011. Letter of invitation for the meeting was issued on 24 June 2011 by ICAO APAC Office. It has also been decided to organize a one and a half day Seminar on Satellite Data-link Communication in conjunction with the meeting. States were invited to participate in the meeting and the seminar. Based on the recommendation of CNS/MET SG/15, the meeting adopted following Conclusion:

Conclusion 22/20 – Second Satellite Data-link Operational Continuity Meeting (SOCM/2) and Seminar on Satellite Data-link Communication

That, the States be urged to nominate suitably qualified personnel to participate in the Seminar on Satellite Data-link Communication and the Second Satellite data-link Operational Continuity Meeting (SOCM/2) scheduled from 15 to 18 November, 2011 in Bangkok, Thailand.

Interregional SATCOM Voice Task Force (IRSVTF)

3.4.29 The IRSVTF was established by the North Atlantic Systems Planning Group (NAT SPG Conclusion 46/5) and Asia-Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG Conclusion 21/27) with the objective to produce a globally applicable SATCOM voice guidance material (SVGM) for air traffic service (ATS) communications. The first meeting of ICAO Inter-Regional SATCOM Voice Task Force (IRSVTF) was held from 25-27 January 2011, in Paris, France.

3.4.30 The CNS/MET SG/15 meeting noted that the IRSVTF plans to complete its work by the end of 2011 and present SVGM edition 1.0 to NAT SPG/48 for approval in June 2012. The ATM/AIS/SAR SG/22 and CNS/MET SG/16 are expected to review the guidance material and make recommendation for consideration by APANPIRG/23 in September 2012.

3.4.31 Draft SATCOM Voice Guidance Material v 0.5TC associated with Master Comment Matrix was provided to the CNS/MET SG/15 meeting. States in the Asia and Pacific Regions, in particular member States of IRSVTF were encouraged to participate in IRSVTF/2 meeting and to provide comments on the guidance material though ICAO APAC Office.

3.4.32 The meeting noted that the NAT SUPPs proposal for amendment to the use of SATCOM voice was formally approved by the President of ICAO Council on 11 May 2011. This was considered by NAT SPG/47 as an important milestone that would formally enable using the SATCOM voice in the NAT region for routine ATS communications. The CNS/MET SG/15 meeting also noted that one of the scenarios considered in the NAT approval is to allow SATCOM voice as a substitute for the carriage of one of the two required HF Long Range Communication System (LRCS) only.

3.4.33 Australia presented a paper highlighting SATCOM Voice issues. A trial in the North Atlantic region was undertaken that led to the subsequent legitimatization of the normal use of one HF set plus one SATCOM on some routes in that region "**if the ground counterparts are equally suited for SATCOM"**. Following points were noted:

a) This is not an approval for SCV to be a stand-alone Long Range Communication System (LRCS);

b) At least one HF must continue to be carried and be serviceable;

c) SCV can only be used in airspace where ATS are capable and authorized to use the capability; and

d) In most ATS infrastructure arrangements, SCV is operated through 'third party' communications protocol that precludes it being suitable for some separation standards.

3.4.34 Informal discussions have indicated that some States in APAC Region have already experienced flights being planned with SCV as the only available Long Range Communication System. Given the European approval, further examples of this could be expected and will need to be managed. IFALPA informed the CNS/MET SG/15 meeting that pilots used SATCOM Voice for communication with ATC in case other preferred means were not available.

SELCAL Code Issue

3.4.35 Australia informed the CNS/MET SG/15 meeting about existing arrangements for allocating Selective Call (SELCAL) codes. Under existing arrangements, only 10920 combinations for SELCAL codes are possible using four tones, but 27,285 codes have been allocated to meet the requirements from the user. Hence a situation can arise where two (or more) aircraft operating within the same HF area will have identical SELCAL codes and this can lead to the possibility of one aircraft responding to the call for another aircraft. The meeting was informed that Aviation Spectrum Resource Inc. (ASRI), the organization responsible for the allocation of SELCAL codes to aircraft operators agreed to institute a programme of recording instances of multiple aircraft responding to the same SELCAL code. A possible solution being discussed is to expand the existing 2 x 2 tone system to a 3 x 2 tone system. The CNS/MET SG/15 meeting was warned about the requirement of updating the airborne systems in addition to the ground based systems, if this proposal was agreed. After discussing the issue, the meeting adopted following Conclusion urging the States using HF voice communication to report instances of two (or more) aircraft operating in the same HF area with identical SELCAL codes.

Conclusion 22/21 – Identical SELCAL Codes

That, ICAO be invited to conduct a survey to assess the instances (per annum) of two (or more) aircraft using identical SELCAL codes in the same HF area in the Asia/Pacific Region.

3.4.36 The CNS/MET SG/15 meeting was of the view that the States should be informed about the issue while asking them to respond to the survey. In response to the query, if any other system was being considered for the replacement of SELCAL system, it was informed that no information about any replacement was available.

Data-link Performance Monitoring

3.4.37 New Zealand provided data-link monitoring results from the Auckland Oceanic FIR for last three years. The CNS/MET SG/15 meeting noted the encouraging results of data-link performance which had shown significant improvement since July 2010. The statistical data collected from December 2008 to June 2011 indicates that the safety targets for network availability are being achieved since July 2010 and data link performance generally shows improvement. While the safety

targets for network availability are being achieved at present, it is clear that considerable improvement is necessary if the efficiency target is to be met. The efficiency target supports operational efficiency and orderly flow of air traffic. The nominal times for CPDLC and ADS-C continuity are being achieved, but some improvement is necessary to reach the target for expiration time.

Near term future plan of MTSAT

3.4.38 The CNS/MWT SG/15 meeting was informed that the End of Life (the EOL) of MTSAT-1R is expected to occur during Japanese Fiscal Year 2014 and the EOL of MTSAT-2 is JFY 2015. A comprehensive study for next generation satellite was conducted in 2010 by JCAB. JCAB decided not to replace MTSAT-1R, but to continue to provide AMSS through MTSAT-2 after the termination of MTSAT-1R AMSS payload. The calculation of remaining fuel showed that MTSAT-2 has an outlook of four year expansion of its life. JCAB believes that MTSAT System by single satellite will still meet the requirements of Communication Service Provider portion of RCP240 defined in Global Operational Data Link Document (GOLD) mainly due to the high availability of communication satellite and redundancy of ground system.

Contingency Arrangement of Aeronautical Mobil Satellite (Route) Services

3.4.39 Japan presented a case to CNS/MET SG meeting reconfirming the importance of contingency arrangement in aeronautical safety communication infrastructure, based on Japan's experience in the wake of big earthquake in eastern Japan in March 2011. In order to realize uninterrupted data link communication in such events, the MTSAT system has been designed as follows:

- Safety critical functions of the system are multiplexed.
- The changeover time of multiplexed systems is of the order of second to millisecond.
- Two ASCs are disposed with about 600 km separation on Japan Mainland for space diversity.

3.4.40 The AMSS provided by the MTSAT continued operating during the earthquake period. Although electricity recovered in two days, repair and calibration of the equipment took almost one month. Hitachiota ASC went back-on-normal in April 2011. The experience gained from the earthquake in Japan this year shows that a certain level of redundancy of system is needed for the continuity of aeronautical satellite communication. It was concluded that contingency arrangement in the design of global or regional air navigation systems such as AMS(R)S System is one of the salient issues that needs to be considered for the assurance of continuity and availability of air navigation service.

Indonesia FSS Restructurization

3.4.41 The CNS/MET SG/15 meeting was informed that Indonesia has a plan to restructure its existing 14 Flight Service Sectors (FSS) by the year 2014. FSS will cover airspace under FL245 which is not within VHF coverage. The planned FSS restructurization will have 2 FSS in the Western FIR, 3 FSS in the Eastern FIR and additional centralized FSS units located in Jakarta and Ujung Pandang respectively.

HF Reception Performance over Colombo FIR

3.4.42 Sri Lanka presented the summarized HF reception data observed during 2010/ 2011 within Colombo FIR with specific attention to fading characteristics of HF signals. The meeting noted that the distribution of fading hours concentrate during the period 1930 – 0100hrs (UTC) and higher outage figures were observed during May – September 2010. It was also noted that the outage figures from February 2011 onwards have been significantly lower.

Navigation

Review reports of the Seventh and Eighth Meetings of Performance Based Navigation (PBN) Task Force (TF/7 and TF/8)

3.4.43 The Seventh Meeting of the Performance-Based Navigation Task Force (PBN/TF/7) was held in Bangkok from 1 to 3 September 2010. The Eighth Meeting of the Performance Based Navigation Task Force (PBN/TF/8) was held in conjunction with the PBN Workshop and the PBN Implementation Seminar 2011, which were graciously hosted by the Airports Authority of India (AAI), in New Delhi from 9 to 13 May 2011.

3.4.44 The following key subjects and developments on PBN implementation were reviewed and noted by the CNS/MET SG/15 meeting:

- ICAO Assembly Resolution A37-11 allowed the implementation of RNP APCH LNAV approaches if Approaches with vertical guidance (APV) cannot be implemented;

- PBN GO Team activity was noted (a GO Team had been to Thailand);

- ICAO was developing Operational Approval guidance for global application, based to a large degree on the APAC Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAP) Handbook in cooperation with the Civil Aviation Safety Authority of Australia (CASA);

- out of the 21 PBN Plans received so far, nine (9) had been assessed by the PBN Plan Review Team as 'robust', four (4) were rated as 'marginal' and eight (8) were rated 'incomplete', which means that less than one quarter of APAC administrations had adequate plans;

- mechanisms such as ICAO Asia/Pacific Flight Procedure Programme (FPP) and COSCAPs, assistance by industry stakeholders such as Boeing, Airbus and IATA and workshop/seminars held at locations that can benefit States which need direct assistance were agreed to be of benefit and were to be encouraged (later termed Regional Support Strategy REDI Initiatives);

- Version 3.0 of the Asia/Pacific Performance-Based Navigation Implementation Plan was agreed, with updates to include Basic Planning Elements, Operational Approval material, and examples of specific measurable benefits resulting from States PBN implementation;

- Nepal would write to the Regional Office to formally request a change to Annex 11, removing the words 'self-contained' in order to allow area navigation derived RNAV waypoints. (In this connection, it was informed that letter received from Nepal before CNS/MET SG/15 meeting was forwarded to ICAO Headquarters for consideration)

- In response to a query, the meeting was informed about the details of the Concept Note and Project Proposal on PBN support in the region presented to the Fifteenth meeting of APEC GNSS Implementation Team (APEC GIT/15) and it was also informed that APEC GIT has assured that the implementation of the support will be in coordination with ICAO APAC Office and will be in line with the regional PBN implementation plan.

- Based on the proposal made by Australia, PBNTF/8 proposed to include the minimum requirement of GNSS-enabled area navigation systems for all RNP navigation authorizations in the *Strategy for the Provision of Navigation Services in the Asia/Pacific Region.* This had been reflected in the revised Navigation Strategy proposed by the CNS/MET SG/15 meeting. The meeting adopted the following Conclusion to support the requirement projected by PBN Task Force:

Conclusion 22/22 - GNSS minimum requirement for RNP Navigation Specifications

That, GNSS-enabled area navigation systems for all RNP navigation specifications be adopted as minimum requirement in the Asia/Pacific Region.

As a result of review of the outcome of PBNTF/7 meeting, the meeting adopted following Conclusion:

Conclusion 22/23- Participation in the Asia/Pacific Flight Procedure Programme

That, States in the Asia/Pacific Region be encouraged to take part in the regional cooperative effort to achieve the safety, access, capacity, efficiency and environmental benefits that are possible with PBN implementation, by joining the Asia/Pacific Flight Procedure Programme (FPP).

Feasibility of Establishing a Regional RAIM Prediction System

3.4.45 GNSS is considered as a main navigation infrastructure supporting PBN operations and is also a critical component of surveillance system, such as ADS-B. The CNS/MET SG/15 meeting recalled that Annex 10 and PBN Manual require the States and Air Navigation Service Providers (ANSPs) to provide timely warning of GNSS Receiver Autonomous Integrity Monitoring (RAIM) outages to the users of the services like pilots, flight dispatchers, Air Traffic Controllers and Airspace Planners. The meeting was also reminded that APANPIRG Decision 20/38 had tasked PBN Task Force to examine the feasibility of establishing a regional RAIM prediction system.

3.4.46 The CNS/MET SG/15 meeting noted that PBNTF/7 endorsed Minimal Technical and Operational Requirements for a Regional RAIM Prediction System and a proposal on a regional RAIM prediction concept. The meeting also noted that the APEC GNSS Implementation Team (GIT) meeting in 2009 had expressed its willingness to work cooperatively with ICAO to support the establishment of a regional RAIM prediction service.

3.4.47 It was informed that AEROTHAI had approved initial investment for the establishment of the Asia/Pacific Regional RAIM Prediction System to support ABAS. Initial operation for the Bangkok FIR is expected to be implemented near the end of 2011. The system would be capable of providing RAIM prediction services to support ABAS (and not GBAS and SBAS) for all participating States within the Asia/Pacific Region in 2012. It was estimated that financial contribution for each participating State will be a monthly fee of less than USD 1,500 with a one-time database set-up cost of less than USD 3,500 per State. The CNS/MET SG/15 meeting noted that AEROTHAI is willing to assist participating States in fulfilling the established requirements.

3.4.48 To encourage States' participation in the regional RAIM prediction service and to harmonize the operational and technical requirements, the meeting adopted following Conclusion:

Conclusion 22/24 – Regional RAIM Prediction System and Minimum Technical and Operational Requirements

That, the States in the Asia/Pacific Region be encouraged to participate in the Regional RAIM Prediction System and the Minimum Technical and Operational Requirements for Asia/Pacific Regional RAIM Prediction System provided in **Appendix F** to the Report on Agenda item 3.4 be adopted.

3.4.49 Noting the PBN TF/8 meeting proposal to amend the regional PBN Implementation Plan to include the following elements, the meeting adopted following Conclusion:

a) Description of the Basic Planning Elements (BPEs);

b) Operational Approval as a BPE;

c) Appendix C to be added to include Operational Approval guidance material; and

d) Updated Appendix D to provide real examples of PBN benefits.

Conclusion 22/25 - Regional PBN Plan Amendment

That, the revised Asia/Pacific Regional PBN Implementation Plan Version 3.0 provided in **Appendix G** to the Report on Agenda Item 3.4 be adopted and published.

PBN Implementation Initiatives in India (WP/30)

3.4.50 Updating the status of PBN implementation in its administration, India informed the meeting that RNAV-1 SIDs and STARs had been implemented in 6 international airports. Implementation has helped in reducing congestion at 3 major international airports through streamlining of traffic. PBN implementation roadmap, approved by Director General of Civil Aviation covers Approach, Arrival/Departure and En-route operations. India invited its neighboring States to jointly develop PBN routes and arrival/departure procedures to form a seamless network of PBN routes and arrival/departure procedures in the sub-continent.

GNSS Implementation and GNSS Implementation Status Survey

3.4.51 The CNS/MET SG/15 meeting was reminded about the concern raised in APANPIRG/21 regarding slow progress of GNSS implementation in the region. To assess the level of GNSS implementation in the region, a questionnaire was circulated to the States through APAC Office State Letter dated 30 November, 2010. The meeting was informed about the significant outcome of the survey. The meeting agreed that GNSS should be considered for inclusion as an ILS component and invited ICAO to conduct a workshop to address issues identified through survey. The workshop may be organized in conjunction with a meeting of PBN Task Force. Following Conclusion on the subject was adopted by the meeting:

Conclusion 22/26 – Workshop on GNSS implementation

That, ICAO be invited to organize a Workshop on GNSS implementation to address issues identified through the GNSS implementation survey conducted in 2010.

Ionospheric Data Collection, Analysis and Sharing in Support of GNSS Implementation

3.4.52 Significance of characterizing ionosphere in the region was identified by APANPIRG/20 as a useful step towards the implementation of GNSS. To progress characterization of ionosphere, APANPIRG/21 agreed upon the requirement of cooperative efforts in developing a standard ionospheric model for the region and invited Japan to provide the technical leadership with ICAO providing support. A two day workshop on *'Ionospheric Data Collection, Analysis and Sharing in Support of GNSS Implementation'* was organized on 5 and 6 May, 2011 in Bangkok.

3.4.53 The CNS/MET SG noted a recommendation developed by the Workshop to urge States to share available GNSS data collected to facilitate characterization of ionosphere. The meeting adopted following Conclusion:

Conclusion 22/27 – Sharing of Ionospheric Data

That, States be urged to coordinate with their relevant national organizations for sharing of available GNSS data with the relevant civil aviation agencies to facilitate characterization of ionosphere to support GNSS implementation in the region.

3.4.54 The CNS/MET SG/15 meeting assessed the requirement projected in a recommendation of the Workshop and made Decision 15/13 establishing an Ionospheric Study Task Force to assess the need of a Regional Ionospheric Threat Model for GBAS and SBAS and create it if required.

3.4.55 The CNS/MET SG/15 meeting noted that the Workshop recommended ICAO Regional Office to coordinate with APEC GIT for the initiative being carried out for ionospheric data collection, analysis and sharing. The meeting was informed that a presentation was made to APEC GIT in its Fifteenth meeting on this issue. Report on the APEC GIT meeting and the support that was received from APEC GNSS Implementation Team was noted. Progress made on the development of a template for data collection was also noted by the meeting. It was clarified that there are many organizations in the States, which have been collecting data for many years. That archival data can be used to predict ionospheric behavior particularly during solar max period. Secretariat informed the meeting that in CAR/SAM region, a TC project had been established for SBAS implementation and APAC region may communicate with GREPECAS for getting further information on the developments that have taken place. Japan reconfirmed its support for this project and conveyed the commitment of ENRI. ICAO proposed a combined global and regional effort on this objective.

Outcome of APEC GIT/15

3.4.56 Fifteenth meeting of Asia Pacific Economic Cooperation (APEC) GNSS Implementation Team (GIT/15) was held in Brisbane, Australia from 13 to 17 June, 2011. Team adopted a Strategy which includes collaborating with ICAO, ICG (International Committee on GNSS) and IMO (International Maritime Organization) to explore possibilities of supporting GNSS activities and avoiding duplication of efforts. The meeting discussed two Concept Notes and Project Proposals on GNSS applications, which included a Proposal on 'Performance Based Navigation (PBN) Regulatory Review and Evaluation Programme' sponsored by USA, Thailand and New Zealand.

ICAO presented status of GNSS implementation in the region and informed the APEC GIT about the outcome of 'Workshop on Ionospheric Data Collection, Analysis and Sharing to support GNSS Implementation'. APEC GIT and some States agreed to support the ionospheric data collection activity of ICAO Asia/Pacific Region.

GNSS Performance Threats

3.4.57 The CNS/MET SG/15 meeting was informed about the potential threats to the performance of GNSS from naturally occurring and manmade sources. The manmade sources were considered in the categories of inadvertent interference and deliberate interference. Inadvertent sources include harmonics, inter-modulation and parasitic oscillations from poorly designed, implemented or maintained radio frequency systems. Deliberate threats to GNSS can come from individuals who seek to defeat security and tracking devices on the basis of privacy protection or to facilitate criminal activities. Low cost jammers are available in the market that target GNSS. These devices will generally effect nearby locations and will have little effect on flying aircraft due to the short exposure time unless the device is carried on to the aircraft. Attention was drawn to technical standards issued by some States and to the legislative provisions that enforce compliance with standards and prohibit the sale, possession and operation of jamming devices.

3.4.58 In seeking to preserve the utility of GNSS to aviation, the meeting adopted following conclusion:

Conclusion 22/28 - Protection of aviation utility of GNSS

That, State aviation authorities in partnership with other agencies of the State prohibit malicious and unintentional interference to GNSS and regulate legitimate uses of technology to preserve aviation utility of GNSS.

3.4.59 Providing clarification on the subject, the meeting was informed that there are legislations in Australia, USA and in Europe on this issue and the matter is likely to come up in 12th Air Navigation Conference. It was further added that there is a proliferation of jamming devices, though not targeted at civil aviation but basically for the purpose of tracking vehicles etc. The meeting was of the view that ICAO should develop a recommendation in one of the Annexes, if there is no recommendation already available in the existing annexes. Hong Kong China informed the meeting that such a provision is already existed in their national telecommunication ordinance.

GBAS

3.4.60 The CNS/MET SG/15 meeting was informed about the status of GBAS implementation in Australia and Japan. Australia expects to complete evaluation of their GBAS (SLS – 4000 SmartPath) by 2012. Both States informed the meeting about the development of CAT III GBAS (GAST-D) in support of Navigation System Panel work programme. The meeting was also informed about the ionospheric studies being carried out by Electronic Navigation Research Institute (ENRI).

Regional SBAS Services through GAGAN (WP/ 31)

3.4.61 GAGAN is India's efforts to provide region specific SBAS meeting Annex 10 standards. GAGAN is progressing as per the milestones set out and is well on its way to provide a cost effective regional SBAS solution to all states within the footprint of its GAGAN GEOs.

3.4.62 GAGAN assures RNP 0.1 service in the Indian flight information region and India is working towards attaining certified APV1 capability over the entire Indian land mass by June 2013.

3.4.63 The Indian Satellite Based Augmentation System (SBAS) programme with its unique ISRO-MLDF IONOSPHERIC ALGORITHM proposes to meet the challenges posed in Indian sub continent and other Equatorial Ionospheric Anomaly regions. India invited APANPIRG States to make use of GAGAN signal-in-space for achieving regional harmonization and seamless navigation services in South East Asia.

Navigation Strategy for the Asia/Pacific Region

3.4.64 Taking into account developments in the navigation field in the region and the recommendation from PBNTF/8 meeting to include the minimum requirement of GNSS-enabled area navigation systems for all RNP navigation authorizations in the Strategy, the meeting endorsed the revised Navigation Strategy for the Asia/Pacific Region as presented by an Ad Hoc working group and adopted following Conclusion:

Conclusion 22/29 - Revised Navigation Strategy for the Asia/Pacific Region

That, the revised Navigation Strategy for the Asia/Pacific Region provided in **Appendix H** to the Report on Agenda item 3.4 be adopted.

Navigation Systems Panel

3.4.65 A summary of the activities of the Navigation Systems Panel (NSP) was provided to the CNS/MET SG/15 meeting. The activities of the NSP included the preparation of papers for the 12th Air Navigation Conference, changes to Standards and Recommended Practices (SARP), additions for SBAS, review of the GNSS Manual, paper on ionoapheric effect and the Manual of Testing of Radio Navigation Aids. Attention of the meeting was drawn to a regional State Letter which sought from States information on their navigation plans for forwarding to the NSP to assist in the preparation of the Navigation Roadmap to support AN Conf/12.

Surveillance

Outcome of ADS-B SITF/10 Meeting

3.4.66 The CNS/MET SG/15 meeting noted that the Tenth Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force (ADS-B SITF/10) hosted by Civil Aviation Authority of Singapore (CAAS) was held from 26 to 29 April 2011 in Singapore. An information sharing session on ADS-B development and implementation was organized on 26 April in conjunction with the ADS-B SITF/10 meeting. The outcome of deliberations at the information sharing session was taken into consideration at the 10th meeting of the Task Force.

Review of Terms of Reference and Subject/Tasks List

3.4.67 The TOR of ADS-B SITF was considered appropriate and the ADS-B SITF/10 CNS/MET SG/15 meeting did not propose any changes to the TOR. The meeting reviewed and proposed updated Subject/Tasks List for ADS-B SITF and adopted following Decision:

Decision 22/30 - Subject/Tasks List of ADS-B Study and Implementation Task Force

That, the updated Subject/Tasks List of ADS-B Study and Implementation Task Force provided in **Appendix I** to the Report on Agenda item 3.4 be adopted.

Guidance Material on building a safety case for ADS-B separation service

3.4.68 The CNS/MET SG/15 meeting reviewed and endorsed a guidance material on building a Safety Case for the delivery of an ADS-B separation services developed by the ADS-B SITF. The meeting noted that the ICAO Circular 311 had been pulled out of circulation and had been replaced by Circular 326 which will be ready for publication by September 2011. The meeting noted the structure and contents of the Guidance Material and adopted it through a consolidated Conclusion below.

Sample agreement for data sharing

3.4.69 The CNS/MET SG/15 meeting noted that the sample agreement was updated based on experience gained by Indonesia and Singapore on its adoption. The meeting noted the description of the changes to the original sample agreement and adopted a revised sample agreement on data sharing through a consolidated Conclusion below.

Amendments to AIGD

3.4.70 The CNS/MET SG/15 meeting noted that Amendment 1 to the PANS-ATM (Doc 4444) will become applicable on 15 November 2012 and endorsed a proposal for a consequential amendment to the ADS-B Implementation Guidance Document (AIGD). The meeting also agreed to add a guidance material to AIGD which contains 5 recommendations for reliability and availability of ADS-B ground system. In this connection, the meeting adopted amendment to AIGD through following consolidated Conclusion.

Conclusion 22/31 – Development of Guidance Material on ADS-B

That, the following regional guidance materials on ADS-B implementation be adopted and published on the APAC Website.

a) Guidance Material on Building a safety case for the delivery of an ADS-B separation service provided in **Appendix J** to the Report on Agenda item 3.4 ;

b) the revised Sample Agreement for Data Sharing contained in **Appendix K**;

c) amendments to the ADS-B Implementation Guidance Document (AIGD) as shown in the **Appendix L** consequential to amendment to the Flight Plan and **Appendix M** on the reliability and availability for ADS-B ground system.

Radio Frequencies for Provision of VHF Voice Communications

3.4.71 The CNS/MET SG/15 meeting recalled that APANPIRG/19 urged States to support provision of VHF radio voice communication associated with ADS-B data sharing between adjacent States. In order to enable radar like separation, ADS-B based surveillance service must be complemented by the Direct Controller Pilot Communication (DCPC) such as VHF radio voice communication. Viet Nam made a proposal that APANPIRG should further support the decision for States to provide VHF voice communications facilities for other States by developing a Conclusion. This would help in the domestic approval process for VHF radio frequency assignment. Consequently, the meeting adopted following Conclusion.

Conclusion 22/32 – Coordination for VHF for sharing Voice Communication Capability

That,

a) States be urged to support provision of VHF radio voice air/ground communication infrastructure for use by adjacent States; and

b) States sharing ADS-B data and providing VHF Voice air-ground communication infrastructure to adjacent States should co-ordinate with ICAO Regional Office and their national Telecommunication Regulatory Authority for assignment of specific VHF radio frequencies to be used by the adjacent States.

Requirement of SA Aware

3.4.72 The CNS/MET SG/15 meeting noted a proposal from IATA to ADS-B SITF/10 meeting that the Australian ADS-B rule should be amended to extend the date of compliance by 2 years. Noting reasons stated and the date 12 December 2013 becoming a generally accepted date among APAC Region States for the commencement of ADS-B mandates, the meeting considered that it would be a reasonable compromise to extend the date for SA aware forward fit compliance to the mandate date, rather than 28 June 2012. In view of the foregoing, the meeting endorsed the recommendation provided in the draft Conclusion of ADS-B SITF/10 meeting report. It was recommended for consideration by Australia that the existing forward fit requirement in the Australian CAO 20.18 for SA Aware to be incorporated in GNSS receivers providing position source data for ADS-B be extended from 28 June 2012 to 12 December 2013.

Support for DO260B

3.4.73 The CNS/MET SG/15 meeting recognized that aircraft equipped with ADS-B Out avionics compliant with DO260B are likely to enter Asia Pacific airspace in 2012-2015 timeframe. There will be a need for the States providing ADS-B based surveillance service to include the service to aircraft with DO260B compliant avionics. The meeting therefore adopted following Conclusion formulated by the ADS-B SITF:

Conclusion 22/33 – Support DO260B Compliant Avionics

That, States providing ADS-B based surveillance services be urged to upgrade their ADS-B ground stations in time (2012-2015) to receive DO260B standard transmissions in addition to those aircraft transmitting ADS-B data compliant with DO260 and DO260A.

Review of the TOR and Name of the SEA ADS-B Implementation Working Group

3.4.74 The CNS/MET SG/15 meeting noted the outcome of the sixth meeting of the South East Asia ADS-B Implementation Working Group held from 24 to 25 February 2011 in Singapore. The complete report of the meeting is available on the ICAO APAC website: http://www.bangkok.icao.int/cns/meeting.do?method=MeetingDetail&meeting_id=36

Bay of Bengal/South Asia Sub-regional Project

3.4.75 The CNS/MET SG/15 meeting noted an initial proposal for the deployment of ADS-B ground stations in the Bay of Bengal and various developments that have taken place regarding ADS-B implementation in the States concerned.

3.4.76 With respect to the Work Proramme of the SEA ADS-B working group to cover Bay of Bengal area, meeting considered the need to invite States in the Bay of Bengal area to participate in the working group meeting on a regular basis and agreed to the proposal to change the name of the Working Group from SEA ADS-B Working Group to South East Asia and Bay of Bengal ADS-B Implementation Working Group (SEA/BOB ADS-B WG) as proposed by the ADS-B SITF and adopted following Decision.

Decision 22/34 – Name and Terms of Cooperation of ADS-B Implementation WG

That, recognizing the need to expedite ADS-B implementation and surveillance data sharing in the Bay of Bengal area, the South East Asia Sub-regional ADS-B Implementation Working Group be renamed as “South East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group”. Revised Terms of Cooperation and work programme based on the existing one for the SEA Sub-regional ADS-B Implementation Working Group be further developed by the new Working Group.

ADS-B Collaboration Project in the South China Sea Area

3.4.77 Noting the progress of ADS-B Implementation made by States in the South China Sea area, the meeting encouraged States concerned to expedite implementation of the project and adopted following Conclusion:

Conclusion 22/35 – Expedite ADS-B implementation project in South China Sea area

That, States concerned with ADS-B implementation in the South China Sea area be urged to expedite required actions and coordination to achieve the implementation.

Australia-Indonesia Data Sharing Project

3.4.78 The CNS/MET SG/15 meeting noted that a satellite datalink between Australia and Indonesia was established to exchange the ADS-B data using multicast and using ASTERIX Category 21 Version 0.23. A Deed of Agreement to support ADS-B data sharing was signed on 20 September 2010. Full operation was achieved on 1 February 2011, with ADS-B data from adjacent FIRs on screen in both Brisbane and Makassar ATC centers.

Promotion of ADS-B Implementation by CANSO (WP/19)

3.4.79 The meeting was informed that CANSO has been promoting the implementation of ADS-B to enhance safety and efficiency in high traffic density airspace. CANSO and IATA support ICAO ADS-B activities and jointly promote the implementation of ADS-B in the Region starting with two trunk routes over the South China Sea i.e. L642 and M771. A cost benefit study conducted by CANSO in 2009 for the two routes showed significant savings and environmental benefits. Some other high traffic density routes over the South China Sea and the Bay of Bengal area that would benefit from ADS-B surveillance have been identified by CANSO. CANSO approached the Philippines and Brunei in 2010 to consider working together to enhance the benefits of ADS-B implementation. Subsequently CANSO conducted an ADS-B seminar in Manila for the Philippines in August 2010. The seminar discussed the Philippines' ADS-B master plan and the possibility of optimizing the ADS-B sites in the south. CANSO also conducted an ADS-B seminar in Yangon for Myanmar in February 2011. The seminar similarly discussed Myanmar's ADS-B master plan which was later presented to the ADS-B SITF/10 meeting in April 2011.

3.4.80 Need was identified for the States to work closely together to harmonise their ADS-B implementation plans to optimise overall benefits. States concerned were strongly urged to follow up on the proposed expansion of ADS-B coverage over the South China Sea and Bay of Bengal area.

Note of appreciation

3.4.81 The CNS/MET SG/15 meeting expressed appreciation and gratitude to the Civil Aviation Authority of Singapore for hosting the Tenth Meeting of ADS-B Study and Implementation Task Force (ADS-B SITF/10) and the Sixth Meeting of the SEA ADS-B Working Group in 2011 and for the excellent arrangements including all activities organized during the meeting.

Time and Venue of Next Meeting

3.4.82 The seventh meeting of SEA/BOB ADS-B Implementation Working Group is scheduled from 28 to 30 November 2011. The next ADS-B Study and Implementation Task Force meeting is scheduled for April or May 2012. The CNS/MET SG/15 meeting appreciated the kind offer made by India to host the seventh Working Group meeting in Chennai and the kind offer by the Republic of Korea to host the Eleventh ADS-B Study and Implementation Task Force meeting in Republic of Korea.

Review of Regional Surveillance Strategy

3.4.83 The meeting reviewed the regional Surveillance Strategy of Asia/Pacific Region which was updated by the ADS-B SITF/9, CNS/MET SG/14 and adopted by APANPIRG/21 in 2010 under Conclusion 21/41. The Strategy was considered appropriate and the CNS/MET SG/15 meeting did not identify the need to amend it.

Amendment to Regional Supplementary Procedure on ADS-B

3.4.84 Australia proposed to initiate amendment to Regional Supplementary Procedures (Doc7030) MID/ASIA to include requirement for aircraft operators to disable 1090 ES ADS-B transmissions that are misleading or are non compliant. The purpose of the proposal is to ensure that safety of air-air and air-ground operations is maintained. One state (Australia) promulgated regulations in 2007 that prohibits misleading and non compliant ADS-B transmissions. The regulation became effective in 2007 and applies to the whole Australian airspace at all flight levels. The proposed wording of the amendment is provided in **Appendix N** to this report.

3.4.85 The meeting generally supported the proposal and adopted following Conclusion:

Conclusion 22/36 – Amendment to Regional Supplementary Procedures on ADS-B

That, the Regional Supplementary Procedure Doc 7030 be amended in accordance with the established procedure to include regional requirements on ADS-B as provided in the **Appendix N** to the Report on Agenda item 3.4 .

Surveillance and Broadcast Services (SBS) Programme in USA

3.4.86 USA informed the CNS/MET SG/15 meeting about the status of Surveillance and Broadcast Services (SBS) implementation programme for both the air traffic control (ATC) separation service (also known as 'ADS-B critical services') and the up-linking of Traffic Information Services - Broadcast (TIS-B) and Flight Information Services – Broadcast (FIS-B) to the equipped aircraft. It was informed that approximately 300 ground stations had been installed across the National Airspace System (NAS) as on date and a total of 321 ground stations were scheduled to be installed later this year. The ground station deployment will be completed across the NAS, approximately everywhere there is a radar coverage by 2013. In response to a query as to what standards will be used for the critical service before ADS-B mandate in 2020, it was informed that a fusion of radar and ADS-B surveillance would be used for separation service.

Indian ADS-B Implementation Plan

3.4.87 In line with APANPIRG Conclusion, India plans to implement ADS-B at 14 locations i.e, Jaipur, Lucknow, Calicut, Agartala, Trivandrum, Ahmadabad, Guwahati, Port Blair, Nagpur, Mangalore, Coimbatore ,Cochin, Varanasi and Amritsar for supplementing the MSSR coverage initially in the low density traffic areas. In these locations, ATS automation systems under implementation will have the capability to process input from ADS-B sensors. At 10 out of the above mentioned 14 Airports, ADS-B will be employed for the provision of ATC in Terminal Areas (where procedural ATC is in vogue presently). Implementation of ADS-B is also planned at Port Blair, to cater for increasing enroute surveillance. Implementing ADS-B at Port Blair will enable provision of efficient air traffic services on routes L759, P628, N877, P761 and L510 and aid the controllers in better conflict detection and separation over crossing points. The existing separation of 15 minutes over crossing points can be reduced to ATS surveillance separation minima allowing aircraft on crossing tracks to maintain optimum levels. India has successfully integrated all Radars in Chennai FIR thus enabling seamless upper airspace with lower limit as FL 260. India has planned to issue ADS-B mandate for the entire Indian airspace and is planning to operationalise ADS-B stations by Dec 2013 as per ICAO Asia/Pacific regional plan. India is also willing to actively support and participate in the "South-East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group" as adopted by APANPIRG/22. The meeting noted with appreciation India's ADS-B implementation initiatives and India's willingness to share the data with its neighboring States. Aircraft operators were urged to equip their aircraft suitably in a time-bound manner to facilitate implementation of ADS-B in APAC Region.

Regional Preparations for ITU WRC-2012

3.4.88 Continuation of existing aeronautical services and development of new aeronautical applications are dependent on the availability of adequate frequency spectrum. Process of international competition between expanding aeronautical and non-aeronautical radio services takes place in ITU World Radiocommunication Conference (WRC) held approximately every four years. Next WRC is scheduled to be held from 23 January to 17 February 2012.

Updated ICAO position on WRC-2012

3.4.89 ICAO position on WRC-2012 (then 2011) Agenda Items of critical interest to civil aviation was circulated through State Letter dated 30 June 2009. Through a number of APANPIRG Conclusions, ICAO Assembly Resolutions and DGCA Recommendations, States have been urged to project and support this position both in their national and regional positions. Updated ICAO Position on WRC-12 Agenda Items of critical interest to Civil Aviation was approved by ICAO Council in its third meeting of its 193rd Session on 15 June 2011 and was circulated through ICAO State Letter SL 2011/59 dated 22 July 2011. Main points addressed by the update to ICAO Position are listed in **Appendix O**. The States, through the State Letter mentioned were urged to use this updated position to ensure its support in their national/regional position.

Protection of AMS(R)S Bands

3.4.90 Japan presented a paper on the issues related to the protection of AMS(R)S Bands in general and the related Agenda Item (Agenda Item 1.7) of ITU WRC-2012 in particular. Significance of the services provided in this band and the importance of long-term and stable access to this band, was described and emphasized taking into account the future air traffic demand in the region. States were encouraged to well coordinate with their national Telecommunication Regulatory Authorities to protect aeronautical spectrum in their national/regional positions. A power point presentation on this Agenda Item was included in the paper for supporting the States in projecting and protecting ICAO Position on Agenda Item 1.7. Some States extended full support to ICAO Position on this Agenda Item and it was reminded that this Item is related to the provisions of very safety critical services - the ADS and CPDLC and hence any allocation in the relevant band needs to be very transparent and protection to the safety services for civil aviation needs to be ensured. States were urged to take a very firm stand on the issue of transparency and protection of civil aviation services.

Preferred CPM Methods

3.4.91 Describing the organization of the ITU-R conference preparatory work for WRC-2012, Secretariat informed the CNS/MET SG/15 about the role of Conference Preparatory Meeting for WRC-2012 (CPM-12) report in WRC-12 deliberations. Role of 'Methods' described in the CPM Report for individual Agenda Items was explained and it was informed that Aeronautical Communication Panel (ACP) Working Group F had reviewed CPM Report and had developed a Matrix showing which Methods in the report were in line with ICAO Position and which were not. Matrix mentioned is placed in **Appendix P**. The CNS/MET SG/15 meeting was urged to note ICAO preferred Methods in the CPM Report for each Agenda Item and support them in their national/regional position. Focal Contact Points identified by the States have already been urged to support Methods recommended in the Matrix.

Third and Fourth Meeting of APT Conference Preparatory Group

3.4.92 CNS/MET SG/15 meeting noted the outcome of Third and Fourth Asia-Pacific Telecommunity (APT) Conference Preparatory Group (APG/3 and APG/4) meetings held from 8 to 12 March in Bangkok and from 13 to 18 December, 2010 in Hong Kong respectively. The CNS/MET SG/15 meeting expressed concern over very low level of participation from State civil aviation organizations in both these meeting. It was informed that ICAO participated in both these meetings and presented Information Papers projecting and defending ICAO position on Agenda Items of critical interest to civil aviation. It was expressed that the tentative position adopted by APG was more or less in line with ICAO position. The Fifth and also the last meeting of APG for WRC-2012 is scheduled from 29 August to 3 September, 2011 in Busan, Republic of Korea. It was informed that the regional common position carries a lot more weight than individual national positions and hence the meeting was urged to make sure that the State civil aviation organizations are adequately represented in APG/5 meeting to make sure that ICAO position is effectively presented and included in the regional common position.

3.4.93 Meeting was informed that the participation by State Civil Aviation Organizations in the Fifth meeting of APT Conference Preparatory Group (APG/5) held in Busan, Republic of Korea was much better than in the earlier meetings. 22 participants from 11 States (out of 25 States that participated in the meeting) were from the State Civil Aviation Organizations. This large presence made it possible for the ICAO team to access the national Telecommunication Regulators more effectively and discuss with them issues of importance for Civil Aviation.

3.4.94 Some States appreciated the updated marked up copy (with the updates marked in different color) of ICAO Position on WRC-12 Agenda Items of critical interest to civil aviation circulated to the nominated Contact Focal Points and found it useful while dealing with the national Telecommunication Regulatory Authorities. Based on the discussions above, following integrated Conclusion was adopted by the meeting.

Conclusion 22/37 – ICAO Position on WRC-12 Agenda Items of Critical Interest to Civil Aviation

That, States be urged to:

a) coordinate with their national Telecommunication Regulatory Authorities to ensure support for updated ICAO Position on WRC-12 Agenda Items of critical interest to civil aviation circulated through ICAO State Letter SL 2011/59 dated 22 July 2011 in the development of their national/regional position;

b) actively and cooperatively participate in WRC-12 and preparatory meetings and encourage coordination between the focal contact points nominated by Administrations; and

c) support ICAO position provided in the Table at **Appendix P** to the Report on Agenda item 3.4 on the preferred Methods in CPM-12 Report on WRC-12 Agenda Items.

3.4.95 Secretariat made a presentation (WP/33) about the complexities created because of increasing number of spectrum users and the requirement of using sound Spectrum Management techniques to ensure provision of safe air traffic operating environment. The meeting was informed about the regulatory arrangements for the allocation of radio spectrum for aviation and non-aviation users. The meeting noted that aviation uses approx 14% of the total radio spectrum for safety of life services. It was also noted that ICAO does not generally recommend allocations in aeronautical

bands to non-aeronautical applications on safety ground. The presentation discussed issues related to unintentional and intentional interference on aeronautical spectrum and the States were urged to use regulatory measures to monitor and report such instances. Contents of the Radio Frequency Handbook (Doc 9718) were introduced and the States were urged to use guidance provided in the document for developing their spectrum management policies. Taking into account the information presented, the meeting adopted following Conclusion:

Conclusion 22/38 – Frequency Spectrum Management

That,

1) States be urged to actively coordinate with their national Telecommunication Regulatory Authority to consider:

   a) avoiding sharing of aeronautical frequency bands for safety service with non-aeronautical applications and requesting for deletion of their country footnote or have their country name deleted from footnotes under WRC – 12 Agenda Item 1.1 in support of ICAO Position for this Agenda Item;

   b) developing technical and regulatory arrangements to ensure operating environment without harmful interference.

2) States also be urged to develop their spectrum management policy based on the guidance provided in *'Handbook on Radio Frequency Spectrum Requirements for Civil Aviation'* (Doc 9718).

Development of Part II of ICAO Frequency Spectrum Handbook

3.4.96 The CNS/MET SG/15 meeting was informed that at the Twenty Fourth meeting of Aeronautical Communication Panel (ACP) Working Group F (ACP WG-F/24) held in Paris in April 2011, proposed Part II of the Frequency Spectrum Handbook (Doc 9718) was reviewed. Structure of the proposed Part II was described.

3.4.97 The member States of CNS/MET SG were urged to review and provide comments to the ICAO Regional Office on the Part II of the Handbook (Doc 9718) on frequency assignment planning which is provided in **Appendix Q** to this report. It was also agreed to reflect this into the list of subject/tasks of the Sub-group.

Regional Implementation of World Area Forecast System (WAFS)

Implementation issues associated with cessation of ISCS-G2

3.4.98 The meeting, recalling the cessation of International Satellite Communication Service – Generation 2 (ISCS-G2) on 1 July 2012, reviewed the implementation of the WAFS Internet File Service (WIFS) in the Asia/Pacific Region. It was noted that States, only under the ISCS-G2 footprint had to transition to WIFS by March 2012. States under both SADIS and ISCS-G2 footprints that choose to access WIFS as a primary or backup service were also required to transition to WIFS preferably by March 2012.

3.4.99 It was noted that States were invited to provide updates to the table that indicated the number of ISCS and WIFS accounts as well as point of contacts that included one main point of contact (POC) for each State to serve as a single approving officer with associated contact information for respective organization/State. Brunei and Vanuatu had not yet registered for WIFS accounts (http://aviationweather.gov/wifs/) and were thus encouraged to do so as soon as possible. It was also noted that some States have registered, but remained as inactive users (e.g. Nauru, Samoa and the Solomon Islands) and continued efforts by those States to transition to WIFS were considered essential.

3.4.100 The meeting further noted that WIFS users were required to have their WIFS software updated and use one common Uniform Resource Locator (URL) as opposed to the current site-specific URL. This URL is specified in version 4.1 of the WIFS Users Guide (www.aviationweather.gov/wifs/data) under Section 5 – Data Retrieval Process. The WIFS Provider State had also encouraged users to access WIFS Advisory page for any interim updates to the WIFS Users Guide as it would be the first location indicating changes to WIFS. Furthermore, the WIFS service provider would generate a WIFS Admin message (NOXX10KKCI) containing the same information as that on the WIFS Advisory page. In view of the above the meeting adopted following Conclusion.

Conclusion 22/39 – Accessibility to WIFS and currency of WIFS User Guide and Administrative Messages

That,

a) States be advised to monitor administrative messages on WIFS and to periodically access the WIFS Advisories page for any interim updates to the WIFS Users Guide for changes in the operations of WIFS; and

b) States be urged to use the single common URL (www.aviationweather.gov/wifs/data), and transit to the common URL as soon as possible, as required.

Progress of trial gridded forecasts and related implementation issues

3.4.101 Gridded forecasts of cumulonimbus (CB), icing and turbulence in GRIB2 data format are currently provided for trial use only, thus labeled as ‘trial forecasts’. The meeting noted a conclusion of the WAFSOPSG/6 Meeting that the label ‘trial forecasts’ was expected to be removed in Amendment 76 to Annex 3 in anticipation of the expected successful harmonization of the WAFS gridded data sets from the two WAFCs, the expected positive results of the forthcoming verification of the forecasts at WAFSOPSG/7, as well as the provision of updated guidance material on the new gridded data (WAFSOPSG/6 C6/18 refers).

3.4.102 It was also noted that even though different numerical weather prediction models were being used, the harmonization processes would result in identical products for the user (some results of harmonization expected by the end of 2011). At this time, verification for turbulence products was being conducted by WAFC London while verification of the icing product was being performed by WAFC Washington.

3.4.103 Additional information with regard to verification of WAFS gridded forecasts of icing using aircraft observations was provided by Hong Kong China. Further harmonization and verification based on aircraft observations was expected in light of the fact that special aircraft observations of moderate icing became available at the WAFCs since Amendment 75 of Annex 3. The use of observations would also assist in producing guidance material on the use of these products. The meeting supported the harmonization and verification of WAFS gridded forecasts of CB, icing and turbulence (WAFSOPSG/6 Conclusion 6/15 refers), guidance on the interpretation of these forecasts (WAFSOPSG/6 Conclusion 6/12refers) and subsequent training requirements (WAFSOPSG/6 Conclusion 6/13 refers) before their operational use.

Other WAFS (ISCS & SADIS) implementation issues

3.4.104 The meeting noted developments associated with the WAFS since the CNS/MET SG/14 Meeting held from 19-22 July 2010 in Jakarta, Indonesia.

3.4.105 It was noted that clarification on the access policy in obtaining WAFS forecasts and products via Internet (SADIS FTP/ Secure SADIS FTP and WIFS) was being developed in coordination with the WAFSOPSG, SADISOPSG and SCRAG.

3.4.106 The meeting recognized the need to conduct a regional survey on the download speed of the Secure SADIS FTP, noting that the speed was found to be significantly lower than that of WIFS during the test and that more users were expected to transition from SADIS FTP to Secure SADIS FTP after cessation of the SADIS FTP service in November 2012. It was therefore agreed that in order to assist in determining the users' needs for presentation at the SADISOPSG/17 Meeting, a survey on bandwidth required for Secure SADIS FTP would be conducted and a paper through coincidental membership would be developed by the WAFS/I TF. In view of the above, the meeting adopted following Conclusion.

Conclusion 22/40 – Secure SADIS FTP download speed

That,

a) the WAFS/I TF survey Asia/Pacific States to determine if an upgrade to Secure SADIS FTP download speed is considered beneficial; and

b) SADISOPSG Member State, on behalf of WAFS/1 TF, submit a paper on the regional survey results to the SADISOPSG/17 meeting.

3.4.107 With reference to reception of SIGMET via WAFS, Hong Kong China had monitored the reception of SIGMET during the SIGMET Advisory trial in Asia and noted a significant difference in reception between AFTN and SADIS to SADIS FTP and WIFS (in the order of 10-20% lower for Internet based reception) on 28 June 2011. As WIFS was currently operational and satellite retrieval was expected to be terminated 1 July 2012, the meeting noted that this discrepancy should be investigated and resolved as soon as possible. To facilitate resolving the discrepancies observed and utilize existing mechanisms of SIGMET monitoring and/or tests (e.g. biannual EUR SIGMET monitoring by the EUR Data Management Group, annual APAC SIGMET tests), the meeting adopted the following Conclusion.

Conclusion 22/41 – Improvement of WAFS SIGMET availability

That, the SADIS and ISCS States be invited to participate in regional SIGMET monitoring exercises and/or regional SIGMET tests in the Asia/Pacific Region in an effort to improve the availability of SIGMET.

3.4.108 It was noted that with regard to the problem associated with the presentation of information on radioactive clouds in SIGWX charts, future improvements would be expected after the IAVWOPSG/6 meeting in September 2011.

3.4.109 With reference to the reception of GRIB2 Products from SADIS FTP and WIFS, it was observed by Hong Kong, China that not all of the bulletins in each set of GRIB2 Product were received via WIFS, whereas all bulletins were received via SADIS FTP during the monitoring period of 17-26 June 2011. The United States provided an update during the meeting confirming that the problem identified has since been corrected by making software changes and conducting subsequent tests. Hong Kong, China also confirmed that the problem has been corrected. In view of this, the meeting did not considered the need to take action on the Draft Conclusion 15/27 formulated by the CNS/MET SG/15 as the problem identified had already been resolved.

3.4.110 It was recognized that in order to overcome some problems identified in the forecasts on SIGWX charts, WAFCs should be notified of discrepancies to assist in ongoing improvements to the service. A case study on SIGWX in Northern portion of Bay of Bengal was conducted by Hong Kong, China. Discrepancy between forecasts in SIGWX and the actual weather reported by pilots were noted. It was agreed that the WAFSOPSG should be invited to request WAFCs to provide SIGWX verification results to ensure accuracy of SIGWX charts. It was also noted that SIGWX charts were designed for flight planning and that in-flight tactical decision making should be derived from SIGMET as SIGWX charts created 17 hours in advance of validity time. IATA noted that SIGWX charts were provided for pre-flight planning, but were also used in the cockpit due to the user friendly graphic summary of significant weather. In view of the foregoing, the meeting adopted following Conclusion.

Conclusion 22/42 – Improvement of WAFC SIGWX charts

That, the WAFSOPSG be invited to request the WAFC Provider States to provide SIGWX chart verification results, if any, to illustrate the degree of accuracy of their SIGWX charts.

3.4.111 The meeting noted a survey on the implementation status of WAFS in the Asia/Pacific Region and WAFS training needs for Asia/Pacific States. The survey sent to 29 contracting States and Territories in the APAC Region in February 2011 included the following subjects: reception of WAFS products, transition of GRIB1 to GRIB2 WAFS data, utilization of trial gridded forecast of icing, turbulence and CB as well as training needs. Of particular note, the most needed topic for training was decoding of WAFS data followed by interpretation of WAFS products. Also of note was that only 3 out of 12 respondents had evaluated the trial gridded forecasts of icing, turbulence and CB. Lastly, two-thirds of the respondents expressed difficulty in migrating from GRIB1 to GRIB2 data, which was reiterated by Viet Nam. The meeting agreed that the results of this survey indicate the need for clarification on issues such as transition from GRIB1 to GRIB2 and the APANPIRG WAFS Service Reference Document would assist in this effort. The meeting clarified that GRIB2 was an improved code form (higher temporal and spatial resolution) that should be used for improved flight briefings and that SIGWX would be supplied for an indefinite period, until such time display graphics are determined by the user. The CNS/MET SG/15 meeting in its Decision 15/29 decided to amend the WAFS Implementation Plan and Procedures and composition and the work programme.

Regional Implementation of International Airways Volcano Watch (IAVW)

Regional contingency plans (WP/40 and IP/13)

3.4.112 The meeting noted that the Meteorological Advisories and Warnings Implementation Task Force (METWARN/I TF) was established to develop a framework of regional contingency plan for weather phenomenon that includes volcanic ash, tropical cyclone, radioactive cloud and Tsunami. In light of the fact that the International Volcanic Ash Task Force (IVATF) ATM/AIS/SAR Sub Group had not yet produced a regional template on contingency for volcanic ash at the time of the METWARN/I TF/1 Meeting (March 2011), the METWARN/I TF/1 Meeting agreed that development of a framework of contingency would be the first step in developing contingency plans. As a result, a draft framework for contingency plans that included volcanic ash, tropical cyclone, Tsunami and radioactive cloud was developed and coordinated with the ATM/AIS/SAR/SG/22. The CNS/MET SG/15 meeting determined that this framework would include Japan in future developments, consider collaboration with other regions, address the need to provide aircraft reports from flight operations to the VAACs, and consider text based products.

3.4.113 METWARN/I TF had noted that EUR/NAT regional contingency plan might not be a suitable to the APAC region. APAC Volcanic Ash Advisory Centres (VAACs) had determined that there was too much uncertainty and error in the volcanic ash concentration product and only 2 of the 9 VAACs worldwide provided volcanic ash concentration maps.

3.4.114 The meeting noted with appreciation the sub regional initiative taken by Indonesia, Malaysia, Philippines, Singapore, Thailand and IATA in organizing Special Coordination Meeting (SCM) in Singapore from 31 January to 1 February 2011. The second teleconference, including a table top exercise was held on 26 August 2011 with the participation of Indonesia, Malaysia, the Philippines, Singapore and Thailand supported by IATA. The intent of the SCM was to support and supplement ICAO APAC Regional Office on ATM initiatives in a smaller scale to reap benefits through a simplified coordination processes among a few States with a view to develop an interim arrangement in the absence of harmonized contingency plan to minimize flight disruption in the event of volcanic eruption**.** It was recognized that this initiative could be adopted as a model for other sub-regions to implement initiatives in line with the regional targets, with the aim to harmonize procedures among all the sub-regions. It was also noted that a Regional ATM Contingency Plan Task Force (RACP/TF) will develop regional ATM contingencies plan that would include volcanic ash. It was further noted that to ensure coordination, a link to Regional ATM Contingency Plan Task Force (RACP/TF) with the METWARN/I TF had also been included in CNS/MET Tasks List.

3.4.115 IATA reiterated its position on operating in or near volcanic ash should be left to the airlines noting that through safety risk assessment and standard operating procedures as approved by the respective regulator has proven successful over the years in that no fatalities were associated with the volcanic ash hazard. To conduct the proper safety risk assessment, it was noted that accurate and timely information related to volcanic ash was necessary.

3.4.116 The specific points presented by IATA at IVATF/2 meeting with regard to volcanic ash were also noted. The meeting considered that the information could be used at future meetings dealing with volcanic ash for consideration.

Distribution of radioactive cloud information

3.4.117 It was noted that notification of radioactive material is sent by the International Atomic Energy Agency (IAEA) in Vienna, Austria to 1) VAAC London to notify ACCs and 2) to WMO Regional Specialized Meteorological Centres (RSMC) for further distribution to MWOs (through national meteorological centres).

VAAC London – notification of radioactive release to ACCs

3.4.118 Regional developments associated with the International Airways Volcano Watch (IAVW), in particular, issues related to radioactive cloud was discussed at the CNS/MET SG/15. One issue for review by the group was to validate the 8-character AFTN addresses for Area Control Centres (ACCs) in the Asia/Pacific Region that is used by RSMC collocated with VAAC London in notifying ACCs of a radioactive material release (Amendment 75 to Annex 3). It was noted that 95% of the addresses have been obtained and included in a global database for the dissemination of radioactive cloud information to ACCs by VAAC London. Sri Lanka had provided at the Sub Group meeting the AFTN address of the Colombo ACC, VCCCZRZX, to be used for dissemination of radioactive cloud information. In addition, Japan was in the process of providing their ACC AFTN addresses.

3.4.119 The meeting noted collaborative decision making (CDM) approach in Australia in response to volcanic ash transported from southern Chile that impacted the Melbourne FIR beginning 9 June 2011. The National Operations Centre Meteorological Unit (NOC-MET) coordinated discussions involving VAAC Darwin, Qantas and Virgin Australia meteorological units as well as Airservices Australia and the airlines. Coordination amongst VAACs Darwin, Toulouse and Wellington was performed and agreed that each VAAC would issue volcanic ash advisories for their respective areas of responsibility (in accordance to IAVW, noting the responsibility of VAAC Darwin and Wellington was expected to be aligned to the Australian FIRs at the IAVWOPSG/6 Meeting in September 2011 to mitigate confusion).VAAC Darwin considered airlines' desire to provide volcanic ash concentration charts as well as longer duration forecasts at greater frequency, however, outcomes of the IVATF/2 Meeting showed VAAC Darwin is unable to produce volcanic ash concentration charts given the current level of accuracy of volcanic ash forecasts and further work was expected at the global level in coordination with the VAACs to meet the users' needs.

3.4.120 It was noted that Qantas commissioned Environment Research Agency, Adelaide to take measurements of the event for future analysis of volcanic ash concentrations which could be used in the future for more real-time verification for use by operators and VAACs. Training of pilots on recognizing volcanic ash would be conducted by Air New Zealand. It was recognized that continued pilot training was considered essential in the overall reduction of risk.

Regional Implementation of International Tropical Cyclone Watch (ITCW)

3.4.121 It was noted that in the past tropical cyclone advisories had been issued in text format. With the amendment 75 to Annex 3 graphical advisories on tropical cyclone from Tropical Cyclone Advisory Centres (TCACs) were introduced effective 18 November 2010. The TCAC Darwin was in the process of implementing graphical advisories on tropical cyclone for the next cyclone season. TCAC Darwin was also coordinating with TCAC Nadi on meeting this provision and would offer the software package to provide the graphics. Furthermore, TCAC Tokyo has implemented this provision and was available at the published URL. It was noted that 5 out of 7 TCACs had implemented graphical advisories on tropical cyclones. Coordination is continuing with the remaining TCACs to meet the requirements.

3.4.122 The meeting noted the latest developments of a pilot project of the World Meteorological Organization (WMO) on Aviation-weather Disaster Risk Reduction (ADRR), under the lead of Hong Kong China, for aviation users in the Asia and South-West Pacific Regions as well as the Bay of Bengal and the Arabian Sea. To assist in disaster risk reduction, forecasts of tropical cyclones for 24-48 hours were provided at the ADRR website (http://adrr.caem.wmo.int). The website also provides products taking into consideration the wider terminal area associated with the Meteorological Service in the Terminal Area (MSTA) initiative.

Review of METWARN/I TF/1 Meeting

3.4.123 The First Meeting of the Meteorological Advisories and Warnings Task Force (METWARN/I TF/1) was held in Bangkok, Thailand from 23-24 March 2011. The METWARN/I TF/1 report covered the topics that include SIGMET tests and SIGMET advisory trial, difficulties in formulating SIGMET on radioactive cloud, lack of clarity in utilizing Tsunami warnings for aviation purposes, issues related with volcanic ash advisories such as confusion associated with the use of color code for eruption and the development of regional contingency plans. The full report may be accessed at the following website:
http://www.bangkok.icao.int/Meetings/2011/metwarni_tf1/Index.html.

3.4.124 One of the main tasks of METWARN/1 TF included the development of regional contingency plans that includes volcanic ash, tropical cyclone, radioactive cloud, and Tsunami. TheTask Force attributes can be found at the following link:
http://www.icao.or.th/edocs/apanpirg/apanpirg_sg/met/MET_WARNITF.pdf.

3.4.125 The METWARN/I TF/1 Meeting proposed its TORs to include Singapore as a member and adjust the development of contingency plans to consider outcomes from global ICAO groups and WMO. The CNS/MET SG/15 Meeting decided in its Decision 15/30 to adopt changes to the TOR and the Work Programme as proposed.

3.4.126 CDM has proven to be a valuable method of determining ATM measures necessary for events (e.g. volcanic ash, tropical cyclone, disasters such as earthquake and Tsunami) that impact international flight. IATA agreed to the sharing of information by VAACs as this would help reduce the differences between VAACs noting some have less capability than others. In addition, IATA supported the concept of choice by the operator and the policy of not prohibiting airspace.

Implementation of SIGMET and warnings

Review SIGMET tests

3.4.127 The result of the SIGMET tests conducted in November 2010 was noted. The equatorial region was highlighted since the Honiara, Nauru and Port Moresby FIRs were large and situated in a zone plagued with CB and possible volcanic ash. States were informed of the errors identified in the SIGMET tests and encouraged to continue participation.

3.4.128 It is noted that other OPMET such as METAR, SPECI and TAF, are prepared in WMO code forms, which reduces the risk of errors in format. It was recognized that a similar arrangement for the presentation of SIGMET information could also reduce the risk of errors in the format of SIGMETs noting it is difficult to trace accepted formats such as ending the SIGMET with the equal sign and that many States still lack Quality Management. IATA expressed that the current deficiencies in SIGMET were unacceptable. In view of the foregoing, the meeting adopted following Conclusion.

Conclusion 22/43 – SIGMET code

That, ICAO invite WMO to consider the feasibility of developing a code form for SIGMET information.

SIGMET and warnings implementation issues

3.4.129 It was noted that the 9.0 earthquake in Japan on March 11, 2011 that resulted in a Tsunami of approximately 10 metres and accidental release of radioactivity at the Fukushima Dai-ichi nuclear power plant. Japan had provided the information to the CNS/MET SG/15 Meeting that the Tsunami impacted the Sendai Airport and stranded 1400 staff and passengers for two days. Due the

urgency of Tsunami information at the aerodromes in Japan due to fault lines very nearby, Tsunami warnings were issued by the Japan Meteorological Agency (JMA) within3 minutes after the earthquake occurred. This information was provided to ATS providers and/or airport authorities of Japan directly, without repackaging as aerodrome warnings on Tsunami. Japan has strongly encouraged States in the Asia/Pacific Region to identify aerodromes in the possible path of a Tsunami and provide timely information on Tsunami to those associated with those aerodromes.

3.4.130 Japan recommended that products from the RSMCs be further verified and harmonized amongst RSMCs and guidance on the use of these products be provided. It was noted that IAVWOPSG/6 will be addressing these issues in September 2011 and a joint paper would be submitted by Canada and the U.S. that should assist in providing guidance.

3.4.131 The meeting also noted initiative taken by the METWARN/I TF/1 Meeting to conduct a survey to determine the current capabilities of States in providing aerodrome warnings on Tsunami to identify training and guidance needs and to assist in the development of frameworks for regional contingency plans.

3.4.132 It was noted that various Tsunami messages were described and dissemination of the messages via Global Telecommunications System (GTS) utilizing WMO headers. Dissemination of these warnings should be by AFTN for international aviation purposes noting other methods such as the Internet should only be used for backup purposes as this is time critical information.

Review METWSG SIGMET advisory

3.4.133 It was noted that the CNS/MET SG/15 Meeting was informed of the developments with regard to the feasibility study on the regional issuance of SIGMET advisories for thunderstorms, severe turbulence, severe icing and severe mountain wave for selected regional centres.

3.4.134 With reference to the Asia/Pacific Region, China was in the process of hosting the SIGMET advisory trial for 9 States (Bangladesh, Cambodia, DPR Korea, Lao PDR, Mongolia, Myanmar, Nepal, Thailand and Viet Nam). In preparation for this trial, China organized and conducted (April 2011) a Regional Seminar on Asian Aeronautical Meteorology Services where eleven delegates from participating States mentioned attended as well as participants from China.

3.4.135 SIGMET advisories were being issued by China for thunderstorms, severe turbulence, severe icing and severe mountain wave that occurred or expected to occur above FL100 every 4 hours with a period of validity no greater than 6 hours. Additional advisories on the non-designated times were expected when conditions warranted a SIGMET advisory.

3.4.136 Statistics on the issuance of SIGMET during the advisory trial was expected to be compiled by the ad-hoc group in January 2012. Displaying Volcanic Ash Graphics (VAG) on the global SIGMET monitoring website was also considered as a future enhancement.

Update on Regional SIGMET Guide

3.4.137 Recent small volcanic eruptions in the South Pacific resulted in the ash plumes dissipating within a few hours following the eruptions. SIGMETs issued for these events included information on the observed ash. However, because the ash was expected to dissipate by the end of the SIGMET validity period, it was not possible to include information on the forecast position of the ash at the end of the SIGMET validity period, i.e, in the forecast section of the SIGMET. The SIGMET template included in Annex 3 does not provide any guidance on how such a situation should be reported in a SIGMET. Similarly, there is no guidance or any SIGMET example for this particular situation in the Asia Pacific SIGMET Guide. In view of the foregoing, the meeting adopted following Conclusion.

Conclusion 22/44 – SIGMET template and example for no VA expected

That,

a) ICAO consider modifying the SIGMET template in Annex 3 to include an example to report a situation when no ash is expected in the forecast section of a SIGMET; and

b) the Asia/Pacific SIGMET Guide be amended accordingly with an example of a SIGMET satisfying the condition in a).

Review outcomes of Wind Shear Systems Acquisition Workshop

3.4.138 The meeting noted that the ICAO Asia/Pacific Wind Shear Systems Acquisition Workshop was held in Bangkok, Thailand from 1-3 December 2010 as part of an ICAO Special Implementation Project (SIP). The objective of the workshop was to provide States information on different types of wind shear systems in order to assist States in the acquisition of wind shear systems that would satisfy Annex 3, Chapter 7 and Appendix 6. The executive summary of the workshop included information on wind shear SARPs, Aircraft and pilot responses to wind shear, wind shear detection systems abilities and resulting matrix, steps in selection process and ICAO service to assist in the acquisition process. The full report may be accessed at http://www.bangkok.icao.int/meetings/2010/icao_wssa/Index.html.

Issues associated with SIGMET for radioactive clouds (including guidance for MWOs, and the inclusion of radioactive cloud symbol in SIGWX charts)

3.4.139 In light of the recent accidental release of radioactive material associated with the Fukushima nuclear power plant, issues related to the issuance of SIGMET and NOTAM on radioactive material such as SIGMET compliance with ICAO Annex 3 is necessary for ingest systems used for flight briefings. Classification of airspace used in NOTAMs was also discussed and compliance to definitions provided in Annex 15 supported by CNS/MET SG. The AFTN address for ACCs used in the notification of the release of radioactive material was also supported.

3.4.140 Since SIGMET on radioactive cloud is in the current provisions, it was decided by the CNS/MET SG/15 in its Decision15/33 to task the METWARN/1 TF to develop guidance material in consultation with the IAVWOPSG and WMO for the issuance of RDOACT CLD SIGMET.

Implementation of the issuance of observation, TAF and OPMET exchanges

Review of OPMET/M TF/9 Meeting

3.4.141 The executive summary of the OPMET/M TF/9 Meeting includes topics of discussion such as OPMET availability and regularity, 30-hour TAF implementation. Other issues, such as successful backup test by RODB Bangkok for RODB Singapore, implementation of WIFS and XML, and reexamination of RODB structure with consideration of XML implementation were also covered. The full report may be accessed at the following website: http://www.bangkok.icao.int/Meetings/2011/opmet_tf9/Index.html.

3.4.142 The OPMET/M TF/9 Meeting proposed to add China, Hong Kong – China, Indonesia and New Zealand as members of the OPMET/M TF. It was noted that the CNS/MET SG/15 Meeting decided in its Decision15/34 to revise the TOR and the work programme of the OPMET/M TF.

Implementation of Amendment 74 and 75

3.4.143 It was noted that the format of TAF and the cessation of dissemination of 9- and 12-hour TAF, the Region were near full implementation with the exception of Mongolia. It was further noted that implementation of 30-hour TAF in accordance to FASID Table MET 1A is continuing to increase, but at a slower pace.

Other OPMET implementation issues

3.4.144 It was noted that OPMET monitoring results provided by IATA for the period 12 June 2011 to 07 July 2011. In particular, timeliness, availability and regularity of Asia/Pacific OPMET data as received at SADIS and ISCS was noted. The RODBs and Provider States were encouraged to coordinate to ensure that OPMET data was received in time by both SADIS and ISCS.

3.4.145 With reference to TAF, IATA identified that some transmission times associated with TAF exceeded 30 minutes, which was unacceptable (noting TAF should be created and disseminated and received in approximately 25 minutes). It was noted that transmission times appeared larger for SADIS than for ISCS, however, again this contradicted the study conducted by RODBs Singapore and Tokyo. Some TAF were only on one system (SADIS or ISCS) and once again, RODBs and Provider States were invited to focus on these aerodromes for providing TAF on both SADIS and ISCS. It was therefore agreed to request States to implement the standardized procedures for the issuance of OPMET data as specified in paragraph 7.5.1 of the ROBEX Handbook. In view of the above, the meeting adopted following Conclusion.

Conclusion 22/45 – Improvement of timeliness, regularity and availability of OPMET data on the SADIS and ISCS broadcast

That ICAO be invited to,

a) request States to implement the standardized procedures for the issuance of OPMET data as specified in - the ROBEX Handbook; and

b) inform States of the details provided in the IATA monitoring for the Asia/Pacific Region.

Update on ROBEX Handbook and ICD

3.4.146 The meeting noted that two amendments to the ROBEX Handbook were issued since the CNS/MET SG/14 Meeting in July 2010. The August 2010 amendment to the ROBEX Handbook contained changes associated with Amendment 75 to Annex 3 that became applicable 18 November 2010. Specifically, Section 9 of the ROBEX Handbook indicated that collectives of AIREPS by voice communication at MWOs were no longer necessary and Table D was no longer referenced. Explanations on the dissemination of the various air report types were also provided in this amendment. The ROBEX Handbook can be accessed at the following website: http://www.bangkok.icao.int/edocs/robex2004_e12.pdf.

3.4.147 The meeting noted updates to the Asia/Pacific OPMET data banks interface control document (ICD) to reflect the current RODB operations of non scheduled exchange of OPMET data in the Region. Specifically, RODBs Bangkok, Singapore and Tokyo updated their respective appendices A, D and E to the ICD for the June 2011 amendment. The Asia/Pacific ICD is posted on the APAC website:
http://www.bangkok.icao.int/edocs/OPMET_DataBanksICD2004.pdf.

Review of regional procedures contained in the ANP/FASID (MET Part)

3.4.148 The meeting noted the importance of maintaining the Regional Air Navigation Plan and associated FASID Tables MET referenced whose purposes include: (1) regional planning by operators, (2) measurement of implementation which allows for proper focus in implementation strategies by many entities (Operations, States and ICAO); and (3) input to cost-recovery of MET Services provided for international aviation (as referenced in the *Manual on Air Navigation Services Economics*, Doc 9161, 4th edition, 2007). Therefore, an annual review of the latest Basic ANP and FASID Tables MET was strongly encouraged.

3.4.149 The meeting recalled that amendment proposals in the previous year aligned the Basic ANP and FASID to Amendment 75 to Annex 3, and in particular that routine voice reporting of weather by pilots was no longer required. States inputs such as 30-hour TAF implementation were included.

Regional MET support to ATM

Review of MET/ATM Seminar 2011 & MET/ATM TF/2 Meeting

3.4.150 The meeting noted the outcomes of the ICAO/WMO Asia/Pacific MET/ATM Seminar held in Fukuoka, Japan from 24-26 January 2011. The objective of the seminar was to exchange information on MET developments for ATM Following the Seminar, the MET/ATM TF/2 Meeting was held in Fukuoka, Japan from 27-28 January 2011. The full report to each event can be found at the following websites: (Seminar) http://www.bangkok.icao.int/meetings/2011/METATM_Seminar/METATM_Seminar-rpt.pdf and (TF/2) at http://www.bangkok.icao.int/meetings/2011/METATM_TF2/METATM_TF2rpt.pdf.

3.4.151 Collaborative Decision Making (CDM) was deemed important to the MET/ATM TF/2 Meeting such that the TORs of the MET/ATM TF/2 were proposed to include the monitoring of CDM in other regions for future applications in the APAC Region. Additional membership of Singapore and the Russian Federation was also agreed. In view of the foregoing the CNS/MET SG/15 Meeting revised the TOR of the MET/ATM TF.

3.4.152 It was noted that the information provided at the MET/ATM TF/2 Meeting has been forwarded to the AMOFSG ad-hoc group for consideration in developing MET in support of global ATM and Performance Based Navigation (PBN). Coordination between the WMO expert team of MSTA, ICAO AMOFSG ad-hoc group and Air Traffic Management Requirements and Performance Panel (ATMRPP) on MET support for ATM resulted in a reiteration that the MSTA initiatives continue development from the perspective of PBN.

3.4.153 It was noted that MSTA was to provide MET services for ATM use for the terminal area and beyond. IATA reiterated that the MSTA initiative was several years away from implementation and designed for high density terminal airspace that would provide impact products at a time and location within the range of MSTA and that operators would assess the risk of utilizing certain airspace that would likely assist in ATM measures (if many flights cancelled in advance of a high risk forecast, less ATM measures would be needed).

Exchange of information on MET support for operations at aerodromes, terminal areas and en-route

3.4.154 It was noted that CNS/MET SG/15 Meeting was provided with a description of the Typhoon Wind Distribution Map provided by Japan since 23 June 2011 to meet the needs of stakeholders in that wind gust forecast information is updated more frequently (every 3 hours versus 6 hours by the tropical cyclone advisory centre) and represents the possible wind speed an aircraft may encounter. These surface winds were provided for 12 and 24 hours and derived from numerical weather models.

Review of ATFM 2010 Survey

3.4.155 The meeting noted that the Air Traffic Flow Management (ATFM) survey that includes a MET component was conducted in 2010 in accordance to APANPIRG/20 Conclusion 20/13. The updated survey results were provided by Malaysia and the United States and the overall survey results updated.

Other MET issues (QMS)

3.4.156 The meeting noted the initiative by Australia to enhance the verification of aviation forecasts. Specifically, the Australian Bureau of Meteorology, in consultation with industry, was developing a new aviation forecast verification scheme (AVS2) in order to improve forecast services. The AVS2 utilizes lightning strikes in the verification of thunderstorms and provides short and long term forecast verifications for different categories. This was expected to assist in determining forecasting shortfalls and focus training to meet formulated benchmarking strategies. The U.S. also offered assistance in automated forecast verification tools.

3.4.157 It was noted that States were invited to provide updates to the table that indicated the number of ISCS and WIFS accounts as well as point of contacts that included one main point of contact (POC) for each State to serve as a single approving officer with associated contact information for respective organization/State. Brunei and Vanuatu had not yet registered for WIFS accounts (http://aviationweather.gov/wifs/) and were thus encouraged to do so as soon as possible. It was also noted that some States have registered, but remained as inactive users (e.g. Nauru, Samoa and the Solomon Islands) and continued efforts by those States to transition to WIFS were considered essential.

Review of CNS/ATM Implementation and Planning Matrix

3.4.158 The CNS/MET SG/15 meeting reviewed the updated CNS/ATM Implementation and Planning matrix. CNS/ATM Implementation Matrix, developed in accordance with APANPIRG Conclusion 11/37 reflects the status of implementation of major CNS/ATM elements in the region and includes ATN, AIDC, CPDLC, GNSS, ADS-C and ADS-B. The meeting was informed that the Matrix was updated by the ADS-B SITF/10 meeting, the Sixth meeting of ATN Study and Implementation Task Force and CNS/MET SG/15. The updated Matrix is provided in **Appendix R** to this Report.

Review Performance-based communication and surveillance compliance requirements

3.4.159 New Zealand proposed development of a framework for performance-based communications and surveil**l**ance within the ICAO Asia/Pacific Region that will complement the existing performance-based navigation framework. The performance-based communications and surveillance framework will apply performance specifications to FANS1/A controller-pilot data link communications (CPDLC), automatic dependent surveillance contract (ADS-C), satellite communications (SATCOM) voice and HF for air traffic control.

3.4.160 It was noted that communication and surveillance performance requirements were, in fact, already in place for various separation standards in use in oceanic and remote continental airspace. These are identified, *inter alia*, in the Global Operational Datalink Document (GOLD). The CNS/MET SG/15 Meeting reviewed and endorsed the TOR for an ad hoc working group.

3.4.161 The meeting agreed to Chairman of CNS/MET's recommendation to defer adoption of the draft Decision 15/38 on the creation of an Ad Hoc Working Group to review regional performance-based communication and surveillance compliance requirements until the issue is more comprehensively defined and coordinated with the other Sub-groups.

SIP Workshop on Performance Framework for Air Navigation Systems

3.4.162 The APANPIRG/19 (C19/2) invited States to adopt a national performance framework based on ICAO guidance material and regional and global plans. To support this approach, a Special Implementation Workshop on the development of national performance framework for air navigation systems was hosted in Fiji in March-April 2011. It was reported that the participants gained an improved understanding of the ICAO performance framework and were able to consolidate this through practical exercises during the workshop.

Amendment to Part IV BANP

3.4.163 The CNS/MET SG/15 meeting was reminded that Part IV, Volume I of the regional Air Navigation Plan (BANP) contains basic planning principles, operational requirements and planning criteria related to communications, navigation and surveillance (CNS) systems. It was noted that Part IV of Volume I was last updated in 2006 and it had become necessary to update it again to incorporate subsequent developments that have taken place. In view of the foregoing, the meeting adopted following Conclusion.

Conclusion 22/46 - Amendment to Part IV of Asia/Pacific BANP

That, the amendment proposed to Part IV – CNS of the Asia/Pacific Region Air Navigation Plan (Doc 9673), Volume 1, Basic ANP provided in **Appendix S** to the Report on Agenda item 3.4 be adopted and incorporated in the Plan in accordance with the established procedure.

Fellowship training programme

3.4.164 The CNS/MET SG/15 meeting noted that Republic of Korea had signed an MOU with ICAO in August, 2009 to train 390 aviation professionals over three year period from 2010 to 2012. It was informed that Republic of Korea had trained 477 fellows from 95 countries since 2001. The CNS/MET SG/15 Meeting was also informed about the training infrastructure available in ROK and the updated programmes being undertaken. States were invited to take benefit of the fellowship programme.

Air Navigation Inspectors Course

3.4.165 Indonesia informed the CNS/MET SG/15 CNS/MET SG/15 meeting about the establishment of Air Navigation Inspectors course by ICAO to meet and satisfy findings through USOAP, particularly in respect of air navigation safety oversight. Indonesia's requirements for HR/air navigation inspectors were explained and expectation from ICAO to organize and conduct continuity air navigation courses was expressed. The CNS/MET SG/15 Meeting was also informed about the TRAINAIR and TRAINAIR Plus programmes of ICAO and availability of Standard Training Packages (STP) on various subjects. States were invited to access ICAO website for further information on the subject or write to ICAO APAC Office requesting for specific information.

Training for Air Traffic Safety Electronics Personnel (ATSEP)

3.4.166 International Federation of Air Traffic Safety Electronics Associations (IFATSEA) brought to the notice of ICAO the fact that the personnel involved in the technical operation and installation of CNS/ATM systems were trained and qualified under various standards in different States. It was appreciated that the Air Traffic Safety Electronics Personnel (ATSEP) responsible for the provision and maintenance of these systems should be trained to uniform requirements on a worldwide basis. To develop a guidance addressing the training needs of ATSEP, IFATSEA and ICAO worked together from 2000 to 2004 and produced a document, which was published as Part E-2, Training Manual (Doc 7192) for the Air Traffic Safety Electronics Personnel (ATSEP). Secretariat described in details the principle duties and responsibilities of the personnel who will be covered by this document. Licensing issue was discussed in the 36th ICAO Assembly in 2007 and the concept of "establishing licensing requirements for ATSEP" was endorsed in principle. Japan presented the licensing structure that has been adopted in JCAB. It was also expected that the regional effort for achieving uniformity and harmonized training system for ASTEP will build up the aviation safety in the region and eventually lead to the enhancement of aviation safety at a global scale. Appreciating the concept behind implementing uniform training standards for the ASTEP, the meeting supported the proposal and adopted following Conclusion.

Conclusion 22/47 – Training Manual (Doc 7192) Part E-2

That, States be urged to develop their training programme for the Air Traffic Safety Electronics Personnel (ATSEP) in line with the guidance provided in the Training Manual (Doc 7192) Part E-2.

Support for XML Based Applications

3.4.167 Status of extensible markup language (XML) development as it relates to ICAO and WMO requirements was provided to the CNS/MET SG/15 Meeting. The CNS/MET SG/15 Meeting noted that the Ninth Meeting of the Asia/Pacific OPMET Management Task Force (OPMET/M TF/9) held from 21 to 23 March 2011 and the Sixth Meeting of ICAO AIS-AIM Implementation Task Force (AAITF/6) held from 15 to 17 March 2011 also reviewed the requirements for exchange of XML based data. MET Authorities or meteorological service providers were urged to provide operational requirements so that capability of AFTN/AMHS to handle XML based data could be studied. Requirements of Regional Operational Data Bank (RODB) for disseminating OPMET data was also proposed to be taken into accoun**t**. States were requested to coordinate within their Administrations for collection of information necessary for the implementation of XML, such as file size, target timeline and interface needed etc. Understanding of the requirements would assist in planning implementation of XML based applications supported by AMHS. States capable to do so were encouraged to conduct trials for transmitting XML based application over AMHS. Based on discussions at ATNICG/6 and CNS/MET SG/15 meetings, the meeting adopted following Conclusion:

Conclusion 22/48 - Trials on XML based data over AMHS

That, States be urged to identify the characteristics such as file size, target timeline and interface needed for exchange of OPMET and Digital NOTAM using XML code and conduct trials to promote early provision of a communication medium for exchange of MET and AIM data in XML format over AMHS.

FATS Working Group

3.4.168 Update on Activities of the FAA-JCAB Future Air Transportation System Working Group (FATS WG) was presented jointly by USA and Japan to CNS/MET Sub Group. It was informed that US Federal Aviation Administration (FAA) and Civil Aviation Bureau of Japan (JCAB) signed an agreement in 2006 to implement the arrangement to harmonize future air transportation systems and concepts. This agreement established Future Air Transportation Systems Working Group (FATS WG). The WG coordinates harmonization of future systems development for the US Next Generation Air Transportation System (NextGen) and the Japanese Collaborative Actions for Renovation of Air Traffic Systems (CARATS) in areas which include:

- Concept development and validation
- Simulation and modeling
- Research and development
- Technology demonstration
- Systems architecture; and
- Strategic planning

Updates on NextGen

3.4.169 USA provided updates on the Next Generation Air Transportation System (NextGen) programme to the CNS/MET SG/15. Six NextGen Transformational Programmes are being developed, which will change the way air traffic is managed. These programmes are Automatic Dependent Surveillance – Broadcast (ADS-B), Collaborative Air Traffic Management Technology (CATM-T), Data Communication (DataComm), National Airspace System Voice Switch (NVS), NextGen Network Enabled Weather (NNEW) and System Wide Information Management (SWIM). USA is working with ICAO to identify CNS/ATM programmes and requirements that need to undergo due process of Standards, Recommended Practices and Procedure development and also to ensure that NextGen integrates harmoniously into the global air navigation system. The linkage between NextGen and ICAO proposed concept of block upgrades was also explained. NextGen planning documents and expectations for future equipage are available on FAA website www.faa.gov/nextgen .

Next Meeting

3.4.170 It was agreed that the Sixteenth Meeting of the CNS/MET Sub Group should be scheduled tentatively for 23-27 July 2012 at the ICAO Regional Office, Bangkok.

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Approved Terms of Reference (ToRs) in 2005

Title and Terms of Reference

Title: **Aeronautical Telecommunication Network Implementation Co-ordination Group (ATNICG)**

Terms of Reference (TORs)
Coordinate implementation of ATN in the Asia and Pacific Regions to satisfy performance requirements and address relevant implementation issues.

Composition

The Group will be composed of experts nominated by:
Australia, China, Hong Kong China, Fiji, India, Indonesia, Japan, New Zealand, Republic of Korea, Singapore, Thailand and United States.

Reporting

The Group will present its report to APANPIRG through the CNS/MET Sub-group.

THE REVISED TERMS OF REFERENCE RECOMMENDED BY THE MEETING

Title and Terms of Reference

Title: **Aeronautical Telecommunication Network Implementation Co-ordination Group (ATNICG)**

Terms of Reference (TORs)

Coordinate implementation of ATN and those services identified and assigned by APANPIRG and ICAO in the Asia and Pacific Regions to satisfy ATM operational requirements, achieve inter-operability and address regional implementation and operation related issues.

Composition

The Group will be composed of experts nominated by all ICAO member states in the Asia and Pacific Regions.

Reporting

The Group will present its report to APANPIRG through the CNS/MET Sub-group.

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No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
1	ATN Implementation Coordination	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Review of implementation problems and develop co-ordinated solutions (2) Coordinate/compile the regional implementation schedule (3) Monitor Implementation	Expedite implementation activities, ensure system compatibility through out the region	(1) Co-ordination Report (2) Waterfall schedule (3) Monitor AMHS Implementation Planner	(1)Ongoing/Semi-annually (2) Schedule 09/2009 (3) On going	Kapoor (India) Hong Kong	All members	(1)Updated the information in the ATN Router and AMHS planning tables and the implementation status (2) Completed, maintain the AMHS Implementation Planner.
2	ATN Operational Procedures	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Development of Interim Database for Directory Services	Make available real time and quality assurance addresses for ATN message delivery	(1) Interim Database	(1) (2007)	Robert Hallman (USA)	Thailand, Hong Kong China, Japan	Completed. The database was demonstrated. Aerothai will maintain the database on behalf of the regional ICAO Office. Aerothai will serve as POC for AMC coordination between Asia/Pac States and Eurocontrol. ATN Operational Procedures is completed and adopted.
				(2) Develop the operational database management procedures		(2) Operational Procedures	(2) (2007)			Completed.

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
3	ATN Certification & Validation Process	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Develop conformance procedures and checklist for AMHS and ATN routers	Expedite implementation activities, ensure global system compatibility	(1) Checklist	(1) (2007)	Sin Hie Sng (Singapore)	China, Hong Kong China, Indonesia,ROK,USA,	Completed
				(2) Develop validation process document		(2) Conformance Document	(2) 2007			Completed and forward to CNS/MET SG and APANPIRG/20 for review and adoption
						(3) Update to Conformance Document	(3) Ongoing until 2010			Completed
4	(1) ATN Documentation (2) Review all documents adopted by ATNICG and ATNTTF	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Study DIR objects/attributes proposed in ACP and follow development within other groups (2) Update document tree/establish tracking table for suspended dates (3) Standardized Report form and Guidance Material	Expedite implementation activities, ensure global system compatibility	(1) Directory Report (2) Tracking table/Updated documentation tree (3) AMC report (4)Report Form and Report Guidance	(1) Annually (3) Periodically (4) 2010	Chonlawit B. (Thailand)	USA	Update the database. AMC mandated by ICAO. Training completed. Directory Service will be implemented in coordination with ACP and phases will be developed
				(2) Development AIDC documentation (including ICD) and follow development within other groups		(2) AFTN AIDC/ATN Gateway Specification ATN AIDC ICD	(2) 2008 (ACP-dependent)	(Thailand)	Thailand	Task Closed in view of the removal of provision from Doc 9880

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
				(3) Update of AMHS ICD to comply with SARPs 3rd Edition		(1) Report differences between existing ICD and requirements for Edition 3 of Doc 9705 (3) Updated AMHS ICD	(1) Sept 2011(3) (2007)	US	Japan	Adhoc group formed to develop AMHS ICD to be presented to CNS/MEG SG/15.
				Managing PDR	Update ICAO Documents (9880/9896)	PDR filing and tracking	On-going	US	All the Member States	Additional Task proposed in ATNICG/5. PDR filing procedure already circulated.
5	ATN Performance	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Develop/establish/adapt/monitor/identify/analyse performance indicators	Assure QOS, service continuity, timely delivery of services	(1) AMHS performance report	(1) Annually until (2010)	Japan	Republic of Korea, India	Final Draft of the Document complete. Will be presented.
6	ATN Service Enhancements	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Review the impact of the implementation of Directory Services in the Region	Enhancing the service	(1) Report on directory	(1) Annually	Fiji	USA, Thailand, New Zealand, Japan, Australia	Complete. AMC has been adopted by ICAO. Aerothai has been designed as POC for Asia/Pac region.
				(2) Directory Service - Implementation Strategy	Enhancing the operation	Requirement Analysis Report & Implementation Strategy	(1) 2011 (2) 2012	Thailand		Closed in view of the implementation of AMC

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
				ATN/IPS Implementation Plan	Inter-regional and intra regional network compatibility	(1) ATN/IPS router ICD (2) IPS addressing plan (3) ATN/OSI - ATN/IPS Transition Plan (4) ATN/IPS routing policy (5) Update FASIS Tables to accommodate IPS (6) IDRP over IP subnet - ICD	(1) 2011 (2) 2011 (3) 2011 (4) 2012 (5) 2011 (6) 2011	USA	Australia, China, India, Fiji, HongKong, China, Japan, and USA	Proposed an additional task 1) ongoing 2) IPv4 addressing plan has been adopted
				Providing support for emerging requirements of OPMET, AIS/AIM, AIDC etc.	Enhancing the service	Task Report on XML based messages over AMHS platform	2011	USA	Hong Kong China,	Additional Task proposed in ATNICG/5
				(5) Study for transition of AFTN-based AIDC as an alternative to ATN based AIDC to ATN environment	Improving the service and lowering the operating cost	(5) Report on the impact of transition of AFTN-AIDC to ATN-AIDC AFTN AIDC/ATN Gateway Specification	(5) (2008)	Thailand	India, Indonesia, New Zealand, USA,	A Draft specification of AFTN AIDC/ATN Gateway was presented. Completed. Task closed in view of removal of provision from Doc 9880

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
		D. Efficiency	GPI-17, GPI-19, GPI-22	Analyze Common Address Prefix Proposal	Improving the service and routing efficiency	Report on common prefix based analysis conduced	End of 2008	Mark Brown (Japan)	Australia, Fiji, HongKong China, New Zealand and USA	Completed. Action Items developed at ATNICG/2 for follow-up at WG meetings.

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
7	Security	B. Security	GPI-17, GPI-19, GPI-22	(1) Develop ATN System Security policy	Safe and Secure Inter and Intra Regional Communication and service infrastructure	(1) Policy Document	(1) Annually until (2010)	Vidyut Patel (USA)	Australia, Hong Kong China	Adopted by APANPIRG/19
				(2) Develop ATN System Security Guidance		(2) Guidance Document	(2) (2011)			On-Going review and update
				(3) Develop ATN System Security Solution for Initial and Enhanced Services		(3) Security, Technical, Management and Operational Control	(3) (2008)			Completed
				(4) Co-ordinate and monitor ACP working group and other regions including Directory Service, PDRs		(4) Report	(4) Semi-Annually		Thailand	On-Going review and update
				(5) Develop IPS Security Policy and update the relevant guidance documents		Policy and updated guidance documents	2011			Proposed additional task to facilitate ATN/IPS
				(6) Develop ATN System Security Check List based on Security Control and Regional Incident Response Plan and Contingency Plan		(5) Check List, Regional Incident Response Plan and Contingency Plan	(5) (2009)			Forward to CNS.MET SG and APANPIRG for review and adoption

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
8	ATN Service Enhancements (supporting amended ICAO Flight Plan and ATS Message Formats)	D - Efficiency	GPI - 17, GPI - 19, GPI - 22	(1) Review the impact of the impleemntation of Amendment 1 to 15th Edition of Doc. 4444 effective 15 Nov. 2012 (PANS ATM Chapter 4 and Appendix 3 relating to the ICAO Flight Plan and associated ATS Message formats to the AFS	Enhancing the service	(1) Report on capability of existing and planned AFS systems to the revised ICAO Flight Plan and ATS Message Format	(1) Annually until 2011	USA	Fiji India Hong Kong New Zealand Singapore USA	Pending result from ICAO Flight Plan and ATS Message TF. Monitor the developments.
				(2) Indentify the new requirements for AMHS/AFTN to support new message format	Enhancing the operation	(2) Report on impact of New ATS message format in AMHS	(2) 2010	Thailand	Fiji India Hong Kong New Zealand Singapore USA	Completed
					Enhancing the operation	Develop Voice over IP point-to-point ICD	2012	USA, Japan, India		Task created in ATNICG/6

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/6 Update
				(3) Identify the link control procedure using the AMHS to support the revised ATS message format to the ATC automation system	**Enhancing the service**	**(3) Report whether special link control procedure is required**	**(3) 2010**	**Thailand**	**Fiji India Hong Kong New Zealand Singapore USA**	**Completed. No special link envisaged.**

The ATN PERFORMANCE OBJECTIVE

The APAC ATN ground-to-ground infrastructure will be fully operational 53 percent at 23 locations by December 2007.

(GPI-22) COMMUNICATION NETWORK INFRASTRUCTURE

Related ATM objectives: AMSS; HF data; VHF data; SSR Mode S; ATN

Scope: To evolve the aeronautical mobile and fixed communication infrastructure, supporting both voice and data communications, accommodating new functions as well as providing the adequate capacity and quality of service to support ATM requirements.

(GPI-19) METEOROLOGICAL SYSTEMS

Objective: To improve the availability of meteorological information in support of a seamless global ATM system.

(GPI-17) IMPLEMENTATION OF DATA LINK APPLICATIONS

Scope: Increase the use of data link applications

Related ATM objectives: Application of data link; Functional integration of ground systems; with airborne systems; ATS inter-facility data communication (AIDC)

IV-CNS 1B-1

TABLE CNS 1B

AERONAUTICAL TELECOMMUNICATION NETWORK (ATN) ROUTER PLAN

EXPLANATION OF THE TABLE

Column

1	Administration – the name of the Administration, State or Organization responsible for management of the router
2	Location of Router
3	Type of Router: BBIS - Backbone Boundary Intermediate System BIS - Boundary Intermediate System
4	Type of Interconnection: Inter – Regional -Connection provided with stations in other ICAO regions Intra – Regional - Connection provided between BBIS stations Sub – Regional - Connection provided between a BBIS station and a BIS station
5	Interconnection, Connected to router of: name of the location of the correspondent router
6	Link Speed – Speed requirements of the interconnecting link
7	Link Protocol – Protocol requirements for the interconnecting link
8	Target Date of Implementation – date of implementation of the router TBD- To be determined
9	Remarks

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
Afghanistan	Kabul	BIS	Sub-Regional	Pakistan	9600 bps	IPS	TBD	Intra-domain
		BIS	Inter-Regional	Iran	9600 bps	IPS	TBD	
American Samoa	Pago Pago			United States				Intra-domain
Australia	Brisbane	BBIS	Intra-regional	Fiji	64000 bps	CLNP/IP-SNDCF	2011	
		BIS	Sub-Regional	Indonesia	9600 bps	X.25	TBD	Not Implemented
		BBIS	Intra-Regional	Japan	64000 bps	TDB	2012	Not implemented
		BIS	Sub-Regional	New Zealand	TDB	TDB	TDB	Not implemented
		BBIS	Inter-Regional	South Africa	TDB	TDB	TBD	Not implemented
		BBIS	Intra-Regional	Singapore	64000 bps	CLNP/IP-SNDCF	2011	
		BBIS	Inter-Regional	United States	64000 bps	TDB	2012	
Bangladesh	Dhaka	BIS	Sub-Regional	India	9600 bps	X.25	2010-2011	(India)
		BIS	Sub-Regional	Thailand	9600 bps	X.25	2010-2011	(Thailand)
Bhutan	Paro	BIS	Sub-Regional	India	9600 bps	X.25	TBD	(India)
Brunei Darussalam	Brunei	BIS	Sub-Regional	Malaysia	64000 bps	X.25	2010	(Malaysia) circuit implemented
		BIS	Sub-Regional	Singapore	9600 bps	X.25	2010	(Singapore)
Cambodia	Phnom Penh	BIS	Sub-Regional	Thailand	9600 bps	X.25	2009-2010	(Thailand)
China	Beijing	BIS	Sub-Regional	DPR Korea	9600 bps	X.25	2010	ATN/AMHS Implemented
		BBIS	Intra-Regional	Hong Kong, China	64000 bps	X.25	2011	ATN/AMHS Implemented
		BBIS	Intra-Regional	India	64000 bps	X.25	2011	ATN/AMHS Implemented
		BBIS	Intra-Regional	Japan	64000 bps	X.25	TBD	ATN/AMHS Implemented

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
		BBIS	Inter-Regional	Kuwait	64000 bps	X.25	TBD	ATN/AMHS Implemented
		BIS	Sub-Regional	Macau, China	64000 bps	X.25	TBD	ATN/AMHS Implemented
		BIS	Sub-Regional	Mongolia	9600 bps	X.25	2010	ATN/AMHS Implemented
		BIS	Sub-Regional	Myanmar	9600 bps	X.25	2010	ATN/AMHS Implemented
		BIS	Sub-Regional	Nepal	9600 bps	X.25	2010	ATN/AMHS Implemented
		BIS	Sub-Regional	Pakistan	9600 bps	X.25	2010	ATN/AMHS Implemented
		BIS	Sub-Regional	Republic of Korea	64000 bps	X.25	2011	ATN/AMHS Implemented
		BBIS	Inter-Regional	Russian Federation	19200 bps	X.25	TBD	ATN/AMHS Implemented
		BBIS	Intra-Regional	Thailand	64000 bps	X.25	TBD	ATN/AMHS Implemented
		BIS	Sub-Regional	Vietnam			TBD	(Vietnam)
	Taibei	BIS	Sub-Regional	Hong Kong, China	9600 bps	X.25	2009	
		BIS	Sub-Regional	Japan	9600 bps	X.25	2009	
Hong Kong, China	Hong Kong	BBIS	Intra-Regional	China	64000 bps	X.25	2011	
		BIS	Sub-Regional	Macau, China	64000 bps	X.25	2009	Implemented
		BBIS	Intra-Regional	Japan	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Philippines	9600 bps	X.25	2011	
		BIS	Sub-Regional	Taibei	9600 bps	X.25	2012	
		BBIS	Intra-Regional	Thailand	64000 bps	X.25	Implemented	
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	TBD	

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
Macau, China	Macau	BIS	Sub-Regional	China	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Hong Kong, China	64000 bps	X.25	2009	Implemented
Cook Islands	Rarotonga			New Zealand		IPS	2012	Intra-domain
DPR Korea	Pyongyang	BIS	Sub-Regional	China	9600 bps	X.25	2010	(China)
Fiji	Nadi	BBIS	Intra-Regional	Australia	64000 bps	IPS	2010	Circuit implemented
				Kiribati		VPN	2011	Intra-domain
		BIS	Sub-Regional	New Caledonia		TBD	TBD	Intra-domain
				Tuvalu		VPN	2011	Intra-domain
		BBIS	Inter-Regional	United States	9600 bps	X.25	2010	Circuit implemented
				Wallis Islands		VPN	TBD	Intra-domain
French Polynesia	Papeete			New Zealand		IPS	TBD	Intra-domain
India	Mumbai	BIS	Sub-Regional	Bangladesh	9600 bps	X.25/IPS	TBD	
		BIS	Sub-Regional	Bhutan	9600 bps	X.25/IPS	TBD	
		BBIS	Intra-Regional	China	64000 bps	X.25	2011	Trial being conducted
		BIS	Inter-Regional	Kenya	19200 bps	X.25/IPS	TBD	
		BIS	Sub-Regional	Nepal	9600 bps	X.25/IPS	TBD	
		BIS	Inter-Regional	Oman	19200 bps	IPS	2011	Presently AFTN over TCP/IP on AMHS Gateway
		BIS	Sub-Regional	Pakistan	9600 bps	IPS	2011	Trial being conducted
		BBIS	Intra-Regional	Singapore	64000 bps	IPS	March 2011	Commissioned
		BIS	Sub-Regional	Sri Lanka	64000 bps	X.25/IPS	2012	

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
		BBIS	Intra-Regional	Thailand	64000 bps	IPS	TBD	Awaiting readiness from Thailand
Indonesia	Jakarta	BIS	Sub-Regional	Australia	9600 bps	X.25	2010	
		BIS	Sub-Regional	Singapore	19200 bps	IP	2012	
Japan	Tokyo	BBIS	Intra-Regional	Australia	64000 bps	X.25	TBD	
		BBIS	Intra-Regional	China	64000 bps	X.25	TBD	
		BBIS	Intra-Regional	Hong Kong, China	64000 bps	X.25	TBD	
		BBIS	Inter-Regional	Europe	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Republic of Korea	64000 bps	X.25	TBD	
		BBIS	Inter-Regional	Russian Federation	64000 bps	X.25	TBD	
		BBIS	Intra-Regional	Singapore	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Taibei	64000 bps	X.25	TBD	
		BBIS	Inter-Regional	United States	64000 bps	X.25	Implemented	
Kiribati	Tarawa	BIS	Sub-Regional	Fiji	9600 bps	VPN	2011	Intra-domain
Lao PDR	Vientiane	BIS	Sub-Regional	Thailand	9600 bps	X.25	2011	(Thailand)
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	TBD	(Vietnam)
Malaysia	Kuala Lumpur	BIS	Sub-Regional	Brunei	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Singapore	64000 bps	X.25	2007	Circuit Implemented
		BIS	Sub-Regional	Thailand	64000 bps	X.25	2012	
Maldives	Male’	BIS	Sub-regional	Sri Lanka	64000 bps	X.25/IPS	2012	

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
Micronesia Federated State of	Chuuk			United States				Intra-domain
	Kosrae			United States				Intra-domain
	Ponapei			United States				Intra-domain
	Yap			United States				Intra-domain
Mongolia	Ulaanbaatar	BIS	Sub-Regional	China	9600 bps	X.25	2010	(China)
Myanmar	Yangon	BIS	Sub-Regional	China	9600 bps	X.25	2010	(China)
		BIS	Sub-Regional	Thailand	9600 bps	X.25	2009-2010	(Thailand)
Nauru	Nauru			Australia				Intra-domain
Nepal	Kathmandu	BIS	Sub-Regional	China	9600bps	X.25	2010	(China)
		BIS	Sub-Regional	India	9600bps	X.25	TBD	(India)
New Caledonia	Noumea			Fiji			TBD	Intra-domain
New Zealand	Christchurch	BIS	Sub-Regional	Australia	9600 bps	IPS	2012	
				Cook Is				Intra-domain
				French Polynesia	9600 bps	X.25	TBD	Intra-domain
				Niue	9600 bps	IPS	2012	Intra-domain
				Samoa	9600 bps	IPS	2012	Intra-domain
				Tonga	9600 bps	IPS	2012	Intra-domain
		BIS	Inter-Regional	USA	9600 bps	IPS	2012	
Niue Islands	Niue			New Zealand	9600 bps	X.25		Intra-domain

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
Pakistan	Karachi	BIS	Sub-Regional	China	64000 bps		2011	Discussed in ATNICG-5 with China delegation. For ATN/AMHS coordination will be mad soon, for bilateral meeting/agreement.
		BIS	Sub-Regional	Afghanistan	64000 bps	IPS	TBD	AFTN line already working but intermittent. For ATN/AMHS coordination will be made after proper contact person at Kabul, Afghanistan.
		BIS	Sub-Regional	India	64000 bps	IPS	End 2010	Ping test completed Feb. 2010. Configuration at both end in progress.
		BIS	Inter-Regional	Oman	-	-	TBD	New line to be established with prior bilateral agreement/coordination.
		BIS	Inter-Regional	Iran	64000 bps	-	TBD	AFTN line already working for ATN/AMHS Coordination will be made, as soon as AMHS installed in Iran.

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
		BIS	Inter-Regional	Kuwait	64000 bps	-	TBD	AFTN line already working for ATN/AMHS Coordination will be made soon for bilateral meeting/agreement
Papua New Guinea	Port Moresby			Australia				Intra-domain
Philippines	Manila	BIS	Sub-Regional	Hong Kong, China	9600 bps	X.25	2009	Circuit Implemented
		BIS	Sub-Regional	Singapore	32000 bps	X.25	2009	Not yet implemented
Republic of Korea	Seoul	BIS	Sub-Regional	China	64000 bps	X.25	2011	ATN/AMHS Implemented
		BIS	Sub-Regional	Japan	64000 bps	X.25	2011	
Singapore	Singapore	BBIS	Intra-Regional	Australia	64000 bps	X.25/IPS	2009	
		BBIS	Inter-Regional	Bahrain	64000 bps	IPS	2012	
		BIS	Sub-Regional	Brunei	9600 bps	X.25	TBD	
		BBIS	Intra-Regional	India	64000 bps	X.25	2011	Implemented
		BIS	Sub-Regional	Indonesia	19200 bps	IPS	2012	Circuit Implemented
		BBIS	Intra-Regional	Japan	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Malaysia	64000 bps	X.25	2012	
		BIS	Sub-Regional	Philippines	32000 bps	X.25	2012	
		BIS	Sub-Regional	Sri Lanka	64000 bps	X.25/IPS	2013	
		BBIS	Intra-Regional	Thailand	64000 bps	X.25	2013	

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
		BBIS	Inter-Regional	United Kingdom	64000 bps	IPS	2012	
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	2013	
Solomon Islands	Honiara			Australia	VPN		2008	(Australia) Intra-Domain
Sri Lanka	Colombo	BIS	Sub-Regional	India	64000 bps	X.25/IPS	2012	
		BIS	Sub-Regional	Maldives	64000 bps	X.25/IPS	2012	
		BIS	Sub-Regional	Singapore	64000 bps	X.25/IPS	2013	
Thailand	Bangkok	BIS	Sub-Regional	Bangladesh	9600 bps	X.25	2009-2010	
		BIS	Sub-Regional	Cambodia	9600 bps	X.25	2009-2010	
		BBIS	Intra-Regional	China	64000 bps	X.25	2009	
		BBIS	Intra-Regional	Hong Kong, China	64000 bps	X.25	Implemented	
		BBIS	Intra-Regional	India	64000 bps	X.25	2009-2010	Circuit Implemented
		BBIS	Inter-Regional	Italy	64000 bps	X.25	TBD	Circuit Implemented
		BIS	Sub-Regional	Lao PDR	9600 bps	X.25	2009-2010	
		BIS	Sub-Regional	Malaysia	64000 bps	X.25	2009-2010	
		BIS	Sub-Regional	Myanmar	9600 bps	X.25	2009-2010	
		BBIS	Intra-Regional	Singapore	64000 bps	X.25	2009-2010	Circuit Implemented
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	2009-2010	
Timor Leste	Dili			Australia				Intra-domain
Tonga	Tongatapu			New Zealand	9600 bps	IPS	2012	Intra-domain
Tuvalu	Funafuti			Fiji			TBD	Intra-domain

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
United States	Atlanta	BBIS	Inter-Regional	Australia	64000 bps	IP	2012	
				American Samoa				Intra-domain
	Salt Lake City	BBIS	Inter-Regional	Fiji	9600 bps	X.25	2011	Circuit Implemented
	Salt Lake City	BBIS	Inter-Regional	Japan	64000 bps	X.25	2006	Circuit Implemented
				Marshall Islands				Intra-domain
				Micronesia, Federated State of				Intra-domain
	Salt Lake City	BIS	Inter-Regional	New Zealand	9600 bps	IP	2012	
				Palau				Intra-domain
Vanuatu	Port Vila			Australia	VPN		2012	Intra-domain (Australia)
Viet Nam	Ho Chi Minh/Hanoi	BIS	Sub-Regional	China			TBD	
		BIS	Sub-Regional	Hong Kong, China	9600bps	X.25	2010	
		BIS	Sub-Regional	Lao PDR	9600bps	X.25	2010	
		BIS	Sub-Regional	Singapore	9600bps	X.25	2010	
		BIS	Sub-Regional	Thailand	9600bps	X.25	2010	
Wallis Islands	Wallis			Fiji		X.25	TBD	Intra-domain

IV-CNS 1C-1

Table CNS 1C

AMHS ROUTING PLAN

EXPLANATION OF THE TABLE

Column

1	Administration – the name of the Administration, State or Organization responsible for management of the facility
2	Location of Facility
3	Facility Type: AMHS UA (Location of AMHS)
4	Target Date of Implementation – date of implementation of the ATSMHS TBD – To be determined
5	Remarks

Note: AMHS – ATS Message Handling System which may include Message Transfer Agents and AFTN/AMHS gateways services.

Administration	Location of Facility	Facility Type	Target Date of Implementation	Remarks
Afghanistan	Kabul	AMHS	TBD	
American Samoa	Pago Pago	UA (Salt Lake City)	2010	
Australia	Brisbane	AMHS	2006	Implemented
Bangladesh	Dhaka	AMHS	2011	
Bhutan	Paro	UA (Mumbai)	2010	
Brunei Darussalam	Brunei	AMHS	2012	
Cambodia	Phnom Penh	AMHS	2010	
China	Beijing	AMHS	2010	Implemented
	Taibei	AMHS	2010	
Hong Kong, China	Hong Kong	AMHS	2009	Implemented
Macau, China	Macau	AMHS	2009	Implemented
Cook Island	Rarotonga	UA (Christchurch)	2012	
DPR Korea	Pyongyang	AMHS	2010	
Fiji	Nadi	AMHS	2010	
French Polynesia	Papeete	AMHS	TBD	
India	Mumbai	AMHS	Mar. 2011	Implemented
Indonesia	Jakarta	AMHS	2012	
	Ujung Pandang	AMHS	2012	
Japan	Fukoka	AMHS	Implemented	
Kiribati	Tarawa	UA (Nadi)	2011	
Lao PDR	Vientiane	AMHS	2011	
Malaysia	Kuala Lumpur	AMHS	2012	
Maldives	Male	AMHS	2010	

Administration	Location of Facility	Facility Type	Target Date of Implementation	Remarks
Marshall Island	Majuro	UA (Salt Lake City)	2010	
Micronesia Federated State of	Chuuk	UA (Salt Lake City)	2006	UA Implemented
	Kosrai	UA (Salt Lake City)	2006	UA Implemented
	Ponapei	UA (Salt Lake City)	2006	UA Implemented
	Yap	UA (Salt Lake City)	2006	UA Implemented
Mongolia	Ulaanbaatar	AMHS	2010	
Myanmar	Yangon	AMHS	2010	
Nauru	Nauru	UA (Brisbane)	2010	
Nepal	Kathmandu	AMHS	2010	
New Caledonia	Noumea	AMHS	TBD	
New Zealand	Christchurch	AMHS	2012	
Niue Is	Niue	UA (Christchurch)	2010	
Pakistan	Karachi	AMHS	July 2009	Implemented. All Domestic Network working on AMHS through about 50 User Agents and all International AFTN Circuits are working through AFTN/AMSH Gateway.
Palau	Koror	UA (Salt Lake City)	2006	UA Implemented
Papua New Guinea	Port Moresby	UA (Brisbane)	2010	
Philippines	Manila	AMHS	2012	
Republic of Korea	Seoul	AMHS	2011	
Samoa	Faleolo	UA (Christchurch)	2012	
Singapore	Singapore	AMHS	2011	Implemented (India-Singapore 1st link)
Solomon Is	Honiara	UA (Brisbane)	2010	
Sri Lanka	Colombo	AMHS	2011	
Thailand	Bangkok	AMHS	2012	

Administration	Location of Facility	Facility Type	Target Date of Implementation	Remarks
Timor Leste	Dili	UA (Brisbane)	2010	
Tonga	Tongatapu	UA (Christchurch)	2012	
Tuvalu	Funafuti	UA (Nadi)	2011	
United States	Atlanta	AMHS	Implemented	
	Salt Lake City	AMHS	Implemented	
Vanuatu	Port Vila	UA (Brisbane)	2010	
Viet Nam	Ho Chi Minh	AMHS	2012	2010 for Test, 2012 for deployment
Wallis Is.	Wallis	AMHS	TBD	

4-1E-1

TABLE CNS 1E

**ATS INTER-FACILITY DATA COMMUNICATION (AIDC)
IMPLEMENTATION PLAN**

EXPLANATION OF THE TABLE

Column

1 State/Administration – the name of the State/Administration;

2 Location of AIDC end system – the location of the AIDC end system under the supervision of State/Administration identified in column 1;

3 AIDC Pair – the correspondent AIDC end system;

Location – location of the correspondent AIDC end system

State/Administration – the name of the State/Administration responsible for management of the correspondent AIDC end system

4 AIDC standard used – the AIDC standard adopted for the AIDC connection between the corresponding AIDC pair, AFTN, AFTN/AMHS or ATN;

5 Target Date of Implementation – date of implementation of the AIDC end system;

6 Remarks – any additional information describing the AIDC end system or the AIDC service between the corresponding AIDC pair.

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
AUSTRALIA	Brisbane ACC	Oakland ARTCC	USA	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
		Auckland ACC	New Zealand	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
		Melbourne	Australia	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
		Makassar ACC	Indonesia	AFTN	2010	ICD V.2.0
				AFTN/AMHS	TBD	
		Nadi ACC	Fiji	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
	Melbourne ACC	Brisbane ACC	Australia	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
		Jakarta ACC	Indonesia	AFTN	TBD	ICD V.2.0
				AFTN/AMHS	TBD	
		Mauritius ACC	Mauritius	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
BANGLADESH	Dhaka ACC	Kolkata ACC	India	AFTN/AMHS	TBD	
		Yangon ACC	Myanmar	AFTN/AMHS	2012	Subject to concurrence with Myanmar
BHUTAN						
BRUNEI DARUSSALAM						
CAMBODIA	Phnom Penh ACC	Bangkok ACC	Thailand	AFTN	2010	
CHINA	Beijing ACC	Incheon ACC	Republic of Korea	AFTN	TBD	
	Sanya ACC	Hong Kong ACC	Hong Kong, China	AFTN	Implemented	
		Ho Chi Minh ACC	Vietnam	AFTN	TBD	
	Guangzhou ACC	Hong Kong ACC	Hong Kong, China	AFTN	TBD	
	Taibei ACC	Hong Kong ACC	China	TBD	2012	
	Shanghai ACC	Fukuoka ATMC	Japan	TBD	TBD	

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
HONG KONG, CHINA	Hong Kong ACC	Guangzhou ACC	China	AFTN/AMHS	2013	
		Sanya ACC	China	AFTN	Implemented	
		Manila ACC	Philippines	AFTN/AMHS	2013	
		Taibei ACC	China	AFTN/AMHS	2013	
MACAO, CHINA						
COOK ISLANDS						
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA						
FIJI	Nadi ACC	Auckland ACC	New Zealand	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
		Brisbane ACC	Australia	AFTN	Implemented	ICD V. 1.0
				AFTN/AMHS	2010	
		Oakland ARTCC	USA	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
FRANCE						
French Polynesia	Papeete ACC	Auckland ACC	New Zealand	AFTN	Implemented	ICD V. 2.0
New Caledonia						
INDIA	Kolkata ACC	Dhaka ACC	Bangladesh	AFTN	TBD	Subject to co-ordinate between Administrations
	Mumbai ACC	Karachi ACC	Pakistan	AFTN	Trial Operations	
INDONESIA	Jakarta ACC	Melbourne	Australia	AFTN/AMHS	TBD	
	Makassar ACC	Brisbane ACC	Australia	AFTN	2010	ICD V.1.0
				AFTN/AMHS	TBD	

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
JAPAN	Fukuoka ATMC	Anchorage ACC	USA	AFTN	Implemented	ICD V.2.0
		Incheon ACC	Republic of Korea	AFTN	Implemented	ICD V.1.0
		Oakland ARTCC	USA	AFTN	Implemented	ICD V.2.0
		Taibei ACC	Taibei, China	AFTN	2012	ICD V.3.0
KIRIBATI						
LAO PEOPLE'S DEMOCRATIC	Vientiane ACC	Bangkok ACC	Thailand	AFTN	2010	TBD
MALAYSIA	Kuala Lumpur ACC	Bangkok ACC	Thailand	AFTN	2012	TBD
		Singapore	Singapore	AFTN	2012	
		Kota Kinabalu	Manila	AFTN	2012	
		Kota Kinabalu	Ujung Padang	AFTN	2012	
MALDIVES	Male ACC	Colombo ACC	Sri Lanka	AFTN	2013	
MARSHALL ISLANDS						
MICRONESIA (FEDERATED STATE OF)						
MONGOLIA						
MYANMAR	Yangon ACC	Bangkok ACC	Thailand	AFTN	2010	ICD V.1.0
		Dhaka ACC	Bangladesh	AFTN	2011	
NEPAL	Kathmandu ACC	Kolkata ACC	India	AFTN	2010	
				AFTN/AMHS		
		Banaras ACC	India	AFTN	2010	
				AFTN/AMHS		
		Lhasa ACC	China	AFTN	2010	
				AFTN/AMHS		

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
NAURU	Brisbane ACC	Oakland ARTCC	USA	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	TBD	
		Nadi ACC	Fiji	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
NEW ZEALAND	Auckland ACC	Brisbane ACC	Australia	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
		Nadi ACC	Fiji	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
		Oakland ARTCC	USA	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	2010	
		Papeete ACC	French Polynesia	AFTN	Implemented	ICD V.2.0
PAKISTAN	Karachi	Mumbai ACC	India	AFTN	Trials Operation	Tentatively 2011 depending on bilateral agreement and syste-to-system matching.
				AFTN/AMHS		
		Muscat ACC	Oman	AFTN	TBD	
				AFTN/AMHS		
		Tehran ACC	Iran	AFTN	TBD	
				AFTN/AMHS		
		Delhi ACC	India	AFTN	TBD	
				AFTN/AMHS		
		Ahmadabad ACC	India	AFTN	TBD	
				AFTN/AMHS		
		Kabul ACC	Afghanistan	AFTN	TBD	
				AFTN/AMHS		
	Lahore	Delhi ACC	India	AFTN	TBD	
		Urumqui	China	AFTN/AMHS		
		Tajakistan	Tajakistan	AFTN	TBD	
		Kabul ACC	Afghanistan	AFTN/AMHS		

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
	Karachi	Lahore	Pakistan between Domestic ACCs. Karachi and Lahore	AFTN	end 2010	
PALAU						
PAPUA NEW GUINEA						
PHILIPPINES	Manila ACC	Hong Kong ACC	Hong Kong, China	AMHS	2013	
		Singapore ACC	Singapore	AMHS	2013	
		Taibei	Taibei, China	AMHS	2013	
		Makassar ACC	Indonesia	AMHS	2013	
		Ho Chi Minh ACC	Viet Nam	AMHS	2013	
		Oakland ARTCC	USA	AMHS	2013	

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
REPUBLIC OF KOREA	Incheon ACC	Fukoka ATMC	Japan	AFTN	Implemented	ICD V.1.0
		Beijing	China	AFTN	TBD	
SAMOA						
SINGAPORE	Singapore ACC	Ho Chi Minh ACC	Vietnam	AFTN/AMHS	2012	ICD V.1.0 Subject to concurrence from Ho Chi Minh
				ATN	TBD	
		Manila ACC	Philippines	AFTN/AMHS	2012	ICD V.3.0
				ATN	TBD	
		Jakarta ACC	Indonesia	AFTN/AMHS	2012	Subject to concurrence from States
				ATN	TBD	
		Kuala Lumpur ACC	Malaysia	AFTN/AMHS	2012	
				ATN	TBD	
		Kota Kinabalu ACC	Malaysia	AFTN/AMHS	2012	
				ATN	TBD	
SOLOM ISLANDS						
SRI LANKA	Colombo ACC	Male ACC	Maldives	AFTN	2013	AFTN/AMHS gateway to be used initially
TIMOR LASTE						
THAILAND	Bangkok ACC	Hochiminh ACC	Viet Nam	AFTN	TBD	
		Kuala Lumpur ACC	Malaysia	AFTN	TBD	
		Phnom Penh ACC	Cambodia	AFTN	TBD	
		Vientiane ACC	Lao PDR	AFTN	TBD	
		Yangon ACC	Myanmar	AFTN	TBD	

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA AND PACIFIC OFFICE

ASIA/PAC Technical Specification of the Air Traffic Services Message Handling System (AMHS)

ABSTRACT

This document is the ASIA/PAC Specification for the ATS Message Handling System (AMHS). The objective is to define precise means of compliance to the essential AMHS requirements to ensure interoperability of AMHS systems in the Asia/Pacific Region. Implementations that comply with the mandatory provisions of this specification will be compliant to the essential requirements for AMHS endorsed by APANPIRG.

EXECUTIVE SUMMARY

This document is the ASIA/PAC Specification for the Air Traffic Services Message Handling System (AMHS). It has been developed by the ATNICG Working Group under APANPIRG. The objective is to define precise means of compliance to the essential AMHS requirements to ensure interoperability of AMHS systems in the Asia/Pacific Region. Implementations that comply with the mandatory provisions of this specification will be compliant to the essential requirements for AMHS endorsed by APANPIRG. This ASIA/PAC Specification refines and augments the detailed technical specifications for AMHS in ICAO Annex 10 and associated ICAO technical manuals. This ASIA/PAC Specification is based on the EUROCONTROL Specification for the Air Traffic Services Message Handling System (AMHS). The goal is to enable support of specific profiles of Basic and Extended service of the ATS Message Handling Service (ATSMHS), as defined by ICAO. The Extended service includes:

a) support for binary information transfer,

b) use of standard message heading extensions to convey Air Traffic Services (ATS) header information,

c) migration to the use of an on-line X.400 based directory at a future date if required.

Note. – ASIA/PAC will use an off-line directory (AMC).

d) migration to the use of digitally signed secure messages at a future date if required.

An initial transition step supporting migration from the AFTN to the Basic ATSMHS level of service is anticipated.

The anticipated next step is to add support for binary information transfer and use of heading extensions.

Longer term, ASIA/PAC may migrate to use of Directory and support for Security.

The specific timing for this migration strategy will be developed in coordination with APANPIRG as part of the overall ATN Implementation strategy.

The provisions of this ASIA/PAC Specification are applicable to air navigation service providers (ANSPs) in the Asia/Pacific Region. Specifically, the provisions apply to the parts of an ANSP’s organization responsible for providing, directly or by outsourcing, data messaging services to end users both within and between States.

Compliance with this ASIA/PAC Specification is achieved once implementations comply with all requirements of the normative Annexes.

1. INTRODUCTION

1.1 Document Structure

1.1.1 This ASIA/PAC Specification is organized as a number of Chapters and Annexes. The chapters in the main body of the document provide contextual guidance and explanatory material and point to the annexes which contain the normative requirements. The main body is structured as follows:

- The present Chapter includes introductory material describing the purpose and scope of the ASIA/PAC Specification, its structure, and a description of the document conventions, abbreviations, definitions and the interoperability target.

- Chapter 2 describes the basic level of interoperability for the Air Traffic Services Message Handling Service (ATSMHS) in the Asia/Pacific Region.

- Chapter 3 contains explanatory material concerning the Extended ATSMHS functionality.

- Chapter 4 describes additional requirements relating to implementation options, testing and validation.

- Chapter 5 describes some of the transition and coexistence issues.

- Chapter 6 contains a list of documents which are referenced from the main body and annexes by means of reference numbers contained in square brackets.

1.1.2 Detailed interoperability and compliance requirements are specified in Annexes, which form an integral part of this ASIA/PAC Specification:

• Annex A (normative) contains detailed requirements for the Air Traffic Services (ATS) Message Handling functionality at the level of the Basic ATSMHS. It identifies the systems that are deployed in order to provide those services, the system level requirements, and the external standards and documents applicable to each system.

• Annex B (normative) contains detailed requirements for the ATS Message Handling functionality at the Extended ATSMHS level of service, requiring support of Functional Groups (FG) for the Basic ATSMHS (Basic FG), use of file transfer body parts for binary data exchange (FTBP FG), use of interpersonal messaging heading extensions (IHE FG). Use of Directory (DIR FG) and support of AMHS Security (SEC FG) is foreseen in the future.

1.1.3 Under the X.400 standards compliance requirements are provided where possible in the form of protocol implementation conformance statement (PICS) tables giving a detailed statement of functional and protocol compliancy. These tables are generally contained in ICAO standards and the base standards and ISPs referenced from this ASIA/PAC Specification.

1.2 Purpose

1.2.1 This ASIA/PAC Specification on the Air Traffic Services Message Handling System (AMHS) is developed to ensure interoperability among AMHS implementing systems.

1.2.2 This ASIA/PAC Specification is organized as a number of chapters and normative annexes. Therefore compliance with this ASIA/PAC Specification is achieved once implementations comply with all requirements of the normative Annexes.

1.3 Background Context

1.3.1 The exchange of ATS messages, as part of the Aeronautical Fixed Service (AFS) defined in ICAO Annex 10 Volume II [3] is an essential function to the safety of air navigation and to the regular, efficient and economical operation of ATS provision.

1.3.2 The Aeronautical Fixed Telecommunications Network (AFTN) has provided an effective store-and-forward messaging service for the conveyance of text messages, using character-oriented procedures, for many years. However AFTN technology is now becoming obsolescent, and is not sufficiently flexible to support messaging functions found in modern messaging systems (such as transfer of binary information.)

1.3.3 It is intended that existing AFTN users and systems will transition to the architecture of the Aeronautical Telecommunication Network (ATN), and this is enabled in part by the ATSMHS application, which has been defined by ICAO to replace the AFTN telegraphic style of working with a modern store-and-forward Message Handling System based on international Standards.

1.3.4 Standards and Recommended Practices (SARPs) for the ATSMHS application are specified in ICAO Annex 10 to the Convention on International Civil Aviation. These SARPs refer to detailed specifications in the relevant technical Manual (ICAO Doc 9705, superseded by ICAO Doc 9880 Part IIB [5].

1.3.5 The technical provisions in ICAO Doc 9880 Part II [5] define two fundamental levels of service within the ATSMHS; the Basic ATSMHS and the Extended ATSMHS. Additionally, ICAO Doc 9880 (Part II, section 3.4) outlines various subsets of the Extended ATSMHS, to which conformance can be claimed.

1.3.6 The Basic ATSMHS performs an operational role similar to the AFTN with a few enhancements, while the Extended ATSMHS provides more advanced features. The Extended level of service includes the Basic level of service capability; in this way it is ensured that users with Extended Service capabilities can interoperate, at a basic level, with users having Basic Service capabilities and vice-versa.

1.3.7 The ATSMHS is provided by a set of ATN End Systems, which collectively comprise the ATS Message Handling System (AMHS), and which co-operate to provide users (human or automated) with a data communication service.

The AMHS network is composed of interconnected ATS Message Servers that perform message switching at the application layer (Layer 7 in the basic reference model for open systems interconnection (OSI)). Direct users connect to ATS Message Servers by means of ATS Message User Agents. An ATS Message User Agent supporting the Extended level of service will use the Basic level of service to allow communication with users who only support the Basic ATSMHS. To support the transition from AFTN,

AFTN/AMHS Gateways provide interfaces between the AMHS and the AFTN. The AMHS network makes use of an underlying network infrastructure that allows data interchange to be performed.

1.3.8 Implementation of the Extended ATSMHS implies the existence of various support functions, which are not necessarily exclusively dedicated to messaging. These include optional on-line Directory support and (if secure messaging is implemented) public key management functions.

1.4 Scope

1.4.1 The scope of this document covers the Basic and Extended levels of the ATSMHS. Specifically, support for functional groups Basic, FTBP, and IHE is specified. Functional groups DIR and SEC are outlined as an indication of future requirements.

1.4.2 This ASIA/PAC Specification is intended to provide the requirements for AMHS systems. As such, for each external standard, it identifies the baseline version of that standard and the changes to those standards that are required. Each identified change that is incorporated into this specification includes the original reference.

1.4.3 The specification applies to the following Asia/Pacific systems:

- Ground communication and display systems, including user interfaces and end systems concerned with message submission, transfer, delivery and (in the case of AFTN interworking) conversion;

- Ground data logging and recording systems, which, in general, will be an integral part of the communication subsystems.

1.4.4 Compliance with this ASIA/PAC Specification would be mandated in a call for tender for an AMHS End System. However, this ASIA/PAC Specification is not intended to be a complete system specification sufficient for procurement purposes.

1.4.5 Topics addressed by this ASIA/PAC Specification include:

- The interoperability aspects between implementations of the Basic ATSMHS, with its functional components, and implementations conforming to the provisions of this ASIA/PAC Specification;

- The interoperability aspects of AFTN/AMHS gateways within the transition phase from AFTN to AMHS;

1.5 Conventions

1.5.1 Only the minimum subset of requirements necessary for the correct and harmonized implementation of the ASIA/PAC Specification is specified. Mandatory items within the ASIA/PAC Specification are clearly separated from non-mandatory items.

1.5.2 Every requirement and recommendation in this specification is preceded by a structured identifier which can be used to reference uniquely the requirement / recommendation from associated documents and traceability tools. Such identifiers have the form:

AMHS-[Fn]-[Ann]

where:

[Fn]: is a sequence of characters to identify the operational procedure or category to which the requirement applies.

[Ann]: is the Annex identifier followed by a number, unique within a given [Fn].

1.5.3 Conventions for denoting requirements in the normative Annexes A and B are as follows:

• 'Shall' - indicates a statement of specification, the compliance with which is mandatory to achieve the implementation of the ASIA/PAC Specification. It indicates a requirement which must be satisfied by all systems claiming conformity to the specification. Such requirements are intended to be testable and their implementation auditable.

• 'Should' - indicates a recommendation or best practice, whose use is encouraged, but which may or may not be satisfied by all systems claiming conformity to the specification.

• 'May' – indicates an optional feature.

• 'Will' – is meant in its normal English usage to indicate a forward-looking statement or statement of intent.

1.6 Abbreviations and Definitions

1.6.1 Abbreviations

The following abbreviations are used throughout this Main Body and associated Annexes:

84IW	1984 Interworking (MHS functional group)
ACP	ICAO Aeronautical Communications Panel
ACSE	Association Control Service Element
ADEXP	ASIA/PAC Standard for ATS Data Exchange Presentation
AF-Address	AFTN-form address
AFS	Aeronautical Fixed Service
AFSG	Aeronautical Fixed Service Group (ICAO EUR Regional group)
AFTN	Aeronautical Fixed Telecommunication Network
AIRAC	Aeronautical Information Regulation And Control
AMC	ATS Messaging Management Centre
AMHS	ATS Message Handling System
AMHxx	Application profile for MHS standards
ANSP	Air Navigation Service Provider
API	Application Programming Interface
ASN.1	Abstract Syntax Notation One
ATM	Air Traffic Management

ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSMHS	ATS Message Handling Service
AU	Access Unit
BC	Business Class
CA	Certificate Authority
CAAS	Common AMHS Addressing Scheme
CFMU	Central Flow Management Unit
CIC	Content Integrity Check
CIDIN	Common ICAO Data Interchange Network
CLNP	Connectionless Network Protocol
CNS/ATM	Communications Navigation and Surveillance / Air Traffic Management
COM	Communication
COTS	Commercial-off-the-Shelf
CSV	Comma Separated Values
CV	Conversion
DAP	Directory Access Protocol
DAP/CSP	Directorate ATM Programmes / Communications Systems and Programmes
DIB	Directory Information Base
DIR	Directory
DISP	Directory Information Shadowing Protocol
DIT	Directory Information Tree
DL	Distribution List
DMD	Directory Management Domain
DMZ	De-militarized Zone
DN	Distinguished (Directory) Name
Doc	ICAO Document
DOP	Directory Operational Binding Protocol
DSA	Directory System Agent
DSP	Directory System Protocol
DUA	Directory User Agent
EANPG	ICAO European Air Navigation Planning Group
EATMN	European Air Traffic Management Network
EC	European Community
ED	EUROCAE Document
EIT	Encoded Information Type
ER	Exempted Recipients (MHS context)
ER	Essential Requirement (SES context)
ETSI	European Telecommunications Standards Institute
EU	European Union
EUR	ICAO European Region
EUROCAE	The European Organization for Civil Aviation Equipment
FG	Functional Group
FHA	Functional Hazard Assessment
FIPS	Federal Information Processing Standard
FTBP	File Transfer Body Part
HMI	Human-Machine Interface
IA5	International Alphabet Number 5
ICAO	International Civil Aviation Organisation
ICS	Implementation Conformance Statement

Id	Identifier
IEC	International Electro-technical Commission
IETF	Internet Engineering Task Force
IHE	IPM Heading Extension
IP	Internet Protocol
IPM	Interpersonal Message
IPN	Interpersonal Notification
IPS	Internet Protocol Suite
IPsec	Internet Protocol Security (RFC 4301)
IPv4	Internet Protocol version 4 (RFC 791)
IPv6	Internet Protocol version 6 (RFC 2460)
ISO	International Organization for Standardization
ISP	International Standardized Profile
ITU-T	International Telecommunication Union – Telecommunications Sector
LD	Latest Delivery
LDAP	Lightweight Directory Access Protocol
LDIF	LDAP Data Interchange Format (RFC 2849)
MD	Management Domain
MF-Address	MHS-form address
MHS	Message Handling System
MS	Message Store
MTA	Message Transfer Agent
MTCU	Message Transfer and Control Unit
MTS	Message Transfer Service
NAT	ICAO North Atlantic Region
NATO	North Atlantic Treaty Organisation
NB	Notified Body
NIST	USA National Institute of Standards and Technology
NOTAM	Notice to Airmen
NRN	Non-Receipt Notification
O/R	Originator / Recipient
OHI	Optional Heading Information
OID	Object Identifier
OSI	Open Systems Interconnection
OU1	Organizational Unit One (in AMHS address)
P1	MHS Protocol for message transfer
P2	MHS Protocol for interpersonal messaging
P3	MHS Protocol for message submission and retrieval between UA and MTA
P7	MHS Protocol for message indirect submission and retrieval from MS
PD	Physical Delivery
PDR	Proposed Defect Report (on ICAO Doc 9705)
PICS	Protocol Implementation Conformance Statement
PKI	Public Key Infrastructure
PRL	Profile Requirements List
QoS	Quality of Service
RCP	Required Communication Performance
RDN	Relative Distinguished Name
RED	Redirection
RFC	Request For Comments (IETF)
RN	Receipt Notification

RoC	Return Of Content
ROSE	Remote Operations Service Element
RTSE	Reliable Transfer Service Element
SARPs	ICAO Standards and Recommended Practices
SDG	Specification Drafting Group
SEC	Security
SNMP	Simple Network Management Protocol (RFC 1157)
SV	Sub-Volume of ICAO Doc 9705
TCP/IP	Transmission Control Protocol / Internet Protocol
TP0 ISO	Transport Protocol Class 0
TP4 ISO	Transport Protocol Class 4
UA	User Agent
WAN	Wide Area Network
X.400	ITU-T message handling recommendations
X.500	ITU-T Directory recommendations
X.509	ITU-T Recommendation defining public key certificate format
XF-Address	Translated-form address
XMIB	Cross-Domain Management Information Base

1.6.2 Definitions

This section defines the terms specific to this document, as well as some common terms which are included for ease of reference. Other definitions may be included by reference to other documents.

AMHS - The set of end systems providing the ATSMHS. In this document, “AMHS” refers only to that part of the global AMHS which is implemented unless otherwise stated, including the interfaces at boundaries with third countries. The AMHS comprises a set of ATN End Systems of type:

- ATS Message Server, which includes an MTA and optionally one or more MS(s);
- ATS Message User Agent which includes a UA;
- AFTN/AMHS Gateway which includes an MTA, and an AU.

AMHS Component - One of the functional objects identified in ICAO Doc 9880 Part II [5] which form part of an AMHS End System; i.e. an MTA, UA, MS, or AU.

AMHS End System - An ATN End System participating in the provision of the ATSMHS; an ATS Message Server, ATS Message User Agent or AFTN/AMHS Gateway.

ANSP (Air Navigation Service Provider) - A body that manages flight traffic on behalf of a company, region or country. It is a provider of air traffic control services.

ATN End System - A computer system that supports one of the ATN applications identified in ICAO Annex 10 Volume III Part I Chapter 3 [26] “Aeronautical Telecommunication Network”.

ATSMHS - The air traffic services message handling service (ATSMHS) application aims at providing generic messaging services over the Aeronautical Telecommunication Network (ATN). Two levels of service are defined within the ATSMHS:

- The Basic ATSMHS;

- The Extended ATSMHS.

1.7 Interoperability Target

1.7.1 In a generic specification such as this it is impossible to foresee all possible messaging configurations. The actual environment will have to be elaborated as part of the detailed specification for each individual implementation.

1.7.2 The functional environment specification includes:

• Required gateway functionality;

• Messaging systems that are to be interconnected;

• Available communications and network infrastructure.

1.7.3 A messaging system in terms of this ASIA/PAC Specification may be required to interwork with:

•ATS Message Servers within a State or in other States, implementing the ATSMHS over ATN/IPS transport services;

•ATS Message User Agents, for the local submission and delivery of messages by "direct" ATSMHS users;

• AFTN/AMHS Gateways, for the transition of AMHS messages into the AFTN, and vice-versa;

1.7.4 Possible interworking with other message handling systems is a local matter,outside the scope of this ASIA/PAC Specification.

1.7.5 To ensure seamless operation, there are interoperability requirements at a number of distinct levels:

• Geographical

The ATSMHS is applicable within and between countries. The ATS Message Server topology needs to be optimized for efficient routing in this context.

• Procedural

The ATSMHS must be used in a consistent way to ensure a seamless service. Procedures must be specified for day-to-day configuration and operation of the message handling service, as well as for orderly transition from legacy systems.

• Human-machine interface (HMI)

For direct AMHS users in the human user subgroup, the HMI must offer the required input capabilities and display the required information. However, human factors / ergonomics are out of scope of this ASIA/PAC Specification.

• Communication protocols

Ground end systems must interwork at the technical level. End systems must interwork with logically adjacent end systems (e.g. an ATS Message User Agent must interwork with an ATS Message Server for message submission and delivery) as well as with peer end systems (i.e. interworking between AMHS users, both direct and indirect). The end system includes:

-Application entities (e.g. MTA, MS, UA, DUA, DSA)
-Upper Layers (above transport layer)
-Lower Layers (transport layer and below)

1.7.6 Figure 1 illustrates the interoperability target for AMHS.

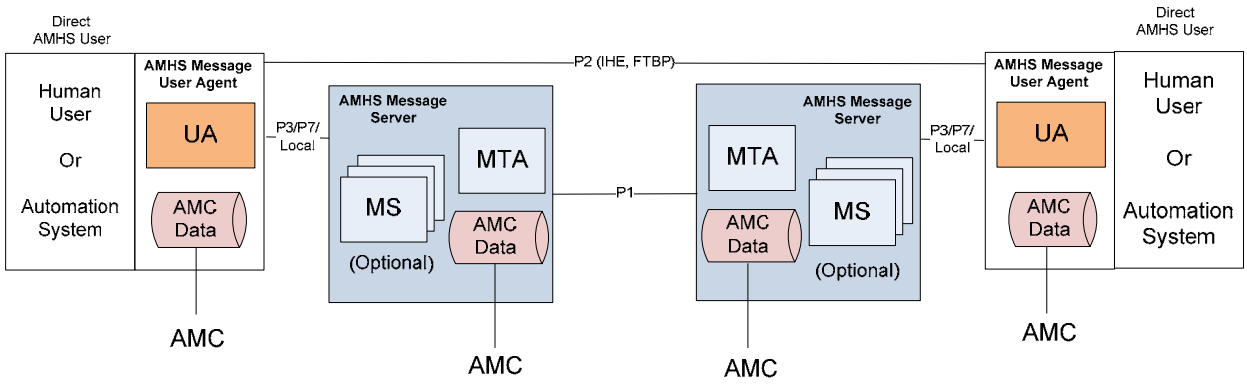

Figure 1: AMHS Interoperability Target

1.7.7 The ATS Message User Agent is a logical component that may or may not be physically identifiable in an implementation. It may be either logically collocated or remote from the ATS Message Server with which it is associated. When logically remote from the ATS Message Server, it will use the P7 protocol if using a Message Store (MS), or the P3 protocol if communicating directly with the Message Transfer Agent (MTA). The MS is an optional component of the ATS Message Server.

1.7.8 If end-to-end message security services are implemented, the user agent (UA) components would need additional functionality for generating and verifying the content integrity check and digital signature, and there would need to be additional infrastructure to support the management of public key certificates.
Note that there are also security measures applied to ATS Message Servers and DSAs, as well as link level security.

1.7.9 The AMC Database provides supporting functions such as address lookup and enabling a message originator to determine the capability of an intended recipient (direct AMHS user) before initiating the message exchange.

1.7.10 During the transition phase, which may take a number of years, legacy AFTN systems and terminals will need to be supported, both within States and between States. A State which has an operational AMHS may still support legacy AFTN users within that State (indirect AMHS users), and will also need to interwork with States that do not have operational AMHS deployments.

1.7.11 The goal is for interoperability between end users. Clearly, the degree of interoperability possible will depend upon the capability of the end user's system. For example, an AFTN terminal would not be expected to interoperate with an ATS Message User Agent for the exchange of binary encoded weather maps. However, basic interoperability at the level of ATS message exchange (textual rendition of flight plan, etc. messages) would be supported, and would be achieved through the use of an AFTN/AMHS gateway.

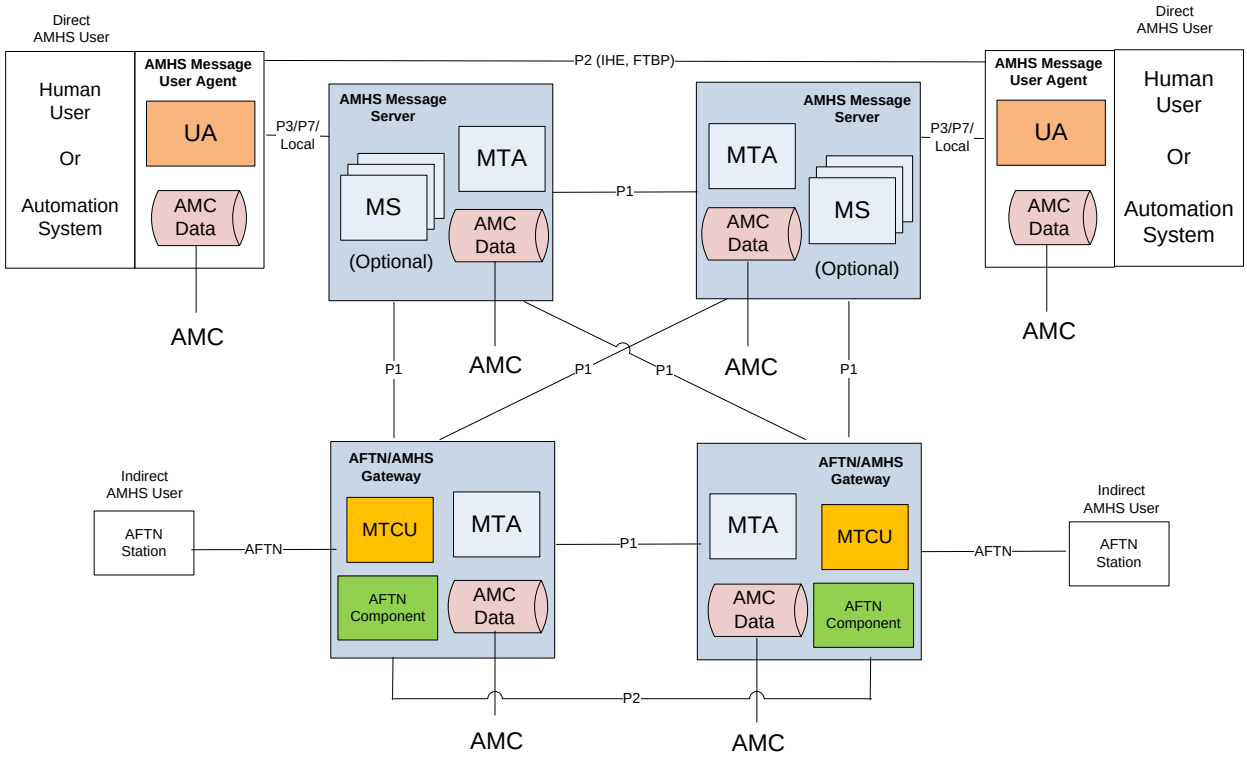

Figure 2: AMHS Interoperability Target (transitional phase)

1.7.12 Figure 2 illustrates the elements which are needed for transition, and represents the initial Interoperability Target.

1.7.13 At a future date, when the transition from AFTN is complete, and no legacy AFTN stations remain, the AFTN/AMHS Gateways will no longer be required. The ultimate interoperability target for AMHS is for all end users to become Direct AMHS users.

2. AMHS INTEROPERABILITY – BASIC ATSMHS

2.1 General

2.1.1 This chapter contains guidance and explanatory material for the AMHS Interoperability requirements in Annex A, which apply to the Basic ATSMHS level of service as defined in ICAO Doc 9880 Part II [5].

2.2 Standards Baseline

2.2.1 The standards baseline in Annex A defines the standards which through reference constitute part of the ASIA/PAC Specification.

2.2.2 The approach is to reference ICAO material where available, noting deviations where required and specifying additional functionality where necessary.

2.2.3 ICAO Annex 10 Volume III refers to the detailed technical specifications for the ATSMHS in ICAO Doc 9880 Part II [5]. These provisions in turn make reference to International Standardized Profiles (ISPs) published by the International Organization for Standardization (ISO).

2.2.4 In the MHS base standards (ISO/IEC 10021 and ITU-T X.400), a subset of the OSI Upper Layer protocols (ROSE, RTSE, ACSE, Presentation and Session layers) is used to support communications between the MHS components (MTA, UA, AU and MS). The use of OSI upper layers is specified in a common ISP applicable to each MHS component.

2.2.5 The referenced ISPs also include profiles for common messaging and for inter-personal messaging (IPM).

2.2.6 However, there remain some options and implementation choices in the AMHS technical specifications in ICAO Doc 9880 Part II [5]. These include support of the Extended and/or Basic ATSMHS, support for different body part types, message size constraints, etc.

2.2.7 The Asia/Pacific Region has adopted the ATS Messaging Management Center (AMC).

2.3 Network Support

2.3.1 This section describes interoperability between the AMHS components (MTA, UA, etc.) and the supporting network infrastructure. In general, there will be network level security features such as firewalls to control access to the infrastructure. Security protocols such as IPsec can be used to ensure that only named servers can connect to one another. However, these are not specific to the messaging system and are not described further.

2.3.2 As specified in ICAO Doc 9880 Part II [5], an AMHS End System can make use of the connection mode transport service provided by either or both of the ATN/OSI or the ATN/IPS. In the former case, it operates over the ATN internet communications service, based on a TP4/CLNP protocol stack, while in the latter case it operates over a TCP/IP protocol stack.

2.3.3 Implementations by ANSPs in the Asia/Pacific Region will make use of a backbone ground-ground network infrastructure based on TP4/CLNP.

2.3.4 TP4/CLNP is specified for interconnections between Backbone MTAs of different ANSP international COM Centers within the Asia/Pacific Region; however, the TCP/IP lower layer profile may be used within an ANSP's local systems or to connect to Non-Backbone MTAs or to MTAs in other regions.

2.4 Message Transfer Service Interoperability

2.4.1 This section is concerned with MTA-to-MTA interoperability requirements.

2.4.2 The Message Transfer Service (MTS) is provided by MTAs communicating via the message transfer protocol P1. The profile requirements for MTAs in the Asia/Pacific Region shall be as specified in ICAO Doc 9880, Part II B [5], section 3.2.2

2.4.3 A backup ATS Message Server may be specified to take over from an international ATS Message Server if the primary system becomes unavailable.

2.5 End-to-End Interoperability of Direct AMHS Users

2.5.1 This section is concerned with UA-to-UA interoperability requirements.

2.5.2 A direct AMHS user is a human or automated system that uses an ATS Message User Agent for message submission and delivery.

2.5.3 The ATSMHS is based on the standards for the interpersonal messaging protocol (P2), i.e. ISO/IEC 10021-7 | ITU-T Recommendation X.420, using message content type 22.

2.5.4 Users of the Basic ATSMHS are able to send and receive simple text messages using a single ia5-text body part containing a structured ATS Message Header.

2.6 Interoperability between AFTN and AMHS

2.6.1 This section is concerned with AFTN/AMHS Gateway requirements.

2.6.2 During the transition phase from AFTN to the AMHS, the interoperability between AFTN and AMHS is achieved by the use of AFTN/AMHS gateways.

2.6.3 Interconnection between the AFTN and the AMHS in the Asia/Pacific Region will be by means of AFTN/AMHS Gateways directly interfacing with the AFTN application supported by ASIA/PAC COM Centers.

2.6.4 Technical provisions for the AFTN/AMHS gateway are specified in ICAO Doc. 9880 Part II [5], section 4.

2.7 Ground Recording of Messages

2.7.1 Annex A elaborates on the information required to be recorded by AMHS End Systems, in accordance with ICAO recording requirements. These are minimum requirements for recording the message exchanges for audit and incident investigation purposes.

2.8 Naming and Addressing

2.8.1 Annex A includes requirements for specifying, maintaining and disseminating unambiguous name and address information required for safe and efficient operation of the communications system.

2.8.2 ICAO Doc 9880 Part II [5] section 2.5.1.4 requires each AMHS management domain to implement an AMHS addressing scheme policy. The management domain may implement either a MHS-form (MF) addressing scheme, or a locally defined addressing scheme, or a combination of both. Two alternative MF-addressing schemes are defined: the Common AMHS Addressing Scheme (CAAS) and the Translated-form (XF) addressing scheme.

2.8.3 Adoption of the ASIA/PAC AMHS Naming Plan will simplify address management and hence aid seamless operations. Under the AMHS Naming Plan the CAAS is recommended for the Asia/Pacific Region. This is consistent with ICAO Doc 9880 Part II, section 2.5.1.4.1.5.

2.8.4 However, for interoperability purposes, all components of Basic and Extended ATSMHS systems must support all of the AMHS address formats identified in ICAO Doc 9880, including XF-addresses. This does not require any form of address translation by an ATS User Agent or an ATS Message Server.

2.9 Interoperability with Systems External to ASIA/PAC

2.9.1 Within the ASIA/PAC Backbone, AMHS communication will be based on ATN/OSI lower layers. Elsewhere in the world, it is possible that AMHS communication could be based on ATN/IPS lower layers. ICAO Annex 10 Volume III requires that regional air navigation agreements will specify the area in which the communication standards for the ATN/OSI or the ATN/IPS are applicable.

2.9.2 The decoupling that exists in an AMHS End System between upper layers and lower layers (transport and network services) allows an ATS Message Server to communicate using different lower layers with different adjacent MTAs. Such lower layer stacks can include ATN/OSI and ATN/IPS protocol stacks.

2.9.3 The ability to implement AMHS end systems with multiple lower layer stacks may be used if needed to ensure global interoperability at the application layer. In this model, one ATS Message Server could be nominated as the boundary system for interfacing the ASIA/PAC AMHS to the AMHS in third countries.

2.9.4 In such a case, the requirements applicable to AMHS End Systems within the ASIA/PAC may not be applicable to those system elements responsible for interfacing with external systems, e.g. in terms of performance or protocol support.

2.9.5 Provisions for AMHS interworking at boundaries with countries external to ASIA/PAC will normally be concentrated in Boundary ATS Message Servers. If the external systems support only ATN/IPS lower layer protocols, the implementation of dual stacks can be proposed as the interworking solution. Other solutions may also be possible, but are outside the scope of this ASIA/PAC Specification.

2.9.6 The ASIA/PAC AMHS Backbone will make use of an ISO TP4 transport service implemented over a CLNP stack. If needed, boundary ATS Message Servers in selected boundary COM centers will implement dual stack systems to allow interconnection with ATN/IPS AMHS systems external to the ASIA/PAC.

2.9.7 It is envisaged that such boundary ATS Message Servers will be implemented as a Common Facility for the benefit of the whole ASIA/PAC network, to provide AMHS connectivity towards other countries.

3. EXTENDED ATSMHS

3.1 General

3.1.1 This section contains explanatory material for the requirements in Annex B concerning the Extended ATSMHS.

3.1.2 The Extended ATSMHS is an enabler for ATS operational improvements. It will provide significant operational benefits, improvement of ATS capacity and performance.

3.1.3 The requirements for Extended ATSMHS are in addition to those for Basic ATSMHS.

3.2 Standards Baseline

3.2.1 The standards baseline in Annex B defines the standards which through reference constitute part of the ASIA/PAC Specification concerned with the Extended ATSMHS.

3.3 Extended ATSMHS Functionality

3.3.1 All AMHS End Systems supporting the Extended ATSMHS must conform to the relevant requirements of the Basic ATSMHS.

3.3.2 In addition, implementations which support the Extended ATSMHS include functionality which can conveniently be described in terms of the following functional groups:

a) Use of File Transfer Body Parts (FTBP). This functional group enables the transfer of binary data between direct AMHS users. When binary files can be transferred it is important to include virus protection in the architecture, associated with the ATS Message Server and/or ATS Message User Agent; however this is out of scope of this ASIA/PAC Specification.

b) Use of IPM Heading Extensions (IHE). This functional group uses standard message fields instead of the AMHS-specific ATS Message Header which is required in the Basic ATSMHS.

c) AMHS Security (SEC). This functional group enables support of the AMHS security policy, providing message origin authentication and content integrity assurance between direct AMHS users.

d) Use of Directory (DIR). This functional group enables support of the ATN Directory through the use of a DUA included in the AMHS End System.

3.3.3 An implementation of an ATS Message User Agent or of an ATS Message Server claiming full conformance to ICAO Doc 9880 Part II [5] for the Extended ATSMHS is required to support all of these functional groups.

3.3.4 ICAO Doc 9880 Part II [5] also allows an implementation of an ATS Message User Agent or of an ATS Message Server to claim conformance for a subset of the Extended ATSMHS.

3.3.5 If different AMHS End Systems in ASIA/PAC were to support different combinations of functional groups this would be detrimental to full functional interoperability and seamless operations (although interoperability would be possible at least at the Basic ATSMHS level).

3.3.6 Conformance to this ASIA/PAC Specification for the Extended ATSMHS requires implementation of a configuration of the Basic, IHE, and FTBP functional groups.

3.3.7 Note that the future migration to support the DIR and SEC functional groups may be foreseen, but is not currently required for compliance with this ASIA/PAC Specification.

3.3.8 For the AFTN/AMHS Gateway, ICAO Doc 9880 Part II does not specify any distinct functional groups; an implementation may or may not support the Extended ATSMHS as a whole. In practice, FTBP is not relevant for an AFTN/AMHS Gateway; if an AMHS message containing an FTBP body part were received it would unconditionally be rejected by the gateway according to ICAO Doc 9880 Part II, paragraph 4.5.2.1.4.b). SEC would be applicable in the AMHS-to-AFTN direction. IHE and DIR would be supported by an AFTN/AMHS Gateway that supports the Extended ATSMHS.

3.4 End-to-End Interoperability of Direct AMHS Users

3.4.1 Users of the Extended ATSMHS have access to advanced features that are not available to users of the Basic ATSMHS. These include binary data transfer using file transfer body part. The profile requirements for UAs in ASIA/PAC are as specified in ICAO Doc 9880 [5].

3.4.2 Interoperability issues may arise when a user supporting the Extended ATSMHS wishes to communicate with a user supporting the Basic ATSMHS. In such cases, interoperability will only be possible at the Basic ATSMHS level of service.

3.4.3 For example, if a direct user wishes to send a file transfer body part, this will only be meaningful if all of the addressed recipients can process such body part types correctly, i.e., they support the FTBP Functional Group of the Extended ATSMHS. For the sake of robustness, even an ATS Message User Agent supporting only the Basic level of service is expected to be able to receive a message containing unsupported body parts without aborting or malfunctioning.

3.5 Naming and Addressing

3.5.1 In the Extended ATSMHS, the O/R name of an AMHS user is required to comprise both the MF-address (O/R address) and the directory name (distinguished name form) of the AMHS user (see ICAO Doc 9880 Part II [5] section 2.5.1.1.2).

3.5.2 This implies conveyance of both MF-address and directory name in the message envelope and IPM heading. In practice, a UA, MTA, or Gateway receiving a message has no use for the received directory names, as it never needs to look anything up in the directory (except possibly a user’s certificate, if secure messaging is implemented). Theoretically, support for IPM Use of Directory requires a UA to be able to display the directory component in a received O/R Name (ISO ISP 12062-1 A.2.3).

4. ADDITIONAL AMHS REQUIREMENTS

4.1 Testing and Verification

4.1.1 The ASIA/PAC AMHS Manual specifies a set of testing requirements, conformance, interoperability and pre-operational tests covering the Basic ATSMHS requirements. There is the need to augment the test coverage in such a way as to include the additional functionality of the relevant elements of the Extended ATSMHS.

5. TRANSITION / COEXISTENCE ISSUES

5.1 AFTN to AMHS Transition

5.1.1 As a first step, the Basic ATSMHS can be deployed in ASIA/PAC simply to replace AFTN. Subsequently, it is envisaged that ANSPs will continue to implement other elements of the Extended ATSMHS.

5.1.2 As aging AFTN switches are replaced with ATS Message Servers, AFTN end users will become AMHS indirect users, supported by the AFTN/AMHS Gateway.

5.1.3 The ultimate goal is to phase out the AFTN terminal equipment in favor of ATS Message User Agents. At this stage, all users will be AMHS direct users. The AFTN/AMHS Gateways can only be decommissioned when all indirect users connected to the switch (terminals and applications) are migrated to AMHS. Note that such decommissioning depends also on the migration of all communicating ASIA/PAC countries from AFTN to AMHS.

5.1.4 Systems sending and receiving AFTN messages must be considered. As long as these systems expect AFTN formatted messages, the AFTN/AMHS Gateways will have to remain.

5.1.5 There are a number of transition steps to achieving this end state. Timescales for migration and transition are outside the scope of this ASIA/PAC Specification.

5.1.6 The migration from AFTN to AMHS requires the development of AMHS Operational Procedures, to ensure that transition steps are performed smoothly and without service disruption.

5.1.7 Common facilities, and specifically the routing management function, are of utmost importance to the performance of these AMHS Operational Procedures. It is one of the main goals of the AMC to provide support to the transition to AMHS.

5.1.8 During transition from AFTN to AMHS, existing AFTN routes will be "concatenated" with direct AMHS routes in AMHS Gateways at the borders between the remaining AFTN and the growing AMHS islands.

5.2 Basic ATSMHS to Extended ATSMHS Transition

5.2.1 The Basic ATSMHS may be implemented as a transition step to full Extended ATSMHS. ICAO Doc 9880 Part II [5] notes: It is intended that eventually the Extended ATS Message Handling Service will be

supported by all ATS Message Handling Service users, so that the Basic ATS Message Handling Service will not be required anymore. However the latter may be maintained for transition purposes as long as required.

5.2.2 Coexistence between the two levels of service is facilitated by the use of the AMC service by users to determine the capabilities of intended message recipients.

5.3 Deployment of Directory

5.3.1 Updates to ASIA/PAC ATS messaging configuration and addressing information are published each AIRAC cycle and distributed by the AMC.

6. LIST OF REFERENCES

[1] ASIA/PAC ATN Ground-Ground Transition Plan, 2nd Edition (March 2004)

[2] ASIA/PAC AMHS MTA Routing Policy, 1st Edition (April 2005)

[3] ICAO Convention on International Civil Aviation, Annex 10 - Aeronautical Telecommunications, Volume II — Communication Procedures including those with PANS status, Sixth edition – October 2001, incorporating Amendment 83 (20/07/2008)

[4] ICAO Convention on International Civil Aviation, Annex 11 – Air Traffic Services, Thirteenth edition - July 2001, incorporating Amendment 45 (16/07/2007)

[5] ICAO Doc. 9880-AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols, Part II – Ground-Ground Applications – ATS message handling service (ATSMHS), 1st edition, 2010

[6] [ATN SEC] ICAO Doc. 9705-AN/956 – Manual of Technical Provisions for the Aeronautical Telecommunications Network (ATN) Third Edition (2002), Sub-Volume VIII – ATN Security.

[7] [ATN DIR] ICAO Doc 9880-AN/466 – Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols, Part IV – Directory Services, 1st edition, 2010

[8] ASIA/PAC AMHS Manual, Version 3.0 (September 2009)

[9] ASIA/PAC AMHS Naming Plan, 3rd Edition (April 2005)

[10] ASIA/PAC System Management Policy, 1st Edition (April 2005)

[11] ASIA/PAC ATN System Security Policy, 2nd Edition (September 2008)

ANNEX A – SPECIFICATION OF AMHS BASIC INTEROPERABILITY REQUIREMENTS

A.1 EXPLANATORY MATERIALS

This normative Annex is an integral part of this ASIA/PAC Specification. It specifies requirements for AMHS End Systems that support the Basic ATSMHS as defined in ICAO Doc 9880 Part II [5].

This Annex must be read in conjunction with the Main Body of this ASIA/PAC Specification, which provides definitions, document references, and contextual information. References given in square brackets are defined in section 6 of the Main Body.

The Basic ATSMHS is intended as a transition step providing interoperability with existing AFTN equipment and supporting the migration from AFTN to AMHS technology. As such, it supports existing data flows and concepts of operation for applications based on the interchange of ATS messages.

The Basic ATSMHS provides only for the exchange of simple text messages, including a formatted ATS Message Header field. It does not support new concepts of operation requiring the general exchange of binary data or files and does not provide strong authentication or data integrity services. Further, the Basic ATSMHS does not benefit from a standardized directory function, which in the Extended ATSMHS can be used to enhance seamless operation by ensuring the up-to-date dissemination of address and configuration information.

This Annex is structured such that requirements common to all AMHS End Systems are specified in section A.2.1, followed by requirements specific to each AMHS End System type. Compliance is conditional upon the type of AMHS End System under consideration (e.g. section A.2.2 on ATS Message Server is not applicable when considering requirements for ATS Message User Agents).

A.2 REQUIREMENTS

A.2.1 Common Requirements

A.2.1.1 Standards Baseline

[AMHS-BAS-A03] AMHS End Systems shall comply with the requirements specified in ICAO Doc 9880 Part II [5] applicable to the Basic ATSMHS, except where explicitly stated otherwise.

[AMHS-BAS-A04] In the event of conflicting requirements not explicitly identified, the specification in ICAO Doc 9880 Part II [5] shall take precedence.

[AMHS-BAS-A05] Due account shall be taken of any published defect resolutions relating to the ICAO AMHS documentation.

Note. Any outstanding defect reports and/or amendment proposals need to be analyzed when preparing an ANSP's system specification. Any that affect interoperability would be required to be implemented in the supplied system.

[AMHS-BAS-A07] Compatibility with the current version of referenced standards and any relevant corrigenda should be taken into account.

A.2.1.2 General Requirements

[AMHS-GEN-A01] The AMHS shall enable the exchange of messages between the following types of users:

- Direct AMHS user to Direct AMHS user;
- Direct AMHS user to Indirect AMHS user;
- Indirect AMHS user to Direct AMHS user;
- Indirect AMHS user to Indirect AMHS user.

[AMHS-GEN-A02] AMHS Backbone Systems shall be able to communicate using the ATN/OSI Transport Service, as specified in ICAO Doc 9880 Part II [5], section 3.2.2.2

[AMHS-GEN-A04] Wherever possible, AMHS Component implementations should make use of common and standardized interfaces.

Note: Such interfaces are specified for example in IETF RFCs.

[AMHS-GEN-A05] Specifically, standardized interfaces where available for message submission, transfer and delivery, system management, etc. shall be used as a means of enhancing Interoperability between system components.

[AMHS-GEN-A07] AMHS End Systems shall be capable of interworking with independent implementations of AMHS End Systems in accordance with the permissible combinations listed in ICAO Doc 9880 Part II [5], section 1.2.

Note: Such interworking includes correct interoperation representing the services explicitly and implicitly requested by either end user.

[AMHS-GEN-A08] AMHS End Systems supporting the Basic ATSMHS should be designed to accommodate the evolution to support the Extended ATSMHS, e.g. by including well-defined interfaces and software hooks in areas where future extensions are foreseen.

A.2.1.3 Performance Requirements

[AMHS-PER-A08] AMHS End Systems should be capable of supporting the peak rate hour's performance, which corresponds to at least 20% of the daily traffic requirements for that AMHS End System.

A.2.1.4 Naming and Addressing

[AMHS-NAM-A01] AMHS End Systems shall support the ASIA/PAC AMHS Naming Plan [9]

A.2.1.5 Logging

[AMHS-LOG-A01] Data exchanges using the ATSMHS shall be recorded in accordance with the following ICAO standards applicable to the ground-based recording function of data link communications:

- Section 3.5.1.5 of ICAO Annex 10 Volume II [3];
- Section 6.2 of ICAO Annex 11 [4].

[AMHS-LOG-A03] AMHS End Systems shall support the relevant requirements for traffic logging as described in sections 2.7, 3.2.3 and 4.3.1 of ICAO Doc 9880 Part II [5].

[AMHS-LOG-A04] All operator inputs shall be recorded and traceable for a configurable period (e.g. 30 days).

A.2.1.6 Availability, Reliability, Maintainability

A.2.1.6.1 Availability

[AMHS-ARM-A04] Precise constraints for the restart time are dependent on the configuration of the system and specific modes of failure, but for guidance a target restart time of less than 5 minutes should be assumed.

[AMHS-ARM-A06] AMHS End Systems shall be designed such that processing of messages during recovery does not overload the system or degrade the performance below the performance targets.

A.2.1.6.2 Reliability

[AMHS-ARM-A07] AMHS End Systems shall be designed to minimize the effect of a failure of an AMHS End System or component thereof on the function of the entire system.

Note: This requires an audit of design documentation to ensure that factors such as redundancy of components, alternative routings, etc. have been considered.

[AMHS-ARM-A08] AMHS End Systems and their functional components shall be designed to avoid loss of messages.

A.2.1.6.3 Maintainability

[AMHS-ARM-A09] Commercial Off-the-Shelf (COTS), industry standard software, should be used as widely as possible, in order to enable an upward compatible growth path.

[AMHS-ARM-A10] AMHS End System implementations should be modular in nature and by using a series of industry standard interfaces provide a flexible and expandable combination of communication services.

A.2.1.7 System Management

[AMHS-SYM-A01] AMHS End Systems shall support ASIA/PAC System Management Policy. [10]

A.2.1.8 Security Management

[AMHS-SCM-A01] AMHS End Systems shall support the ASIA/PAC ATN System Security Policy. [11]

A.2.2 ATS Message Server Requirements

An ATS Message Server supporting the Basic ATSMHS includes an MTA and optionally one or more MSs, as specified in ICAO Doc 9880 Part II [5] sections 3.2.2 to 3.2.4.

[AMHS-AMS-A01] An ATS Message Server shall route, store and forward ATS Messages, taking into account the applicable performance requirements and routing configuration.

[AMHS-AMS-A02] An ATS Message Server shall be able to support the routing of messages according to a non-hierarchical addressing plan, as well as the MF-Addressing Schemes specified in ICAO Doc 9880 Part II [5] section 2.5.1.4.

[AMHS-AMS-A03] An ATS Message Server should have the capability to import data from the AMC.

[AMHS-AMS-A04] MTAs shall implement the P1 MTS transfer profile as specified in ICAO Doc 9880 Part II [5](profile AMH11 plus AMHS-specific features) for communication with other ATS Message Servers.

[AMHS-AMS-A05] MTAs shall implement the P1 IPM requirements profile as specified in ICAO Doc 9880 Part II [5] (profile AMH22 plus AMHS-specific features) for IPM communication with other ATS Message Servers.

[AMHS-AMS-A07] The ATS Message Server should support a common and standardized interface for the submission and delivery of messages.

[AMHS-AMS-A09] MTAs may support the Distribution List (DL) and Exempted Recipients (ER) functional group as a local matter.

Note: The DL+ER (Exempted Recipients) class of the DL functional group is outside the scope of this ASIA/PAC Specification. It may be supported according to local requirements.

[AMHS-AMS-A10] It is recommended that the ATS Message Server should have the capability to open multiple associations between each pair of communicating MTAs

Note: This means that there is no guarantee that messages are transferred in their received order, only that the start of transfer is independent of message size.

A.2.2.1 ASIA/PAC Boundary Requirements

[AMHS-AMS-A12] ASIA/PAC boundary ATS Message Servers shall additionally have the capability to communicate with ATS Message Servers external to ASIA/PAC, subject to bilateral agreement.

A.2.3 ATS Message User Agent Requirements

In the AMHS architecture defined in ICAO Doc 9880 Part II [5], each direct AMHS user is provided with an ATS Message User Agent to access the message transfer service. ATS Message User Agents include a UA to perform submission of messages to the message transfer service and delivery of messages from the message transfer service.

The logical architecture includes an optional AMHS Message Store component for storing, on behalf of local direct AMHS users, messages received from other users as well as other information objects such as reports.

The ATSMHS uses the Inter-Personal Messaging (IPM) protocol P2 for communication between UAs. ICAO Doc 9880 Part II [5] specifies the relevant IPM Content Type profile.

In the Basic ATSMHS, each IPM message contains a single ia5-text or general-text body part.

[AMHS-AMU-A01] ATS Message User Agents shall comply with the requirements specified in section 3.1 of ICAO Doc 9880 Part II [5] for the support of the Basic ATSMHS, summarized as the following requirements:

- A UA profile based on AMH21 as specified in ISO/IEC ISP 12062-2;

- The requirements of Repertoire Group A, for messages including a body part whose type is an Extended Body Part Type of general-text-body-part type;

- Provisions related to traffic logging.

[AMHS-AMU-A02] It is recommended that standard ISO/IEC 10021 protocols P3 and/or P7 should be used for message submission and delivery.

Note: In the Basic ATSMHS, a UA can communicate with the MTS using P3, P7 or proprietary access protocols, as an implementation choice local to the AMHS MD. The above recommendation is intended to foster seamless operation and enable a smooth transition to the Extended ATSMHS.

[AMHS-AMU-A03] The maximum message-text length supported by the UA shall be a configurable parameter value.

[AMHS-AMU-A04] A UA shall be capable of accepting and processing a maximum received message-text length of at least 64 kByte and be capable of handling messages longer than the maximum length without system malfunction.

Note. It is a local implementation matter how to handle received messages longer than the maximum supported message length.

[AMHS-AMU-A05] If a user application is co-located with an MTA on a common platform, then the interface between the application's (logical) UA and the message transfer service shall provide equivalent functionality to the MT-Access abstract service as defined for the P3 access protocol specified in ISO/IEC 10021-6.

[AMHS-AMU-A06] If "forced" delivery to a UA is required (e.g. for reception of urgent, high priority messages) then either the P3 protocol or (in the case of MS) P7 with Alerts configured should be used.

[AMHS-AMU-A07] It should be possible for direct AMHS users to request confirmation of delivery and to receive delivery reports.

A.2.4 Message Store Requirements

The MS is Optional in the AMHS logical architecture. It is a local decision whether MS functionality is required. The local options of the MS that are appropriate to the MS user's intended task need to be specified when procuring an ATS Message Server.

[AMHS-MST-A01] It is recommended that, when an MS is included in the ATS Message Server, standard ISO/IEC 10021 protocol P3 should be used between the MS and MTA for message submission and delivery.

Note: In the Basic ATSMHS, an MS can communicate with the MTS using P3 or proprietary access protocols, as an implementation choice local to the AMHS MD. The above recommendation is intended to foster seamless operation and enable a smooth transition to the Extended ATSMHS.

[AMHS-MST-A02] It is recommended that the standard ISO/IEC 10021 protocol P7 should be used between MS and UA for message retrieval and indirect submission.

Note: In the Basic ATSMHS, a UA can communicate with the MS using P7 or proprietary access protocols, as an implementation choice local to the AMHS MD. The above recommendation is intended to foster seamless operation and enable a smooth transition to the Extended ATSMHS.

[AMHS-MST-A04] MS implementations may support the Distribution List (DL) functional group.

Note: The DL Exempted Recipients class (DL+ER) is an Optional functional group in profiles AMH13 and AMH15. It is only needed if support of dl-exempted-recipients is required in the message submission envelope.

A.2.5 AFTN/AMHS Gateway Requirements

An AFTN/AMHS Gateway supporting the Basic ATSMHS includes an MTA and an Access Unit (the Message Transfer and Control Unit – MTCU), as specified in ICAO Doc 9880 Part II [5] chapter 4.

[AMHS-GWY-A01] Where interworking with AFTN end systems is required, a gateway between the AMHS and AFTN message services shall be implemented in conformance with ICAO Doc 9880 Part II [5] chapter 4.

[AMHS-GWY-A02] An AFTN/AMHS Gateway supporting the Basic ATSMHS shall implement all elements which are applicable to the Basic ATSMHS and which are marked as "M" in the "ATS Messaging Service" column of ICAO Doc 9880 Part II Table 4-3.

[AMHS-GWY-A03] The AFTN/AMHS Gateway shall support address conversion of O/R addresses belonging to a non-hierarchical addressing plan, as well as the MF-Addressing Schemes specified in ICAO Doc 9880 Part II [5] section 2.5.1.4.

[AMHS-GWY-A04] The AFTN/AMHS Gateway shall support address conversion and routing for all currently assigned ICAO eight-letter addressee indicators (AF-addresses).

ANNEX B – SPECIFICATION OF AMHS EXTENDED INTEROPERABILITY REQUIREMENTS

B.1 EXPLANATORY MATERIALS

This normative Annex is an integral part of this ASIA/PAC Specification. It specifies requirements for AMHS End Systems that support the Extended ATSMHS as defined in ICAO Doc 9880 Part II [5].

This Annex must be read in conjunction with the Main Body of this ASIA/PAC Specification, which provides definitions, document references and contextual information.

References given in square brackets are defined in section 6 of the Main Body. Reference is also made to Annex A of this ASIA/PAC Specification for the definition of the Basic ATSMHS details.

The Extended ATSMHS is functionally a superset of the Basic ATSMHS, and is backward compatible with it, in that the ability to downgrade to the Basic ATSMHS level of service is required. AMHS End Systems claiming compliance with the requirements in this Annex must also be compliant with the requirements in Annex A.

This Annex is structured such that requirements common to all AMHS End Systems supporting the Extended ATSMHS are specified in section B.2.1, followed by requirements specific to each AMHS End System type. Compliance is conditional upon the type of AMHS End System under consideration (e.g. section B.2.2 on ATS Message Server is not applicable when considering requirements for ATS Message User Agents).

B.2 REQUIREMENTS

B.2.1 Common Requirements

B.2.1.1 Standards Baseline

[AMHS-BAS-B01] AMHS End Systems shall comply with the standards identified in Annex A of this ASIA/PAC Specification unless stated otherwise.

[AMHS-BAS-B02] AMHS End Systems conforming to this Annex shall comply with the requirements specified in ICAO Doc 9880 Part II [5], including those requirements specific to the support of the Extended ATSMHS, unless explicitly stated otherwise in this Annex.

[AMHS-BAS-B03] In the event of conflicting requirements not explicitly identified, the specification in ICAO Doc 9880 Part II [5] shall take precedence.

Note: ICAO Doc 9880 Part II [5] paragraph 2.2.4.1.b) requires the storage of management information about ATS Message Servers and AFTN/AMHS Gateways in the ATN cross-domain management information base (XMIB). This is not required for conformance to this ASIA/PAC Specification.

B.2.1.2 General Requirements

[AMHS-GEN-B01] ATS Message Servers and ATS Message User Agents shall support the functional groups Basic, IHE, and FTBP.

Note: Migration to AMHS functional groups DIR and SEC may be foreseen at some time in the future, but is not currently required for compliance with this ASIA/PAC Specification.

[AMHS-GEN-B03] AMHS End Systems shall support the implementation of advanced, agreed and validated concepts of operation by providing managed access to the messaging system for new end-user applications via well-defined interfaces.

Note: The basic recommendation for the use of standardized interfaces wherever possible also applies to AMHS components supporting the Extended ATSMHS. However, it is noted that the Open Group APIs are not fully compliant with extended service requirements such as support for the Business Class (BC) functional group, so some customization may be necessary.

B.2.1.3 Naming and Addressing

There are no ASIA/PAC specific requirements for Naming and Addressing.

B.2.1.4 Performance Requirements

There are no additional performance requirements specified in this Annex. The performance requirements specified in Annex A are fully applicable to elements of the Extended ATSMHS. However, it should be noted that the use of binary attachments will tend to result in larger message sizes. Unless the number of messages with file transfer body parts is very small, there will be an impact on performance. Also, the use of security will increase the submission time and also the time to open a message.

B.2.2 ATS Message Server Requirements

B.2.2.1 General

An ATS Message Server supporting the Extended ATSMHS includes an MTA, a DUA and optionally one or more MSs, as specified in ICAO Doc 9880 Part II [5] sections 3.2.2 to 3.2.5.

B.2.2.2 P1 Message Transfer

[AMHS-AMS-B01] MTAs shall implement the P1 MTS transfer profile AMH11 as specified in Annex A of this ASIA/PAC Specification.

B.2.2.3 P3 Message Access

[AMHS-AMS-B03] MTAs supporting direct message submission and delivery should support P3 access.

B.2.3 ATS Message User Agent Requirements

B.2.3.1 General

An ATS Message User Agent supporting the Extended ATSMHS includes an IPM UA as specified in ICAO Doc 9880 Part II [5] sections 3.1.2 to 3.1.5.

The UA in the Extended ATSMHS supports the P3 protocol to access the MTA in an ATS Message Server and/or the P7 protocol to access the MS in an ATS Message Server, where available.

Note: In the Extended ATSMHS, each IPM message may contain a combination of ia5text, general text and file transfer body parts. Use of the Bilaterally Defined body part type is prohibited for sending, though it must be supported for reception for backwards compatibility – see ICAO Doc 9880 Part II [5] paragraph 3.1.4.2.1.2.

[AMHS-AMU-B01] An ATS Message User Agent supporting the Extended ATSMHS shall comply with the requirements specified in section 3.1 of ICAO Doc 9880 Part II [5] for the support of the Extended ATSMHS, summarized as the following requirements;

- A UA profile based on Profile AMH21;
- The requirements of Repertoire Group A, for messages including a body part whose type is an Extended Body Part Type of general-text-body-part type;
- Support of the IPM Business Class (BC) functional group;
- Support of the file-transfer body part;
- UA access profile based on Profiles AMH23 or AMH25 for P3 access to the MTS, or based on Profiles AMH24 or AMH26 for P7 access to the MS;
- The additional provisions relating to parameters generated at an ATS Message User Agent, as specified for the Extended ATSMHS;
- Provisions related to traffic logging.

B.2.3.2 IPM Content

[AMHS-AMU-B02] A UA in an ATS Message User Agent supporting the Extended ATSMHS shall conform to MHS Profile AMH21 as specified in Doc 9880 Part II [5].

[AMHS-AMU-B03] A UA in an ATS Message User Agent shall be prohibited from sending messages containing a Bilaterally Defined body part.

[AMHS-AMU-B05] The values of the precedence field in the per-recipient heading fields of a message shall be the same for all recipients, as this field corresponds to AFTN Priority.

B.2.3.3 P3 Access

[AMHS-AMU-B06] A UA supporting P3 access shall conform to the profile AMH12 and optionally profile AMH14 in ICAO Doc 9880 Part II [5].

[AMHS-AMU-B07] A UA supporting P3 access shall conform to the profile AMH23 and/or AMH25 in ICAO Doc 9880 Part II [5], section 3.1.4.3.1.

B.2.3.4 P7 Access

[AMHS-AMU-B10] A UA supporting P7 access shall conform to the profile AMH13 or AMH15 ICAO Doc 9880 Part II [9].

[AMHS-AMU-B11] A UA supporting P7 access shall conform to the profile AMH24 or AMH26 in ICAO Doc 9880 Part II [5], section 3.1.4.3.1.

B.2.4 Message Store Requirements

B.2.4.1 General

The MS is an optional functional object in the AMHS logical architecture. For an MS in an ATS Message Server supporting the Extended ATSMHS, the access profiles are prescribed in ICAO Doc 9880 Part II [5].

B.2.4.2 MS Access to MTA

[AMHS-MST-B01] An MS which supports P3 access in an ATS Message Server supporting the Extended ATSMHS shall conform to the profile AMH12 and optionally profile AMH14 in ICAO Doc 9880 Part II [5].

[AMHS-MST-B02] An MS which supports P3 access in an ATS Message Server supporting the Extended ATSMHS shall conform to Profiles AMH23 and/or AMH25 in ICAO Doc 9880 Part II [5].

B.2.4.3 P7 Access

[AMHS-MST-B06] An MS in an ATS Message Server supporting the Extended ATSMHS shall conform to the Profile AMH13 or AMH15 in ICAO Doc 9880 Part II [5].

[AMHS-MST-B07] An MS in an ATS Message Server supporting the Extended ATSMHS shall conform to the profile AMH24 or AMH26 in ICAO Doc 9880 Part II [5].

B.2.5 AFTN/AMHS Gateway Requirements

B.2.5.1 General

An AFTN/AMHS Gateway supporting the Extended ATSMHS includes an MTA and an Access Unit (the Message Transfer and Control Unit – MTCU), as specified in ICAO Doc 9880 Part II [5] chapter 4.

[AMHS-GWY-B02] It is recommended that AMC information in an AFTN/AMHS Gateway supporting the Extended ATSMHS should be used to retrieve information in support of address and content conversion.

Note: The retrieval of AMC information can be used by the MTCU to facilitate address conversion. The MTCU also requires further information on the level of service supported by the intended AMHS recipients.

The Minimum Technical and Operational Requirements for a Regional RAIM Prediction System

Basic Common Denominator - Noting the differences among different RAIM algorithms on-board different aircraft, a regional RAIM prediction system provided by a service provider, such as an ANSP, should provide a "basic common denominator" RAIM prediction service for "basic" GNSS receivers, such TSO-129 (Fault Detection) and TSO-145/146 (Fault Detection and Exclusion).

Prediction Period – A regional RAIM prediction system shall provide prediction for RAIM outage and number of GNSS-satellite availability for a 72 hour period using the latest available GPS NANU.

*Approach Operation*s - A regional RAIM prediction system shall support aircraft approach operations based on RNP APCH (with/without Baro-VNAV) navigation specification. The system shall calculate the predicted RAIM availability for a 72 hour period for specific Aerodromes. The algorithms shall address the RAIM requirements for GNSS receivers operating in Approach operations (±0.3NM). Both the Fault Detection (FD) and Fault Detection and Exclusion (FDE) algorithms shall be provided. The system shall calculate the predicted RAIM availability at the Aerodrome Reference Point (ARP) for baro (pressure altitude) aided and non-baro aided GNSS user equipment at 1 minute intervals or better.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ASIA/PACIFIC REGIONAL PERFORMANCE-BASED NAVIGATION IMPLEMENTATION PLAN

VERSION 3.0

September 2011

RECORD OF AMENDMENT

Version	Activity	Date
0	Adopted by APANPIRG/19 as Interim Edition	September 2008
0.1	RASMAG Proposal	December 2008
0.2	Amended/Finalized by PBN/TF/4	March 2009
0.3	Amended/Finalized by PBN/TF/5	July 2009
1.0	Adopted by APANPIRG/20	September 2009
2.0	Adopted by APANPIRG/21	September 2010
3.0	Adopted by APANPIRG/22	September 2011

TABLE OF CONTENTS

1. Executive Summary 5
2. Explanation of Terms 5
2.1 Asia/Pacific Regional PBN Implementation Plan
2.2 Performance Based Navigation
2.3 Performance requirements
3. Acronyms 5
4. Introduction 6
Need for the Regional PBN Implementation Plan 6
Roles of Navigation in supporting ATM operations 6
Benefits of Performance-Based Navigation 7
Goals & Objectives of PBN Implementation 8
Planning Principles 9
5. PBN Operational Requirements & Implementation Strategy 9
Route Operations 9
TMA Operations 10
Instrument Approaches 10
6. Current Status & Forecast 10
APAC Traffic Forecast 10
Aircraft fleet readiness status 11
Global Navigation Satellite System (GNSS) 11
Other PBN Navigation Infrastructure 11
Surveillance Infrastructure 12
Communication Infrastructure 12
7. Implementation Road Map of Performance Based Navigation 12
ATM Operational Requirements 12
Short Term Implementation Plan 13
- Route Operations 13
- TMA Operations 13
- Instrument Approaches 14
- Summary Table & Implementation Targets 14
Medium Term Implementation Plan 15
- Route Operations 15
- TMA Operations 15
- Instrument Approaches 15
- Summary Table & Implementation Targets 16
Long Term Implementation Strategies (2016 and beyond) 17
8. Transitional Strategies 17

9. Safety Assessment & Monitoring Requirements 17
Need for a safety assessment 17
En-route safety assessment and monitoring 17
Undertaking a safety assessment 18
APPENDIX A: Changes to the PBN Regional Plan 20
APPENDIX B: IATA Traffic Forecast 25
APPENDIX C: Reference documentation for developing operational and airworthiness approval 27
APPENDIX D: Practical Example 29
APPENDIX E: Basic Planning Elements (BPEs) Table 30

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ASIA/PACIFIC REGIONAL PERFORMANCE-BASED NAVIGATION IMPLEMENTATION PLAN

1. Executive Summary

1.1 This Asia/Pacific Regional PBN Implementation Plan has been produced in line with Resolution A 36/23 adopted by ICAO Assembly in its 36th Session held in September 2007 and Conclusion 18/52 adopted by APANPIRG/18. The Regional PBN Plan addresses the strategic objectives for PBN implementation based on clearly established operational requirements, avoiding equipage of multiple on-board or ground based equipment, avoidance of multiple airworthiness and operational approvals and explains in detail contents relating to potential navigation applications. The Plan envisages the conduct of pre- and post-implementation safety assessments and continued availability of conventional air navigation procedures during transition. The Plan also discusses issues related to implementation which include traffic forecasts, aircraft fleet readiness, adequacy of ground-based CNS infrastructure etc. Implementation targets for various categories of airspace for the short term (2008 – 2012) and for the medium term (2013 – 2016) have been projected in tabular forms to facilitate easy reference. For the long term (2016 and beyond) it has been envisaged that GNSS will be the primary navigation infrastructure. It is also expected that precision approach capability using GNSS and its augmentation system will become available in the long term.

2. Explanation of Terms

2.1 The drafting and explanation of this document is based on the understanding of some particular terms and expressions that are described below:

2.1.1 **Asia/Pacific Regional PBN Implementation Plan.** A document adopted by APANPIRG, often referred to as the "Regional PBN Plan", offering appropriate guidance for air navigation service providers, airspace operators and users, regulating agencies, and international organizations on the evolution of navigation capabilities as one of the key systems supporting air traffic management, and which describes the RNAV and RNP navigation applications that should be implemented in the short, medium and long term in the APAC Region.

2.1.2 **Performance Based Navigation** Performance based navigation specifies RNAV and RNP system performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in an airspace.

2.1.3 **Performance requirements.** Performance requirements are defined in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept. Performance requirements are identified in navigation specifications which also identify which navigation sensors and equipment may be used to meet the performance requirement.

3. Acronyms

3.1 The acronyms used in this document along with their expansions are given in the following list:

ABAS	Aircraft-Based Augmentation System
AIS	Aeronautical Information Services
APAC	Asia and Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APCH	Approach
APV	Approach Procedures with Vertical Guidance
ATC	Air Traffic Control

Baro VNAV	Barometric Vertical Navigation
CNS/ATM	Communication Navigation Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
DME	Distance Measuring Equipment
EMA	En-route Monitoring Agency
FASID	Facilities and Services Implementation Document
FIR	Flight Information Region
FMS	Flight Management System
GBAS	Ground-Based Augmentation System
GNSS	Global Navigation Satellite System
GRAS	Ground-based Regional Augmentation System
IATA	International Air Transport Association
IFALPA	International Federation of Air Line Pilots' Associations
INS	Inertial Navigation System
IRU	Inertial Reference Unit
PANS	Procedures for Air Navigation Services
PBN	Performance Based Navigation
PIRG	Planning and Implementation Regional Group
RASMAG	Regional Airspace Safety Monitoring Advisory Group
RCP	Required Communication Performance
RNAV	Area Navigation
RNP	Required Navigation Performance
SARP	Standards and Recommended Practices
SBAS	Satellite-Based Augmentation System
SID	Standard Instrument Departure
STAR	Standard Instrument Arrival
TMA	Terminal Control Area
VOR	VHF Omni-directional Radio-range
WGS	World Geodetic System

4. Introduction

Need for the regional PBN Implementation Plan

4.1 The Thirty-sixth Session of the ICAO Assembly held in Montreal in September 2007 adopted a Resolution to resolve that States and PIRGs complete a regional PBN implementation plan by 2009.

4.2 Recognizing that the PBN concept is now established, States should ensure that all RNAV and RNP operations and procedures are in accordance with the PBN concept as detailed in State letter AN 11/45-07/22 and the ICAO Doc 9613: PBN Manual for ensuring a globally harmonized and coordinated transition of PBN.

4.3 In view of the need for detailed navigation planning, it is advisable to develop a Regional PBN Plan to provide proper guidance to air navigation service providers, airspace operators and users, regulating agencies, and international organizations, on the evolution of navigation capabilities as one of the key systems supporting air traffic management, and which describes the RNAV and RNP navigation applications that should be implemented in the short and medium term in the APAC Region.

4.4 Furthermore, the Asia/Pacific Regional PBN Implementation Plan will contain the basic material serving as guidance for regional projects for the implementation of air navigation infrastructure, such as ABAS, SBAS, GBAS, GRAS, etc., as well as for the development of national implementation plans.

Roles of Navigation in supporting ATM operations

4.5 An "airspace concept" may be viewed as a general vision or master plan for a particular airspace. Based on particular principles, an airspace concept is geared towards specific objectives. Strategic objectives drive the general vision of the airspace concept. These objectives are usually identified by airspace users, air traffic management (ATM), airports as well as environmental and government policy. It is the function of the airspace concept and the concept of operations to respond to these requirements. The strategic objectives which most commonly drive airspace concept are safety, capacity, efficiency, access, and the environment.

4.6 Navigation is one of several enablers of an airspace concept. Communications, ATS Surveillance and ATM are also essential elements of an airspace concept.

4.7 The PBN–concept specifies RNAV and RNP system performance requirements in terms of accuracy, integrity, availability, continuity and functionality needed for the proposed operations in the context of a particular Airspace Concept, when supported by the appropriate navigation infrastructure. In that context, the PBN concept represents a shift from sensor-based to performance-based navigation. Performance requirements are identified in navigation specifications which also identify the choice of navigation sensors and equipment that may be used to meet the performance requirements. These navigation specifications are defined at a sufficient level of detail to facilitate global harmonization by providing specific implementation guidance for States and operators.

4.8 Under the PBN concept, the generic navigation requirements are defined based on operational requirements. Thus, users may evaluate the available options. To ensure synchronization of investment and interoperability of the airborne and ground systems, the selection of the solution should be in consultation with aviation stakeholders, including international and domestic airline operators, air navigation service providers, and regulators. The solution selected should also be the most cost-effective one.

4.9 The development of the PBN concept recognized that advanced aircraft RNAV systems are achieving an enhanced and predictable level of navigation performance accuracy which, together with an appropriate level of functionality, allows a more efficient use of available airspace to be realized. It also takes account of the fact that RNAV systems have developed over a 40-year period and as a result there were a large variety of differing implementations globally. Identifying navigation requirements rather than on the means of meeting the requirements will allow use of all RNAV systems meeting these requirements irrespective of the means by which these are met.

Benefits of Performance-Based Navigation

4.10 The main benefits derived from the implementation of PBN are:

a) Increased airspace safety through the implementation of continuous and stabilized descent procedures using vertical guidance;

b) Reduced aircraft flight time due to the implementation of optimal flight paths, with the resulting savings in fuel, noise reduction, and enhanced environmental protection;

c) Use of the RNAV and/or RNP capabilities that already exist in a significant percentage of the aircraft fleet flying in APAC airspace;

d) Improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimized RNAV or RNP paths;

e) Implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows;

f) Reduced delays in high-density airspaces and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas;

g) Reduction of lateral and longitudinal separation between aircraft to accommodate more traffic;

h) Decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the needs for ATC-Pilot communications and radar vectoring;

i) Increase of predictability of the flight path.

Goals & Objectives of PBN Implementation

4.11 APANPIRG, in its Eighteenth meeting (September 2007), discussed various issues related to an early implementation of PBN in the region. To facilitate coordination between States, a PBN Task Force was formed under Conclusion 18/52 and tasked to develop a harmonized regional PBN implementation plan.

4.12 The Asia/Pacific Regional PBN Implementation Plan has the following strategic objectives:

a) To ensure that the implementation of the navigation item of the CNS/ATM system is based on clearly established operational requirements.

b) To avoid undue equipage of multiple on board equipment and/or ground-based systems.

c) To avoid the need for multiple airworthiness and operational approvals for intra- and inter-regional operations.

d) To explain in detail the contents of the Regional Air Navigation Plan, relating to potential navigation applications.

4.13 Furthermore, the Asia/Pacific Regional PBN Implementation Plan will provide a high-level strategy for the evolution of the navigation applications to be implemented in the APAC Region in the short term (2008-2012) and medium term (2013-2016). This strategy is based on the concepts of Area Navigation (RNAV) and Required Navigation Performance (RNP) in accordance with ICAO Doc. 9613: *Performance Based Navigation Manual*, and will be applied to aircraft operations involving instrument approaches, standard departure (SID) routes, standard arrival (STAR) routes, and ATS routes in oceanic and continental areas.

4.14 The Regional PBN Plan was developed by the APAC States together with the international organizations concerned (including IATA and IFALPA)~~,~~ and is intended to assist the main stakeholders of the aviation community plan a gradual transition to the RNAV and RNP concepts. The main stakeholders of the aviation community that benefit from this Regional Plan are:

- Airspace operators and users.
- Air navigation service providers.
- Regulating agencies.
- International organizations.

4.15 The Regional PBN Plan is intended to assist the main stakeholders of the aviation community plan the future transition and their investment strategies. For example, airlines and operators can use this Plan to derive future equipage and additional navigation capability investments; air navigation service providers can plan a gradual transition for the evolving ground infrastructure. Regulating agencies will be able to anticipate and plan for the criteria that will be needed in the future.

4.16 Recognizing the safety benefits of PBN, the thirty-sixth session of the ICAO Assembly held in Montreal, September 2007 adopted a Resolution to resolve that States and PIRGs prepare ~~a~~ PBN implementation plans by 2009 to achieve:

a) Implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones; and

b) Implementation of APV (Baro-VNAV and/or augmented GNSS) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014.

The ICAO Assembly also urges that States include in their PBN implementation plan provisions for implementation of APV to all runway ends serving aircraft with a maximum certificated take-off mass of 5700 kg or more, according to established timelines and intermediate milestones.

Planning Principles

4.17 Planning for the implementation of PBN in the APAC Region shall be based on the following principles:

a) Pre- and post-implementation safety assessments will be conducted in accordance with ICAO provisions to ensure the application and maintenance of the established target levels of safety.

b) Continued application of conventional air navigation procedures during the transition period, to guarantee the operations by users that are not RNAV and/or RNP equipped.

c) The first regional PBN implementation plan should address the short term (2008-2012) and medium term (2013-2016) and take into account long term global planning issues.

d) Target date for preparation of the first regional PBN implementation plan is APANPIRG/19 (September 2007).

5. PBN Operational Requirements & Implementation Strategy

5.1 Introduction of PBN should be consistent with the Global Air Navigation Plan. Moreover, PBN implementation shall be in full compliance with ICAO SARPs and PANS and support relevant ICAO Global Plan Initiatives.

5.2 The ICAO Council accepted the second amendment to the Global Air Navigation Plan for the CNS/ATM System in November 2006. The approved plan has been renamed as Global Air Navigation Plan (Doc 9750). The relevant Global Plan Initiatives including implementation of performance based navigation (PBN) and navigation system have been included in the Global Plan. The introduction of PBN must be supported by an appropriate navigation infrastructure consisting of an appropriate combination of Global Navigation Satellite System (GNSS), self-contained navigation system (inertial navigation system) and conventional ground-based navigation aids.

5.3 The consolidated *Navigation Strategy for the Asia/Pacific Region was* reviewed and updated by the Thirteenth meeting of CNS/MET Sub Group of APANPIRG in July 2009. The Strategy was subsequently adopted by APANPIRG in its Twentieth meeting held in September 2009 under Conclusion 20/46 and further updated in its Twenty Second Meeting held in September 2011 through Conclusion 22/xx based on a recommendation by CNS/MET SG/15.

Route Operations

5.4 As the routes structure and en-route operation are extensive and complicated in APAC – region, it is difficult to restructure and include the whole airspace in a single implementation plan for en-route operations.

5.5 Considering the traffic characteristics and CNS/ATM capability, en-route operations can be classified as Oceanic, Remote continental, and Continental en-route.

5.6 In principle, each classification of en-route operation (paragraph 5.5 above) should adopt, but not be limited to, a single RNAV or RNP navigation specification. This implementation strategy should be applied by implementing States in coordination with airspace users.

5.7 APANPIRG established the PBN Task Force to develop a PBN implementation plan for the Asia/Pacific Region and to address related regional PBN implementation issues. Accordingly, States are encouraged to work cooperatively bilaterally, multilaterally and with the PBN Task Force to ensure regional and sub-regional harmonization of en-route PBN implementation.

5.8 In areas where operational benefits can be achieved and appropriate CNS/ATM capability exists or can be provided for a more accurate navigation specification than that specified in this plan, States are encouraged to introduce the more accurate navigation specification on the basis of coordination with stakeholders and affected States.

5.9 Similarly, in circumstances where affected States are agreeable to completing an implementation in advance of the timelines specified in this plan, early implementation is encouraged on the basis of coordination between affected States and airspace users.

TMA Operations

5.10 TMA operations have their own characteristics, taking into account the applicable separation minima between aircraft and between aircraft and obstacles. TMA operations also involve–the diversity of aircraft, including low-performance aircraft flying in the lower airspace and conducting arrival and departure procedures on the same path or close to the paths of high-performance aircraft.

5.11 In this sense and as called for under APANPIRG Conclusion 18/53, States shall develop their own national plans for the implementation of PBN in sovereign TMAs. Such national plans should be based on the Asia/Pacific Regional PBN Implementation Plan, seek the harmonization of the application of PBN and avoid the need for multiple operational approvals for intra- and inter-regional operations. Applicable aircraft separation criteria should also be considered.

Instrument Approaches

5.12 States are encouraged to introduce PBN approaches that provide Vertical Guidance to enhance safety. Conventional approach procedures and conventional navigation aids should be maintained to support non-equipped aircraft during the transitional period.

5.13 During early implementation of PBN, IFR Approaches based on PBN should be designed to accommodate a mixed-equipage (PBN and non-PBN) environment. ATC workload should be taken into account while developing approach procedures. One possible way to accomplish this is to co-locate the Initial Approach Waypoint for both PBN and conventional approaches

6. Current Status & Forecast

APAC traffic forecast

6.1 Traffic forecasts have a special role to play in the planning and implementation processes; they represent the demand for future ATM. Global Air Navigation Plan (Doc 9750) requires that the Planning and Implementation Regional Groups (PIRGs) base their work on well developed traffic density forecasts. Guidance on the preparation of traffic forecasts is provided in *Manual on Air Traffic Forecasting* (Doc 8991). At the Asia/Pacific regional level, the traffic forecasting activities were started with the formation of ICAO Pacific Area Traffic Forecasting Group formed in 1991. The

scope of the group was subsequently broadened to include Intra-Asia/Pacific traffic also and the group was renamed as Asia/Pacific Area Traffic Forecasting Group (APA TFG).

6.2 Report of the Fourteenth meeting of Asia/Pacific Area Traffic Forecasting Group (APA TFG/14) has been published as Doc 9915. Report includes medium term forecasts of air traffic in the Transpacific area and for selected Transpacific and Asia/Pacific city pair markets through 2012. Report also contains a long term forecast with a horizon to the year 2025 and the short term forecast for the period 2008 – 2010 and intermediate forecasts for each of the years 2015 and 2020. Forecasts are provided for total passenger traffic and aircraft movements and in the case of the aggregate transpacific market also for peak hour movements on selected groups for the year 2012.

6.3 The February 2008 forecast prepared by IATA–for APAC traffic in respect of passenger, cargo, aircraft movements and new aircraft deliveries in the Regions is also provided in the Appendix B to this plan as reference.

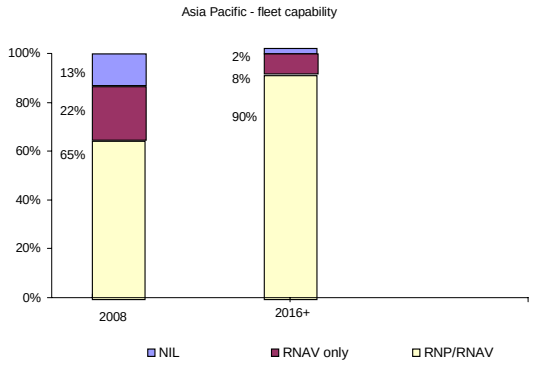
Aircraft fleet readiness status

6.4 2007 was a record year for Asia/Pacific airlines with 418 new aircraft deliveries and more than 1,000 new orders. The overall number of deliveries to Asia/Pacific based airlines in 2008 is expected to total 430 aircraft.

6.5 All major commercial aircraft manufacturers since the 1980's have included RNAV capabilities. The commercial aircraft currently produced incorporate an RNP capability.

6.6 One significant issue for PBN implementation today is directly related to the multitude of FMS installations and varying degrees of capabilities associated with the current fleet of RNAV aircraft. Specifically, there are numerous FMS systems installed in today's fleets, all with varying capabilities.

6.7 The diagram below displays a high level analysis based on fleet numbers from Ascend Online Fleets database March 2008 and RNAV/RNP classification by IATA.



CNS Infrastructure

Navigation infrastructure

Global Navigation Satellite System (GNSS)

6.8 Global Navigation Satellite System (GNSS) is a satellite-based navigation system utilizing satellite signals, such as Global Positioning System (GPS), for providing accurate and reliable position, navigation, and time services to airspace users. In 1996, the International Civil Aviation

Organization (ICAO) endorsed the development and use of GNSS as a primary source of future navigation for civil aviation. ICAO noted the increased flight safety, route flexibility and operational efficiencies that could be realized from the move to space-based navigation.

6.9 GNSS supports both RNAV and RNP operations. Through the use of appropriate GNSS augmentations, GNSS navigation provides sufficient accuracy, integrity, availability and continuity to support en-route, terminal area, and approach operations. Approval of RNP operations with appropriate certified avionics provides on-board performance monitoring and alerting capability enhancing the integrity of aircraft navigation.

6.10 GNSS augmentations include Aircraft-Based Augmentation System (ABAS), Satellite-Based Augmentation System (SBAS), Ground-Based Augmentation System (GBAS), and Ground-based Regional Augmentation System (GRAS).

Other PBN navigation infrastructure

6.11 Other navigation infrastructure includes INS, VOR/DME, DME/DME, and DME/DME/IRU. These navigation infrastructures may satisfy the requirements of RNAV navigation specifications, but not those of RNP.

6.12 INS may be used to support PBN en-route operations with RNAV 10 and RNAV 5 navigation specifications.

6.13 VOR/DME may be used to support PBN en-route and STAR operations based on the RNAV 5 navigation specification.

6.14 Uses of DME/DME and DME/DME/IRU may support PBN en-route and terminal area operations based on RNAV 5, RNAV 2 or RNAV 1 navigation specifications. Validation of DME/DME coverage area and appropriate DME/DME geometry should be conducted to identify possible DME/DME gaps, including identification of critical DMEs, and to ensure proper DME/DME service coverage.

Surveillance infrastructure

6.15 For RNAV operations, States should ensure that sufficient surveillance coverage is provided to assure the safety of the operations. For RNP operations, surveillance coverage may not be required. Details on the surveillance requirements for PBN implementation can be found in the ICAO PBN Manual and ICAO PANS-ATM (Doc 4444), and information on the current existing surveillance infrastructure in APAC can be found in ICAO FASID tables.

Communication infrastructure

6.16 Implementation of RNAV/RNP routes includes communication requirements. Details on the communication requirements for PBN implementation can be found in ICAO PANS-ATM (Doc 4444), ICAO RCP Manual (Doc 9869), and ICAO Annex 10. Information on the current existing communication infrastructure in APAC can also be found in ICAO FASID tables.

7. Implementation Plan for Performance Based Navigation

ATM Operational Requirements

7.1 The Global ATM Operational Concept (Doc 9854) makes it necessary to adopt an airspace concept able to provide an operational scenario that includes route networks, minimum separation standards, assessment of obstacle clearance, and a CNS infrastructure that satisfies specific strategic objectives, including safety, access, capacity, efficiency, and environment.

7.2 In this regard, the following programmes will be developed:

a) traffic and cost benefit analyses

b) necessary updates on automation

c) operational simulations in different scenarios

d) ATC personnel training

e) Flight plan processing

f) Flight procedure design training to include PBN concepts and ARINC-424 coding standard

g) Enhanced electronic data and processes to ensure appropriate level of AIS data accuracy, integrity and timeliness

h) WGS-84 implementation in accordance with ICAO Annex 15

i) iuniform classification of adjacent and regional airspaces, where practicable

j) RNAV/RNP applications for SIDs and STARs

k) Coordinated RNAV/RNP routes implementation

l) RNP approach with vertical guidance

Short Term Implementation Plan

Route Operations

7.3 During the planning phase of any implementation of PBN routes, States should gather inputs from all aviation stakeholders to obtain operational needs and requirements. These needs and requirements should then be used to derive airspace concepts and to select appropriate PBN navigation specification.

7.4 In this phase, the application of RNAV 10 and RNP 4 navigation specifications is expected for Oceanic and Remote continental routes. Prior to implementation of RNP 4, States should consider air traffic demands, ATC workload, surveillance and communication capabilities and fleet readiness statistics, and consult all stakeholders.

7.5 For Continental routes, the application of RNAV 5 and RNAV 2 navigation specifications is expected. In the continental en-route areas of operation, States may choose to implement RNAV 2 routes to enhance efficiency of airspace usage and support closer route spacing, noting that appropriate communication and surveillance coverage must be provided. The RNAV 2 navigation specification can also be used in airspace~~,~~ where sufficient CNS capability is provided and there are operational benefits.

TMA Operations

7.6 In selected TMAs, the application of RNAV 1 in a radar environment can be supported though the use of GNSS or ground navigation infrastructure, such as DME/DME and DME/DME/IRU. In this phase, mixed operations (equipped and non-equipped) will be permitted.

7.7 In a non-radar environment and/or in an environment without adequate ground navigation infrastructure, the SID/STAR application of Basic-RNP1 is expected in selected TMAs with exclusive application of GNSS. In this phase, mixed operations (equipped and non-equipped) will be permitted.

Instrument Approaches

7.8 The application of RNP APCH with Baro-VNAV procedures is expected to be implemented in the maximum possible number of airports, commencing primarily with international airports. To facilitate transitional period, conventional approach procedures and conventional navigation aids should be maintained for non-equipped aircraft.

7.9 States should promote the use of APV operations (Baro-VNAV or augmented GNSS) to enhance safety and accessibility of RNP approaches.

7.10 The application of RNP AR APCH procedures should be considered in selected airports, where obvious operational benefits can be obtained due to the existence of significant obstacles.

Summary table & Implementation targets

Short Term (2008-2012)*		
Airspace	**Preferred Nav. Specifications**	**Acceptable Nav. Specifications**
Route – Oceanic	RNP 4	RNAV 10
Route – Remote continental	RNP 4	RNAV 10
Route – Continental en-route	RNAV 2, RNAV 5	
TMA – Arrival	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
TMA – Departure	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
Approach	RNP APCH with Baro-VNAV in most possible airports RNP AR APCH in airport where there are obvious operational benefits.	
Implementation Targets • RNP APCH (with Baro-VNAV) in 30% of instrument runways by 2010 and 50% by 2012 and priority should be given to airports with operational benefits • RNAV 1 SID/STAR for 50% of international airports by 2010 and 75% by 2012 and priority should be given to airports with RNP Approach • Re-defining existing RNAV/RNP routes into PBN navigation specification by 2012 • Implementation of additional RNAV/RNP routes		

*** Note:** Early completion of an implementation is encouraged within the timeframe on the basis of coordination between affected States and airspace users.

Medium Term Implementation Plan

Route Operations

7.11 Noting the current development of route spacing standards for RNAV 1, RNAV 2, RNP 2, in this phase, it is expected that the implementations of all existing RNAV/RNP routes are consistent with PBN standards. States are encouraged~~,~~ to harmonize their RNAV/RNP routes based on consistent PBN navigation specifications and separation standards. Implementations of additional RNAV/RNP routes are also encouraged.

7.12 With the utilization of ADS and CPDLC, the application of RNP routes in the Oceanic and Remote continental airspace in the APAC Region is expected. This will permit the use of smaller lateral and longitudinal separation, such as 30 NM based on the RNP 4 navigation specification. States should also consider the fleet readiness status during their planning.

7.13 Noting the current development of RNP 2 navigation specification, in this phase, the application of RNP 2 is expected for the continental en-route airspace with high air traffic density. Depending on the sufficiency of DME/DME coverage or GNSS availability, States may consider the use of RNAV 2 navigation specification.

7.14 In this phase, the establishment of a backup system in case of GNSS failure or the development of contingency procedures will be necessary.

TMA Operations

7.15 Noting the current development of Advanced RNP 1 navigation specification, in this phase, it is expected that the application of RNAV 1 or RNP 1 will be expanded in selected TMAs. The application of RNAV 1/RNP 1 will also depend on DME/DME infrastructure, GNSS availability and aircraft navigation capability. In TMAs of high air traffic complexity and movement, the use of RNAV 1 or RNP 1 equipments will be mandatory. In TMAs of less air traffic complexity, mixed operations will be permitted (equipped or non-equipped).

Instrument Approaches

7.16 In this phase, the extended application of RNP APCH with Baro-VNAV or APV in most airports is expected. These applications may also serve as a back-up to precision approaches and provide vertical guided approaches for the runways without precision approach capability.

7.17 The extended application of RNP AR Approaches is expected for airports where there are operational benefits.

7.18 The introduction of application of landing capability using GNSS and its augmentations is expected to guarantee a smooth transition toward high-performance approach and landing capability.

Summary table & Implementation targets

Medium Term (2013-2016)*		
Airspace	**Preferred Nav. Specification**	**Acceptable Nav. Specification**
Route – Oceanic	RNP 2**, RNP 4	RNAV 10
Route – Remote continental	RNP 2	RNAV 2, RNP 4, RNAV 10
Route – Continental en-route	RNAV 1, RNP 2	RNAV 2, RNAV 5
TMA – Arrival	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
TMA – Departure	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
Approach	Expansion of RNP APCH (with Baro-VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations	
Implementation Targets • RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016 • RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016 • RNAV 1 or RNP 1 SID/STAR for 70% of busy domestic airports where there are operational benefits • Implementation of additional RNAV/RNP routes		

*** Note 1:** In circumstances where affected States are agreeable to completing an implementation in advance of the timeline, early implementation is encouraged on the basis of coordination between affected States and airspace users.

** **Note 2:** Related CNS requirements and operational procedures for RNP 2 application in Oceanic Airspace are yet to be determined.

*** **Note 3:** When establishing the implementation targets in accordance with Assembly Resolution A37-11, the States should first conduct an analysis of the instrument RWY eligibility for APV approach. This analysis should include the feasibility of the APV at a particular location, the presence of regular commercial operations and the current or projected user fleet capability for APV. Locations where APV approach is either not feasible or where the regular operators cannot realize the benefit of APV within the set implementation timeline, need not be included. Where APV is not implemented, States should consider implementation of RNP APCH with LNAV minima instead of APV to provide the safety benefits of straight-in approach procedures.

Long Term Implementation Strategies (2016 and beyond)

7.19 In this phase, GNSS is expected to be a primary navigation infrastructure for PBN implementation. States should work co-operatively on a multinational basis to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated research and development programmes on GNSS implementation and operation.

7.20 Moreover, during this phase, States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance.

7.21 With the expectation that precision approach capability using GNSS and its augmentation systems will become available, States are encouraged to explore the use of such capability where there are operational and financial benefits.

8. Transitional Strategies

8.1 During transition to PBN, sufficient ground infrastructure for conventional navigation systems must remain available to serve non-equipped flights. Before existing ground infrastructure is considered for removal, users should be given reasonable transition time to allow them to equip appropriately to attain equivalent PBN-based navigation performance. States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised. Performance of safety assessments and consultation with users through regional air navigation planning processes will be necessary.

8.2 States should coordinate to ensure that harmonized separation standards and procedures are developed and introduced concurrently in all flight information regions along major traffic flows to allow for a seamless transition towards PBN.

8.3 States should cooperate on a multinational basis to implement PBN in order to facilitate seamless and inter-operable systems and undertake coordinated research and development programmes on PBN implementation and operation.

8.4 States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance**,** taking due consideration of the needs of State aircraft.

8.5 States should encourage operators and other airspace users to equip with PBN-capable avionics. This can be achieved through early introductions of RNP approaches, preferably those with vertical guidance.

8.6 ICAO Asia-Pacific Regional Office should provide leadership supporting implementation and transition towards PBN.

9. Safety Assessment & Monitoring Requirements

Need for a safety assessment

9.1 To ensure that the introduction of PBN applications within the Asia/Pacific Region is undertaken in a safe manner, in accordance with relevant ICAO provisions implementation shall only take place following conduct of a safety assessment by the implementing State or group of States that demonstrates that an acceptable level of safety will be met. This assessment may also need to demonstrate that residual levels of risk associated with specific PBN implementations are acceptable. Additionally, after implementation ongoing periodic safety reviews shall be undertaken by the

implementing State or group of States, where required, in order to establish that operations continue to meet acceptable levels of safety.

En-route safety assessment and monitoring

9.2 When considering en-route PBN implementations, the ICAO *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444, Chapter 5, Section 5.4) contains procedures and RNAV procedural separation minima for use in the separation of aircraft in the en-route phase. In some cases, these separation minima require specific RNP capabilities and are based on collision risk modelling which determines communications and surveillance requirements. However, this modelling does not include all operational and technical aspects and is dependent upon parameter values that may vary depending on the particular airspace where the separation minimum will be applied. Therefore, prior to implementation, a system verification of sufficient duration and integrity must be performed to assess such parameters and conditions including weather deviations or other contingency events for the airspace concerned and to demonstrate that operational and technical requirements will be met.

9.3 APANPIRG has established the Regional Airspace Safety Monitoring Advisory Group (RASMAG) to facilitate the airspace safety monitoring aspects for implementations of reduced separation minima and CNS/ATM applications within the Asia and Pacific Regions. RASMAG has adopted the term En-route Monitoring Agency (EMA) to describe an organization providing airspace safety assessment, monitoring and implementation services for international airspace in the Asia/Pacific region to assist the implementation and operation of reduced horizontal (lateral and longitudinal) separation minima. To ensure regional harmonization of en-route safety assessment requirements and methodologies, implementing States are encouraged to work cooperatively with RASMAG who will provide guidance and technical assistance to States to support their en-route PBN implementations.

Undertaking a safety assessment

9.4 The implementing State or group of States shall ensure that a safety assessment and, where required, ongoing monitoring of PBN implementations are conducted. The implementing State or group of States may have the capability to undertake such activities or, in the case of en-route implementations, may seek assistance from an En-route Monitoring Agency. The latter course of action is preferred as an EMA can establish the necessary monitoring and data collection activity in an effective manner for the international airspaces in which the EMA holds responsibility.

9.5 In undertaking a safety assessment to enable en-route implementation of PBN, a State authority or EMA shall:

1) Establish and maintain a database of PBN approvals;
2) Pre-implementation - conduct safety and readiness assessments and, for international implementations, report results to RASMAG;
3) Post-implementation - maintain awareness of data link performance and monitor aircraft horizontal-plane navigation performance and the occurrence of large navigation errors (lateral and longitudinal), implement remedial actions as necessary and, for international implementations, report results to RASMAG;
4) Monitor operator compliance with State approval requirements after PBN implementation;
5) Initiate necessary remedial actions in any instances where PBN requirements are not met.

9.6 Detailed information relating to the international airspace jurisdiction, roles and responsibilities of regional EMAs is contained in the *Asia/Pacific En-route Monitoring Agency Handbook*, which is available from the ICAO Asia/Pacific Regional Office.

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Appendix A – CHANGES TO THE ASIA/PACIFIC REGIONAL PBN IMPLEMENTATION PLAN

Whenever a need is identified for a change to this document, the Request for Change (RFC) Form (see below) should be completed and submitted to the ICAO Asia and Pacific Regional Office. The Regional Office will collate RFCs for consideration by the Performance Based Navigation Task Force (CNS/MET Sub-group of APANPIRG).

When an amendment has been agreed by a meeting of the Performance Based Navigation Task Force then a new version of the PBN Regional Plan will be prepared, with the changes marked by an "|" in the margin, and an endnote indicating the relevant RFC, so a reader can see the origin of the change. If the change is in a table cell, the outside edges of the table will be highlighted; e.g.:

Final approval for publication of an amendment to the PBN Regional Plan will be the responsibility of APANPIRG.

PBN Regional Plan REQUEST FOR CHANGE FORM

RFC Nr:	

Please use this form when requesting a change to any part of this PBN Regional Plan. This form may be photocopied as required, emailed, faxed or e-mailed to ICAO Asia and Pacific Regional Office +66 (2) 537-8199 or icao_apac@bangkok.icao.int

1. SUBJECT:			
2. REASON FOR CHANGE:			
3. DESCRIPTION OF PROPOSAL: [expand / attach additional pages if necessary]			
4. REFERENCE(S):			
5. PERSON INITIATING:		**DATE:**	
ORGANISATION:			
TEL/FA/X/E-MAIL:			

6. CONSULTATION		**RESPONSE DUE BY DATE:**		
	Organization	**Name**	**Agree/Disagree**	**Date**
7. ACTION REQUIRE :				
8. PBN REGIONAL PLAN EDITOR			**DATE REC'D :**	
9. FEEDBACK PASSED			**DATE :**	

AMENDMENT RECORD

Amendment Number	Date	Amended by	Comments

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Appendix B – IATA Traffic Forecast

"By 2010 Asia will be the largest single market for aviation" - IATA 27th Feb 2008. Globally predicted passenger traffic will rise by 4.9 per cent per year between 2007 and 2026, almost trebling in two decades as jet planes got bigger and more people flew on them. Meanwhile airfreight will rise by 5.8 per cent annually in the same period.The greatest demand will come from the Asia-Pacific region, where airlines will take delivery of 31 per cent of new planes in the next 20 years, compared with 24 per cent for Europe and 27 per cent for North America.

Passenger
Asia Pacific airlines saw a marginal drop in demand growth from 6.2 per cent in December 2007 to 5.7 per cent in January 2008. Currently, airlines in the region benefited from increased competitiveness due to the strong Euro and the booming economies of both India and China.

Cargo
Steady year-on-year airfreight growth of 4.5 per cent was recorded in January 2008. In the larger freight markets there is continued strength. Asia Pacific airlines saw demand increase 6.5 per cent, up from 6 per cent in December 2007, boosted by the booming economies in China and India.

For the period 2002-2020 aircraft movements are expected to increase at an annual growth rate of 5.4 per cent, to reach almost 294 thousand aircraft movements by the year 2020. Average annual growth rates of 6.5, 5.7 and 5.2 per cent are forecast for the periods 2005 - 2010, 2010-2015 and 2015 - 2020, respectively.

TRANSPACIFIC PASSENGER FORECAST			
Average Annual Percentage Growth Rates			
	Low	Medium	High
2005-2010	5.3	6.5	7.8
2010-2015	4.5	5.7	7.0
2015-2020	4.0	5.2	6.5
2002-2020	4.1	5.4	6.7

The Intra-Asia/Pacific passenger aircraft movements are expected to increase at an average annual growth rate of 4.6 per cent to the year 2020. The growth rates for the intermediate periods of 2005-2010, 2010- 2015 and 2015-2020 are 5.0, 4.3 and 4.2 per cent, respectively.

INTRA ASIA /PACIFIC AIRCRAFT MOVEMENT FORECAST			
Average Annual Percentage Growth Rates			
	Low	Medium	High
2005-2010	3.6	5.0	5.5
2010-2015	3.1	4.3	5.2
2015-2020	3.1	4.2	5.2
2002-2020	3.3	4.6	5.6

New Aircraft Deliveries by Region

Record new aircraft orders were placed by the airline industry in 2005 – 2007. The large numbers of new orders represent strong confidence in the future prospects of the global airline industry. In its latest forecast of aviation growth, European aircraft maker Airbus said the world's fleet of large passenger jets (of more than 100 seats) would double in the next 20 years to nearly 33,000. The greatest demand will come from the Asia-Pacific region, where airlines will take delivery of 31 per cent of new planes in the next 20 years, compared with 24 per cent for Europe and 27 per cent for North America.

New Aircraft Deliveries by Region	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012+**
	Existing						
Africa	**665**	**26**	**15**	**20**	**16**	**13**	**28**
Asia Pacific	**3,578**	**329**	**428**	**407**	**344**	**267**	**440**
Europe	**5,301**	**292**	**348**	**364**	**251**	**153**	**297**
Latin America/Caribbean	**1,031**	**93**	**91**	**45**	**66**	**43**	**65**
Middle East	**626**	**41**	**57**	**44**	**36**	**27**	**164**
North America	**6,987**	**240**	**293**	**309**	**222**	**163**	**412**
Total	**18,188**	**1,026**	**1,237**	**1,208**	**944**	**679**	**1,551**
Increase in Global aircraft fleet (%)	**4.2**	**4.9**	**4.6**	**4.9**	**3.4**	**2.4**	**2.4**

Appendix C - Reference documentation for developing operational and airworthiness approval

General Guidelines for Obtaining Airworthiness and Operational Approvals for PBN Navigation Specifications, Version 1.0, **International Air Transport Association**, August 2008. (URL - http://www2.icao.int/en/pbn/ICAO%20Documentation/State%20and%20International%20Organization%20Publications/IATA%20Guidelines%20for%20PBN%20Operational%20Approval.pdf**)**

States should consider using the COSCAP Operational Approval Handbook [insert link to Internet copy] as a reference until ICAO Operational Approval guidance material is published.

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Appendix D – Practical Example of tangible benefits

Practical examples of tangible benefits derived from the implementation of PBN are:

- Increased airspace safety through the implementation of continuous and stabilized descent procedures using vertical guidance;
- Provision of runway-aligned final approach path which may not be possible from conventional navigation
- Reduced aircraft flight time due to the implementation of optimal flight paths, with the resulting savings in fuel, noise reduction, and enhanced environmental protection;
- Improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimized RNAV or RNP paths;
- Implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows;
- Reduced delays in high-density airspaces and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas;
- Reduction of lateral and longitudinal separation between aircraft to accommodate more traffic;
- Decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the needs for ATC-Pilot communications and radar vectoring;
- Increase of predictability of the flight path.
- Reduction of maintenance and flight inspection costs associated with conventional navigation aids

Insert here real examples of specific measurable benefits resulting from States PBN implementation (Australia, India, Maldives and Thailand volunteered to provide this information by 1 August 2011 prior to APANPIRG/22)

Appendix E: Basic Planning Elements (BPEs) Table

Basic Plan Elements	Regional Plan References
1. Policy and Implementation Planning Formation of a key working group Standards & Requirements in accordance with ICAO Communication with stakeholders	4.0
2. Assessment of CNS infrastructure	6.11-6.16
3. Assessment for PBN fleet readiness Based on actual operator traffic	6.4-6.7
4. Selection of appropriate PBN navigation specification	7.3-7.18
5. Strategies for en-route implementation Key traffic flows and city pairs identified Domestic International Harmonization in en-route, across FIRs	5.4-5.9
6. Strategies for terminal area implementation, including timeline Specify terminal areas selected for implementation by 2010	5.10- 5.11
7. Strategies for Instrument approach implementation, including timeline Specify procedures selected for implementation by 2010 APV (Baron-VNAV and/or augmented GNSS) Designate RNP APRCH (LNAV or LNAV/VNAV) Designate RNP AR APCH (with operational justification)	4.16(b) / 5.12-5.13 / 7.8-7.10 / 7.16- 7.18
8. Transition strategy Include decommissioning plan	4.17(b) / 8.0
9. Safety Assessment Pre- and post- implementation safety assessments conducted in accordance with ICAO provisions Seek guidance and technical assistance from RASMAG Periodic safety reviews undertaken by the State or group of States where required	4.17(a) / 9.0
10. Description of the tangible benefits Benefits to operations derived from PBN implementation	4.10 / Appendix D
11. Regulatory Framework and Process for Operational Approval	Appendix C

REVISED NAVIGATION STRATEGY FOR THE ASIA/PACIFIC REGION

Considering:

a) the material contained in the Performance Based Navigation Manual (Doc 9613) for enroute, approach, landing and departures operations;

b) operators are equipped to support PBN operations;

c) GNSS is the navigation sensor for RNP;

d) APV operations may be conducted with either BARO-VNAV or augmented GNSS;

e) Augmented GNSS to support Category I operations by end 2012 and Category II and III operations by 2015;

f) in the Asia/Pacific Region, ILS is capable of meeting the majority of requirements for precision approach and landing;

g) MLS CAT III is operational;

h) the need to maintain aircraft interoperability both within the Region and between the Asia/Pacific Region and other ICAO regions and to provide flexibility for future aircraft equipage.

Strategy

a) transit to PBN operations as follows :-

i) RNP10/RNP4/RNP2 for Oceanic and Remote Continental routes;
ii) RNAV5/RNAV2/RNP2/RNP0.3 for Continental En-route;
iii) RNAV1, RNAV2 and RNP1 based arrivals and departure;
iv) APV [**];
v) Precision approaches at selected runways.

with respective end states as follows:
vi) RNP4/RNP2 for Oceanic and Remote Continental routes;
vii) RNP1/RNP2/RNP0.3 for Continental En-route;
viii) RNP1 and RNP0.3 based arrivals and departure;
ix) APV[**];
x) Precision approaches at selected runways.

Note: Ideally, end-state should follow the above process but may be achieved directly without transitting through the immediate phases (i.e. (i) to (v)), if considered safe to do so.

b) retain ILS as an ICAO standard system for as long as it is operationally acceptable & economically beneficial;

c) implement GNSS with augmentation as required for APV and precision approach operations where operationally required and economically beneficial;

d) implement the use of APV operation in accordance with ICAO's requirement;

e) protect all the Aeronautical Radio Navigation Service (ARNS) frequencies; and

f) ensure civil-military interoperability.

[**] APV includes BARO-VNAV, RNP, RNP-AR, APV(SBAS)

UPDATED ADS-B SUBJECT/TASKS LIST

Serial No.	His No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Status and Action to be taken and led by
1	3	Each member State report on the number of airframes fitted and transmitting with good NUC/NIC.	D. Efficiency	GPI01/05/06/09/14/16/ 17/21/22	Report on statistics conducted	4/2011	Closed
2	14	Guidance material on how to build safety case for delivery of separation services.	A.Safety	GPI01/05/06/09/ 14/16/17/21/22	Guidance material for implementation	Apr-11	Completed
3	17	Guidance on legal liability issues for ADS-B data sharing.	A.Safety	GPI01/05/06/09/ 14/16/17/21/22	Guidance material for implementation	Aug-12	U.S.A.
4	18	Develop and implement regional collaboration project for ADS-B Out operational use including data sharing in SEA and report on implementation progress.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Sub-regional ADS-B collaboration project has been developed.	Jul-08/ Apr-11	SEA WG - On going
5	19	Develop and implement regional collaboration project for ADS-B out operational use including data sharing in South Pacific and report on implementation progress.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Develop and implement sub-regional ADS-B collaboration project.	Apr-09/ Dec-11	South Pacific States On-going
6	21	Study application of ADS-B and multilat for precision runway monitoring.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Guidance material for implementation	Apr-11	All Members On-going
7	22	Perform data collection and data analysis of ADS-B messages to examine GPS performance in different geographic areas.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Report of data collected and analyzed - continuous	Apr-11	All Members On-going
8	23	Develop and implement regional collaboration project for ADS-B out operational use including data sharing in Bay of Bengal area and report on implementation progress.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Develop and implement sub-regional ADS-B collaboration project.	Apr-09/ Dec-11	Bay of Bengal States

Serial No.	His No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Status and Action to be taken and led by
9	25	Provide feedback to the proposed amendment and template for data sharing based on experience gained by Indonesia and Singapore.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Comments	April-2011	Completed
10	26	Prepare a paper on the experience of using the ADS-B data sharing template and make any recommendations for change of the data sharing template.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Comments	April-2011	Completed Singapore & Indonesia
11	27	Clarify relation between DO260B and 3NM separation in TMA.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Prepare a WP	April-2011	Completed
12	28	Renaming SEA ADS/B WG and relation between WG and TF.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Comments	April-2011	All Members Completed
13	29	Review the forward fit requirement for SA Aware compliance by June 2012.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	To develop a strategy to resolve this issue	April-2011	IATA & Australia
14	30	To exam existing air-ground communication and surveillance capability in the boarder area between China and Myanmar and identify the need and possibility for sharing ADS-B data from potential ADS-B ground station at Lashio.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Report status and position	April-2011	China & Myanmar On-going
15	31	To exam possibility of sharing ADS-B data from potential ADS-B ground station from Coo Co and Pathein.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Report status and possibility	April-2011	Myanmar & India
16	32	ATS operational letter of agreements between neighboring FIRs among South China Sea States for radar-like surveillance service	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Report progress	April-12	China, Hong Kong China, Viet Nam and Singapore

Serial No.	His No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Status and Action to be taken and led by
17	33	Review of FPL Amendment to update AIGD and its effective date.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Update the AIGD	April-2012	Australia and Secretariat
18	34	Identify new data sharing projects in the eastern part of South China Sea.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Prepare a working paper	April-2011	Singapore
19	35	Identify new data sharing projects in Bay of Bengal.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Prepare a working paper	April-2011	Australia On-going
20	36	States to advise when their ground stations can be upgraded to receive ADS-B DO260B compliant ADS-B data.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22		April/May12	All Members
21	37	Guidance material addresig military concerns regarding sharing ADS-B data	A. Safety	GPI01/05/06/09/ 14/16/17/21/22	Prepare a working paper	April-12	Australia
22	38	Bring attention of States concerned to the risk that ADS-B data without integrity (such as NUC=0) should not be used to support procedural control	A. Safety	GPI01/05/06/09/ 14/16/17/21/22	Letter to States	October-11	Regional Office
23	39	Comparing the changes brought by DO260B and identifying any potential impacts on ATC systsms.	A. Safety	GPI01/05/06/09/ 14/16/17/21/22	Prepare a working paper	April-12	Hong Kong China & Singapore

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

DRAFT

GUIDANCE MATERIAL ON

BUILDING A SAFETY CASE FOR

DELIVERY OF AN ADS-B SEPARATION SERVICE

Version 1.0

May 2011

CONTENTS

Contents		2
References		3
Introduction		3
Definitions		4
PART A	**Generic Guidance on Safety Case Preparation**	5
1	What is a Safety Case	5
2	Generic contents of a Safety Case	5
3	Safety Planning	5
4	A Safety Case may have several discrete parts over the system lifecycle	6
5	STEP 1 – State the Purpose and Scope of the Safety Case	6
6	STEP 2 – Develop and document the safety objectives and safety requirements	7
7	STEP 3 – Develop a Safety Risk management methodology	8
8	STEP 4 – Process for Hazard Identification and Analysis	9
9	STEP 5 – Establish the Safety Risk of each Hazard	9
10	STEP 6 – Establish the Safety Risk Assessment Criteria	10
11	STEP 7 – Process for Risk Control and Mitigation	12
12	STEP 8 – Document and track the Hazards and their Risks	12
13	STEP 9 – Safety case coverage over the lifecycle of the surveillance system	12
14	STEP 10 – Authority for issue and change of the safety case	13
PART B	**Specific Elements For Inclusion in Safety Case Covering ADS-B Based Surveillance System**	14
References		14
Introduction		14
1	STEP 11 –State Implementation Roadmap	14
2	STEP 12 – Safety Case for ADS-B NRA	16
3	STEP 13 – Safety Case Contents	16
ATTACHMENTS		
Attachment A – Safety Case Coverage for a Four Part Safety Case		17
Attachment B – Sample Headings and Content for an ADS-B System Design and Implementation Safety Case		18

GUIDANCE MATERIAL ON BUILDING A SAFETY CASE FOR DELIVERY OF AN ADS-B SEPARATION SERVICE

REFERENCES

The guidance material herein uses information in the three reference documents below:

1. ICAO Doc 9859 AN/474 Safety Management Manual (SMM), Second Edition 2009 – in particular Chapter 4 'Hazards', and Chapter 5 'Safety Risks'

2. ICAO Circular 326 AN/188 'Assessment of ADS-B and Multilateration Surveillance to Support Air Traffic Services and Guidelines for Implementation'

3. RTCA DO-303/EUROCAE ED-126 December 13, 2006 'Safety, Performance and Interoperability Requirements Document for the Non-Radar Airspace Application'

Much of the information needed for the preparation of a Design Safety Case for an ADS-B surveillance service can be derived from the above reference documentation. The aspects that need to be separately covered by a proponent are those arising from any differences in the specific airspace for the surveillance system, and the system engineering of the surveillance services if they differ from the reference systems.

INTRODUCTION

Basic guidance on the building of a Safety Case for delivery of an ADS-B separation service is provided in this document. It relies on referencing existing guidance material in the publications listed above, as well as some existing Safety Cases covering early ADS-B services.

A number of discrete 'steps' in the building of a Safety Case are described to progress to a completed document.

The first steps cover the generic requirements for the preparation of a Safety Case for any airways system, including any surveillance systems used for separation by ATC. The primary reference is Chapters 4 and 5 of ICAO Doc 9859.

The remaining steps cover the elements of a Safety Case specific to a new ADS-B surveillance service. The basic references are ICAO Circular 326 and RTCA DO-303/Eurocae ED-126. These documents contain a significant amount of information on hazard identification and risk assessment of an ADS-B service (as well as a MULTILAT service.) The final steps are guidance to the actual content headings of a Safety Case for an ADS-B service.

Definitions

Accuracy: A measure of the difference between the aircraft position reported by the surveillance system, as compared to the true position

ALARP: As Low as Reasonably Practicable (in risk mitigation)

Availability The probability that a system will be able to perform its intended function when required for use.

Continuity The probability of a system to perform its required function without unscheduled interruption, assuming the system is available when the procedure is initiated (Circ 326)

Failure: Inability of the system to perform its intended service or function

Fault: Degradation in the performance of a system

Hazard: A condition or set of conditions of a system, or an object, with the potential to cause injury to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

Hazard identification: The process of recognising that a hazard exists and defining its characteristics

Integrity: The ability of a system to provide timely warnings to users when the system should not be used for navigation (and, in the case of ADS-B for surveillance).

Maintainability: The ability of a system to be retained in, or restored to service

NRA: Non-Radar Airspace

Operational Requirement: The stated purpose of the (surveillance) system

Reliability: The probability that, during a certain period of time, a system performs its prescribed functions (usually expressed in MTBF)

Risk: The probability of occurrence, together with the severity of the consequence(s), of a hazardous event

Risk assessment: The process of determining the risk involved in the occurrence of a hazardous event, and the tolerability of that risk.

Risk management: The systematic application of management policies, procedures and practices to the tasks of identifying hazards and assessing and controlling risks.

Safety: The state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management. (Doc 9859)

Safety Case: A document which provides substantial evidence that the system to which it pertains meets its safety objectives

PART A: GENERIC GUIDANCE FOR SAFETY CASE PREPARATION

1 What is a Safety Case?

1.1 One of the primary purposes of a Safety Management System is to predict what accidents or incidents may occur, how they may happen, and how they may be prevented. The processes for safety assurance may differ in details; however they all prescribe the systematic undertaking of safety risk assessment and the presentation of evidence that the particular system is safe.

One way of presenting such evidence is by preparing a Safety Case. A Safety Case is an explicit documentation of a safety critical system, its corresponding safety objectives, and the associated safety risk assessment and risk management of the system, at appropriate milestones in the life of the system.

2 Generic contents of a Safety Case

2.1 A Safety Case is a documented record of the steps or processes undertaken by the system proponent to ensure that the system has been designed, tested and implemented as safely as reasonably practicable. Its basic component is a structured, comprehensive statement of the hazards and the corresponding safety risks of the occurrence of the hazards surrounding the provision of an operational service. This should include the significance of the hazards in terms of their likelihood of occurrence and potential effects on aviation safety, and the means whereby they are to be managed. The essential features of a Safety Case are that it should:

a) fully describe the surveillance system including the operational role and functions which it covers (i.e. the configuration and the boundaries of the system);
b) define or reference the performance standards and specifications of the system;
c) establish the safety objectives and the safety requirements for the system;
d) identify the hazards and the operational consequences of the hazards. Identification of hazards and consequences must ensure that all possible failure and fault modes have been identified under all normal and abnormal modes of operation;
e) assess the associated risks (in terms of frequency of occurrence and severity) of each identified operational consequence;
f) categorize each of the risks within a recognised risk tolerability classification scheme;
g) establish the controls necessary to ensure the risks are tolerable.

3 Safety planning

3.1 It is expected that safety will be built into any new surveillance system from its early inception and that the management of safety related activities will be undertaken in a planned manner over the lifecycle of the system.

3.2 The safety plan may be a discrete element of a project management plan, if applicable, or it may stand-alone. The Safety Plan is an important basic document that sets out the safety objectives and requirements and the actions and processes to be followed in the development of the system.

3.3 The safety plan should provide the basis for the development of the several parts of the Safety Case at defined milestones as the development, design and implementation of the surveillance system progresses to commissioning and normal day-to-day operation.

4 A Safety Case may have several discrete parts over the system lifecycle

4.1 ATC surveillance systems have a lifecycle consisting of several distinct phases. The safety hazards and associated risks may differ in type and degree in each phase, and their identification and control treatment will be more appropriately undertaken at a particular phase in the lifecycle. Accordingly, Safety Cases need to be developed to separately consider the safety situation in each of the lifecycle phases. This may require several parts of the Safety Case, with each part building on the previous part as the system is developed.

4.2 The distinct phases of a surveillance system's life which may be covered by a Safety Case, are normally:

a) **the operational requirements definition phase**, when the role and broad functionality of the new system is determined. This phase should identify the safety objectives of the system and its applicable system safety requirements, (these may be based on ICAO SARPS, the State's regulatory requirements, and the service provider's internal safety standards);

b) **the design and procurement phase**, when the system is designed and developed to meet the specified operational and/or engineering requirements. In this phase, the system configuration and operation is defined, incorporating the safety objectives and requirements within the evolving design. A full hazard and risk assessment is usually undertaken at this time;

c) **the implementation phase,** when the system is subject to procedural and/or engineering readiness testing against the design specifications, followed by operational trials, such as ghosting or mimicking. At this phase, the risk assessment is tested and validated by actual trials and testing of the installed system, and specific safety related operational, engineering and/or management procedures are developed to obviate or control the identified risks; and

d) **the routine operations phase,** when the safety of the system continues to be monitored and improved as any hazards are identified as they arise, and the risks are mitigated during actual operations.

4.3 The Safety Case should describe the historical and current safety status of the system or service as it develops throughout its entire lifecycle.

5 STEP 1 – State the purpose and scope of the safety case

5.1 The purpose and scope of the Safety Case should be clearly stated in its introductory paragraphs, and should include:

a) A statement of the purpose and role of the surveillance system under consideration, i.e. its Operational Requirement.

b) A description of the system and its location; its configuration including the sub-system elements; the system boundaries; the elements of the system which have been considered within the scope of the document, i.e., whether it covers equipment, procedures, airspace, personnel, etc.; and the interfaces with other external systems.
c) A statement of the assumptions upon which the Safety Case is based. This should include the defined or known levels of safety, or integrity, of each of the interfacing or support systems/services, and those other services externally provided by third parties, such as those provided by telecommunications service providers, electrical power service providers, etc.

5.2 The relevant lifecycle phase of the system, covered by the particular part/s of the Safety Case should also be defined.

6 STEP 2 – Develop and document the safety objectives and system safety requirements

6.1 The overall safety objectives and related system safety and safety related performance requirements supporting the objectives for the system should be defined as far as possible, particularly at the design stage. Safety objectives and system safety/performance can be derived by reference to the Operational Requirement and the type of service involved – for example an enroute surveillance service may have a lower level of criticality of availability and continuity than a terminal surveillance service. The safety requirements of a particular service may be established by assessing the effect of possible functional failure or fault modes as the source of safety hazards and the associated effect on the operation of the system.

6.2 The fault modes analysis should cover conceivable faults or eventualities affecting system performance including the possibility of human errors, common mode failures, simultaneous occurrences of more than one fault, and external eventualities which cause or result in the loss of, or affect the integrity of, external data, services, security, power supply, or environmental conditions.

6.3 The assessment of the safety objectives may then result in an iterative process of revision and further development of the system design, the adoption of modified operational procedures, or the establishment of contingency arrangements. For this reason, as far as possible the safety objectives should be expressed in a form that is clear and unambiguous so that they can be tested against, and the compliance of the system determined.

6.4 The selection of an appropriate way of expressing the safety objectives is important. Traditional measures include the specification of ***availability, continuity, accuracy, maintainability, recoverability,*** *etc.,* which have some interdependence. In the case of surveillance systems, specifying only availability, without also specifying a limit on the rate of occurrence of failures and faults, and the recoverability of the system following failure, could be insufficient to adequately define the safety requirements. For instance, a very infrequent occurrence of a fairly long down-time may be less hazardous than more frequent failures with shorter down-times, particularly for an ADS-B service in NRA where reversion to procedural separation is the contingency for system failure.

6.5 Quantitative statements of safety objectives and system performance requirements should be used where possible, however, in many areas (e.g.; where people and procedures are involved) it may not be feasible to define quantitative values. For these, qualitative values can be established. Where possible, these should be equated to or assigned corresponding quantitative values.

For a surveillance system, it is obviously important for safety that the voice or data communications service between pilot and ATC has a level of availability and continuity at least equalling same levels of performance as that assigned to the surveillance system itself. Obviously the two systems should be designed so that no single point of failure can result in both systems simultaneously failing at remote stations where single power source may only be available. Bearer links back to the ATC Centre will normally need to be duplicated on separate bearer circuits in order to achieve the reliability required for surveillance services.

6.6 In the development of the Australian ADS-B surveillance service in low density enroute airspace, the following basic safety and performance requirement for both the ADS-B service and the related voice communication service were established:

Table 1 – Basic Performance Parameters for ADS-B ground system (aircraft component not included)

SERVICE	SERVICE CATEGORY	GROUND SYSTEM OPERATIONAL AVAILABILITY	GROUND SYSTEM RELIABILITY per sector. MTBF (95%confidence level)
Enroute surveillance and voice comms (low density airspace)	Essential	.999	5000 hours

Source: Airservices Australia Ops Requirements Doc v2.0

7 STEP 3 – Develop a Safety Risk management methodology

7.1 An appropriate, recognised methodology for safety risk management, i.e. for hazard identification; risk assessment; risk management, control, and mitigation, of a surveillance system, is required. The methodology may vary depending upon the type and safety implications of the proposed surveillance system, and the use of different methods, or combinations thereof, may be appropriate for the different elements and lifecycle phases included in the safety case.

7.2 Chapters 3 and 4 of the ICAO SMM are recommended as an appropriate methodology for States to adopt. Persons preparing Safety Cases are encouraged to familiarise themselves with the concepts in those two Chapters. The following Steps 4 – 8 inclusive are based on and derived from those Chapters.

8 STEP 4 – Process for Hazard Identification and Analysis

8.1 Surveillance systems for aircraft separation services provide significant safety enhancement compared with procedural systems. However, there are safety consequences that predominantly arise during abnormal conditions or in fault or failure situations. Potential risks arise if related systems for air ground communication fail, or aircraft navigation or transponder avionics lose integrity or fail. Lesser impacts on safety might occur where the integrity of a system is degraded or lost but where there are alternative back-up systems, or contingency arrangements, that can be reverted to in order to maintain separation.

8.2 The process for hazard identification and analysis is set out in section 4.5 of the ICAO SMM, from which some of the information in this section is extracted and summarised.
It is essentially a 3 step process:

a) First: Identify the generic hazard (also known as top level hazard, or TLH). Generic hazard is used as a term that intends to provide focus and perspective on a safety issue, while also helping to simplify the tracking and classification of many individual hazards flowing from the generic hazard.
b) Second: Break down the generic hazard into specific hazards components of the generic hazard. Each specific hazard will likely have a different and unique set of causal factors, thus making each specific hazard different and unique in nature.
c) Third: Link specific hazards to potentially specific operational consequences, i.e. specific events or outcomes of the occurrence of the hazard.
d) Fourth: Document the hazards and its consequence.

8.3 Techniques for hazard identification and analysis for a new surveillance system may include:

a) the use of data or experience with similar systems/changes undertaken by overseas or other
b) respected providers of ATC surveillance services;
c) quantitative modelling based on sufficient data, a validated model of the change, and analyzed assumptions; e.g. RAM modelling.
d) the application and documentation of expert knowledge, experience and objective judgement by specialist staff;
e) trial implementation of a proposed change in an “off-line” system, or under a pre-existing surveillance service, and with sufficient backup facility to revert to the existing system before the change, if risks cannot be mitigated;
f) event tree analysis (ETA);
g) failure modes and effects analysis (FMEA);
h) human factors analysis (HFA);
i) hazard identification workshop with expert personnel (HAZID).

9 STEP 5 – Establish the Safety Risk of each Hazard

9.1 The references for this process is section 5.4 and 5.5 of the ICAO SMM, and Tables 30 and 31 of RTCA DO-303/Eurocae ED-126.

9.2 For each of the identified operational consequences of the identified hazards, the safety risk should be established by assessing the probability of occurrence, and the severity of the consequence or outcome.

9.3 Safety risk probability is defined in the SMM as the likelihood that an unsafe event or condition might occur. Safety risk severity is defined as the possible consequences of an unsafe event or condition.

9.4 Particular attention should be given to hazards that have operational consequences of common mode failure. For example, for an ADS-B surveillance service, failure or drop-out or short term loss of integrity of the GNSS may lead to total or partial loss of ATC surveillance and aircraft navigation. The risk control avenues open to a service provider may identify that a safety requirement is to ensure a means of backup to provide continuity of navigation and surveillance during the loss of GNSS, particularly for a terminal area service. Alternatively procedural mitigation may be implemented. Service providers should identify the most appropriate means or combination of risk controls based on local infrastructure and operational circumstances.

9.5 The following tables have been extracted from the SMM as the criteria for the risk assessment process.

Table 2: Safety Risk Probability Table (source ICAO SMM)

Probability	Meaning	Value
Frequent	Likely to occur many times	5
Occasional	Likely to occur sometimes	4
Remote	Unlikely to occur, but possible	3
Improbable	Very unlikely to occur	2
Extremely improbable	Almost inconceivable that the event will occur	1

Table 3: Safety Risk Severity Table (source ICAO SMM)

Severity of Occurrence	Meaning	Value
Catastrophic	Equipment destroyed Multiple deaths	A
Hazardous		B
Major	A significant reduction in safety margins, physical distress or a workload	C
Minor	Nuisance Operating limitations Use of emergency procedures Minor incident	D
Negligible	Little consequences	E

10 STEP 6 – Establish the Safety Risk Assessment Criteria

10.1 In order to ensure that the range of possible safety risks are appropriately classified and controlled, it is necessary for service providers to establish standard, stand-alone, criteria for safety risk assessment and classification. Such a safety risk classification scheme provides a structure for deriving the safety requirements for any airways system, as well as the criteria for risk control decisions. Typically, such schemes provide a standard relationship between the probability of

occurrence of each risk and the categorised severity of the risk in terms of its potential impact on safety.

10.2 A Safety Case document must include or reference the risk assessment criteria (also termed a Risk Tolerability Classification scheme) adopted by the service provider for system safety management.

10.3 The following two Tables (Table 4 and Table 5) have been extracted from the ICAO SMM for Safety Risk Assessment criteria and Safety Risk Tolerability criteria:

Table 4: Safety Risk Assessment Matrix (source ICAO SMM)

Risk Probability	Risk Severity				
	Catastrophic A	**Hazardous B**	**Major C**	**Minor D**	**Negligible E**
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2		2B	2C	2D	2E
Extremely Improbable 1	1A	1B	1C	1D	1E

Table 5: Safety Risk Tolerability Matrix (source ICAO SMM)

Suggested criteria	Assessment risk index	Suggested criteria
INTOLERABLE	5A, 5B,5C, 4A, 4B, 3A	Unacceptable
TOLERABLE/MITIGATE	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C	Acceptable based on risk mitigation. May require management decision
ACCEPTABLE	3E, 2D, 2E, 1A, 1B, 1C, 1D, 1E	Acceptable

10.4 A further reference, specifically for a surveillance service is shown in RTCA DO-303/EUROCAE ED-126. Table 30 of that document presents a qualitative Hazard Classification Matrix derived from ED-78A/DO-264 with 5 grades of risk severity. However, the Risk Classification Scheme (RCS) actually used in the Operational Safety Analysis presented in RTCA DO-303/EUROCAE ED-126 at Table 31 is derived from Table 30 and is based on 5 grades of Safety Targets with the Risk Classification per flight hour of each expressed quantitatively. The scheme is repeated in Table 6 below for reference:

Table 6: DO-303 OSA - Risk Classification Scheme for ADS-B Surveillance Service

Safety Targets	Risk per flight-hour	Risk per flight
ST1 Accident	**1e-08**	**1e-08**
ST2 Serious Incident	**1e-05**	**1e-05**
ST3 Major Incident	**1e-04**	**1e-04**
ST4 Significant Incident	**1e-02**	**1e-02**
ST5 No immediate effect on safety	**Not rated**	**Not rated**

11 STEP 7 – Process for Risk Control and Mitigation

11.1 A risk control process to eliminate, control or mitigate all risks categorised as intolerable or unacceptable, at least to a tolerable or acceptable level, must also be defined. Risk controls may vary considerably, and employ any one, or a combination of, the following:

a) system redesign, modification or replacement;
b) process or procedures redesign, particularly procedures by operational personnel;
c) reliability improvement schemes;
d) personnel education and/or training;
e) various management controls on personnel, operational procedures and equipment; and
f) regulatory controls; including aircraft equipage mandates, limitations on entry to airspace by unequipped aircraft; equipage requirements in accordance with ICAO SARPs, etc.

11.2 Any identified risks which cannot be controlled to a tolerable level shall be explicitly included in a section of the Safety Case which includes a full discussion on all relevant aspects of the risk. The rationale for any decision to proceed with the development or operation of the system while the risk prevails is to be stated and justified.

11.3 **Precedence of Risk Controls.** In the application of the above or other risk control processes, a safety precedence sequence should be adopted and applied. For instance, control of identified hazards should normally be sought first through improved system design or equipment changes, followed then by specific operational procedures or training. For some risks, only one type of mitigation process will be feasible, others may need several means of risk control to bring the overall risk into tolerability. Whichever means of control is implemented the control process should demonstrate how the risks are being brought within the acceptable or tolerable areas of the criteria.

12 STEP 8 – Document and track the Hazards and their Risks

12.1 A standard method of documenting and tracking Hazards and Risks should be established.

12.2 Figure 4.2 of Chapter 4 of the ICAO SMM indicates the process involved in hazard/risk documentation.

12.3 The proformae used for the purpose of documenting/tracking Hazards relevant to ADS-B service as used by two States are shown in ICAO Circular 326 at Appendices G1/G2 (Australia) and Appendix G3 (USA).

13 STEP 9 – Safety Case coverage over the lifecycle of the surveillance system

13.1 As previously discussed, Safety Cases should be developed in separate parts to define the safety situation of the system over the discrete stages of its lifecycle. A four part Safety Case has been adopted by some service providers to define the safety situation at the Operational Requirements Definition stage, at the completion of the Design and Procurement phase, at the Implementation stage, and for the routine Operational phase.

13.2 The contents of the Safety Case will differ for each part. For some systems, it may be appropriate to have more or fewer parts of the Safety Case. For all parts, the level of description and detail included should be sufficient to provide a reasonably informed reader with an understanding of the safety situation, without the need to refer extensively to supporting references. A decision on the number of Parts should be made at an early stage of a surveillance project.

13.3 A guide to the coverage of each part of a four part Safety Case is included in Attachment A ‘Safety Case Coverage for a Four Part Safety Case’.

14 STEP 10 – Authority for issue and change of the Safety Case

14.1 Safety Cases should be placed under a documentation control process. The Safety Case should be authorised by competent authority designated by the service provider. An authority or authorities covering System Requirements, System Design, System Operation, and System Maintenance should be appointed, and the issue of the parts of the Safety Case should be made under the authorization of one or more of these designated bodies, as appropriate to the content of each part.

PART B: SPECIFIC ELEMENTS FOR INCLUSION IN SAFETY CASE COVERING ADS-B BASED SURVEILLANCE SYSTEMS

Primary references:

ICAO Circular 326, in particular:

Chapter 2: ATC Surveillance
Chapter 3: Assessment of ADS-B and MLAT surveillance
Chapter 4: State Implementation Roadmap
Appendix A: General Description of the Reference Radar
Appendix B: Technical Comparison between MSSR, ADS-B and MLAT
Appendix C: Key ADS-B Performance Requirements to Support the Claim that ADS-B Surveillance "Is As Good As the Reference SSR"
Appendix G1: HAZID and Mitigation (Australia)
Appendix G3: Hazard Analysis Report (US Capstone Program)

RTCA DO-303/EUROCAE ED-126 December 13, 2006 Safety, Performance and Interoperability Requirements Document for the ADS-B Non-Radar Airspace Application

Secondary reference:

ICAO Doc 9689 AN/953 Manual on Airspace Planning, Methodology for the Determination of Separation Minima, First Edition 1998

Introduction

This Part itemises the topics that should specifically be included in a Design and Implementation Safety Case for the introduction of an ADS-B based surveillance system. The information herein is derived from two sources; ICAO Circular 326 and the actual Design Safety Case that was produced by the Australian ANSP to gain the approval of the aviation regulator for the commissioning of the Upper Airspace ADS-B surveillance system. That Safety Case was essentially based on a comparative assessment showing that ADS-B was as good as or better than a Monopulse SSR system when used for the same surveillance purposes in the same airspace by ATC. This comparative assessment approach has been documented by the ICAO SASP in Circular 326 as an appropriate means of assessing the safety of an ADS-B separation service in low complexity airspace.

1 STEP 11 – State Implementation Roadmap

1.1 For this STEP, readers should first acquaint themselves with Chapters 3 and 4 of ICAO Circular 326.

1.2 In Chapter 3 of ICAO Circular 326, the ICAO SASP describes the assessment it undertook of the use of ADS-B to support ATS. The assessment methodology compared ADS-B to a Reference SSR which the SASP defined in terms of its technical performance. The assessment demonstrated that ADS-B surveillance is better or at least no worse than the

Reference SSR, and therefore no less safe than Radar. The SASP concluded that, if a number of ADS-B performance requirements relating to the integrity and accuracy of the received ADS-B transmissions from aircraft and the overall latency and update rates of the system are met, then ADS-B can be used as a means of supporting the provision of a 5NM separation (also 2.5NM and 3NM) minima similar to that used with radar.

1.3 However, in making that conclusion, the SASP noted that its assessment was undertaken based on global assumptions and was for low complexity airspace and for the defined reference radar. In its Conclusions to Chapter 3, for reasons it explains in that Chapter, it noted that there remains the requirement for a region or State to undertake a State or local assessment that demonstrates the intended safety level will be met using ADS-B surveillance. To this end, a 'State implementation roadmap' was provided for the guidance of States.

1.4 Circular 326 provides the references and technical evidence to show that ADS-B is as good as or better than an MSSR when used for a 3NM or 5NM separation service by ATC. It is therefore unnecessary to demonstrate that in a Safety Case covering a State or local surveillance service. A State can make reference to that finding in Circular 326 rather than prove that in a Safety Case. However, it should be noted that the Circular clearly points out that the analysis by the SASP makes assumptions on a generic airspace situation which may not be totally relevant to the airspace situation in any particular State and that State and/or local level assessments should be undertaken where there is any difference between the Sate's conditions and those in the assumptions made in the Circular, for example, in complex airspace. (Refer to Sections 4.12 and 4.14 of Circular 326.) Further, there always remains the requirement to undertake State or local level hazard identification and risk analysis of all hazards. For that purpose, the further value of Circular 326 as guidance material for ADS-B Safety Case preparation is that it provides a Compendium of Hazards and Mitigation Measures which has been extracted from several site-specific ADS-B Safety Cases of ADS-B trials and implementation undertaken in two States (USA and Australia). Further there are those identified by EUROCAE in the Annexes to ED-126. Those hazard compendiums will be of value as a reference to those States embarking on safety assessment of their own ADS-B programs.

1.5 The State Implementation Roadmap in Circular 326 comprises four distinct processes. These are:

a) Process A - Definition of Airspace Concept
b) Process B - Identification of ADS-B Performance Requirements
c) Process C – Safety Assessment
d) Process D – Preparation for Implementation

Those Processes imply that a four part Safety Case may best be adopted for those phases of system development. General guidance on the undertaking of all four Processes is given in Chapter 4 of Circular 326. It is recommended that authors of Safety Case documents for ADS-B surveillance should familiarize themselves with the Processes.

1.6 **ADS-B System Design - Performance standards**. In Appendix C to Circular 326 the ICAO SASP identifies the key ADS-B performance requirements for an ADS-B system to enable use of a 3NM or 5NM separation minimum in the provision of ATC. ADS-B 3NM and 5 NM separation services could be delivered when ADS-B data quality indicators meet the requirements in that Appendix. The Safety Case should therefore include the minimum values of quality indicators (in terms of NUC; NIC and NAC) of an aircraft ADS-B transmission before aircraft targets are displayed on ATC screens.

2 STEP 12 – Safety Case for ADS-B NRA

2.1 **RTCA DO-303/EUROCAE ED-126**. Extensive guidance material to assist in preparation of a Design Safety Case on the ADS-B NRA Application is contained in RTCA DO-303/EUROCAE ED-126. That document is a virtual Safety Case and the publication can be used as a reference alongside ICAO Circular 326. The complete document is relevant although the **Operational Safety Assessment** at Annex C has most relevance. Annex C contains the following Steps:

a) Hazard Classification Matrix as per DO-264/ED-78A (Table 30)
b) Safety Targets and Risk Classification Scheme (Table 31)
c) Operational Hazards Identification by Expert Analysis (Table 33)
d) Allocation of Safety Objectives (the maximum frequency or probability at which an operational hazard can be tolerated to occur) and the Safety Requirements for Operational Hazard mitigation.

3 STEP 13 – Safety Case Contents

3.1 **Contents of the Safety Case**. Guidance material on the **contents** (i.e. the topic headings, with a brief description of each topic that may be included under each heading) for inclusion in an ADS-B Design Implementation Safety Case is at Attachment B . This topic listing has been derived by reference to the Safety Case for the ADS-B Upper Airspace Program (UAP) prepared in Australia by the ANSP. (That particular Safety Case was the basis of the regulatory approval by CASA of the now implemented ADS-B UAP of Airservices Australia.)

ATTACHMENT A

Safety Case Coverage for a Four Part Safety Case

The following is a guide to the structure of a four part Safety Case over the life of an airways system.

Safety Case Part 1 - Operational Requirements Phase
A Safety Case Part 1 contains the Safety Objectives and the corresponding Safety Requirements for the proposed system, and will normally be the initial document provided to advise the proposed project's existence and its safety significance. The Safety Case at this stage should be an evaluation of the proposed system, perhaps most appropriately carried out by means of a Preliminary System Safety Assessment (PSSA), supplemented as necessary by overseas or previous experience, and in-house expertise and knowledge of deficiencies in existing systems which the new system is to replace.

Safety Case Part 2 - Design and Procurement Phase
Part 2 of the Safety Case is essentially to assure that the design of the system supports and provides for the safety requirements. Arguments to support the design rationale and the proposed technology of the system, and to verify and validate that such satisfies the safety requirements will be provided. The human factors aspects of the design, and the safety implications of the design of the procedures, and the ability of personnel to safely operate to the design procedures, should also be considered. Here, a full hazard and risk evaluation of the detailed design, including hardware, software, man/machine interface, human factors, equipment and administrative interfaces and external factors, should be undertaken.

Safety Case Part 3 – Implementation Phase
Part 3 of the Safety Case will provide an analysis of the safety situation following its installation and integration. The functional testing to be carried out for installation and pre-commissioning evaluation of the safety situation is detailed in this part. A testing regime aimed at validating the risk assessment made in Part 2 of the Safety Case, and identifying safety hazards not previously identified at Part 2 which arise during testing and integration and related activities, should be defined , with the strategy for assessing and managing these hazards and the safety issues which arise from such testing also specified.

Safety Case Part 4 - Normal Operations Phase
Part 4 of the Safety Case will provide the evidence that the system is safe in operational service. It will address all relevant operational and management issues, and will take account of the safety findings from the preceding three parts of the Safety Case. This part of the Safety Case is maintained as a living document for the life of the system, to define and document any further hazards, identified at post-commissioning or during routine operations, and the risk control actions taken to maintain compliance with safety objectives, in the light of actual day-to-day knowledge and experience with the system.

Note in respect to all Parts
It is important that all parts of the Safety Case be retained and maintained as necessary over the life of the system, reflecting the safety situation for any approved modifications or changes to the system.

ATTACHMENT B

Sample Headings and Content for ADS-B Design and Implementation Safety Case

No.	Heading	Brief Description of Content
1	Title	State the Title of the Safety Case. E.G. ADS-B Upper Airspace Program – Implementation Phase Safety Case
2	Purpose/Background/Operational Requirement	State the background to the development of the system. State the previous trials leading up to the implementation of the surveillance system. State the operational requirement of the system; the scope of the system and the scope of the safety case.
3	Scope	Define the scope of the system covered by the Safety Case. Operational staff impact. Technical staff impact. Changes to voice comms system. System coverage, engineering and operational standards adopted. Include coverage and location of ground station infrastructure, ground station design, bearer link network design, changes to ATM facilities at Area Centres. System transition management. Relativity to other programs. Existing system upgrade requirements. Development of new ATC procedures. Regulatory approval requirements/plans.
4	System Overview and Description	Overall system description/diagram. Ground Stations locations. Site Monitor. Terrestrial and satellite bearer links to ATC Centres. ATC System Processors. ATC Display. Remote Control and Monitoring System. RAIM prediction system. Power supply system(s). Provide schematic diagram of overall system including third party provided services and data-links
5	VHF Communication System	Overall voice comms system description/performance standards/overview/ bearers/third party provided services.
6	New ATC Procedures and Staff Training plan	Define existing separation standards and the intended new separation standard(s). Define ATC staff training required for ‘radar-like service’.
7	Logistics support	Define all aspects of the ILS plan including hardware and software maintenance, spares support plan,
8	Safety Requirements	Establish the safety standards and requirements in terms of system performance parameters (RAM).
9	Assumptions, Constraints and Dependencies	Comparison with radar for 5NM separation service. Proposed aircraft operational accuracy (NAC) and integrity (HPL) standards. State dependencies with related projects (voice, data bearers, aircraft equipage requirements, ATC system upgrades, etc)
10	Responsibilities	Establish the relevant staff responsibilities for the project implementation and safety management. Include all specialist and management personnel and responsibilities
11	Consultation and Communication	State the external consultation undertaken with stakeholders including any issues in relation to safety considerations. Provide references to documentation of

No.	Heading	Brief Description of Content
		consultation outcomes.
12	Design Process	Define the design process undertaken in system development. Define the design test plan/procedures and the outcome of design reviews.
13	Design Safety Risk Management	Describe the processes undertaken for Safety Risk Management at the design phase. Include reference to design HAZID and HAZLOG reviews undertaken. Establish the current status of all hazards identified in the design phase
14	Design Limitations and Shortcomings	Itemize all design phase deficiencies remaining (major and minor) and their safety status and impact
15	Implementation Process	Establish engineering transition plan. Establish operational transition plan. Establish contingency plan for reversion to existing system.
16	Status of Safety Controls and Safety Requirements	State the status of all safety controls and requirements. All outstanding Hazards and all safety requirements not satisfied to be subject to individual documentation
17	Engineering Support and Engineering System Maintenance	Describe the means of future engineering support – internally and externally to the organisation as applicable. Provide references to documented system maintenance procedures.
18	Criteria for Maintenance Technician certification	Establish the technician competency requirements for system monitoring, operation and maintenance.
19	Safety Performance Monitoring	Describe or reference the process for monitoring and management of safety performance after implementation of the system.
20	ATC Staff Training and Education Plan	Establish the ATC staff training plan and comprehensive training package.
21	Pilot Information Package	Provide reference to the Pilot Information and the dissemination of the package.
22	SystemTransition Plan	
23	RAM End-to-End System Analysis	Undertake Reliability, Availability, Maintainability analysis of the end-to-end system. (Use manufacturer provided RAM data or field data if available.) Compare results with established design standards/requirements.
24	System Test Procedure	Describe generally and provide reference to the detailed System Test Plan.
25	System Test Results	State the outcome of the system tests undertaken
26	**Define the System Safety Risk Management plan**	**Provide documentation of the safety risk management plan**
27	**Define Risk Management Process used for the Safety Case**	**Risk Management Process to be defined or referenced. Include process for Hazard Identification, Risk Assessment, Risk Classification, and Risk Control processes.**
28	**HAZID**	**Provide the record of all HAZID activities undertaken**
29	**Status of Hazards (HAZLOG)**	**Provide documentation of the status of all Hazards.**
30	**List all Hazards not controlled to tolerable level**	**List all Hazards not controlled to tolerable level, the reasons and justification.**

No.	Heading	Brief Description of Content
31	Post implementation review plan	Establish the plan, timing and procedures for post implementation review of the performance and safety of the system.
32	Related documentation	Include listing of references to all related or referenced documents

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EDITION 2

**SAMPLE LETTER OF AGREEMENT
ON AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST (ADS-B)
COLLABORATION BETWEEN
[PARTY 1]
AND
[PARTY 2]**

This Agreement is made on the [ ] day of [ ] 2011

BETWEEN

The [Party 1] of [Address], hereinafter referred to as "[.]",

And

The [Party 2] of [Address], hereinafter referred to as "[.]";

(each individually referred to as a "Party" and collectively as the "Parties").

WHEREAS

(A) Automatic Dependent Surveillance – Broadcast ("ADS-B") is a new surveillance technology that will enhance safety and efficiency of air traffic services provision, complementing the role of radars used by air navigation service providers currently;

(B) The Asia Pacific Air Navigation Planning and Implementation Regional Group ("APANPIRG"), recognising the benefits of ADS-B, has established the ADS-B Implementation Task Force under the auspices of the International Civil Aviation Organisation to progressively implement ADS-B in the Asia-Pacific region;

(C) It is the expressed desire of airlines, through representation by the International Air Transport Association, to reap operational benefits arising from the use of ADS-B surveillance by air navigation service providers in the separation of air traffic;

(D) In line with the global thrust towards seamless air traffic services including over oceanic airspaces, the Civil Air Navigation Services Organisation has voiced support for collaboration between air navigation services providers on sharing of ADS-B surveillance data and VHF communications facilities and services, in order to reap the full capabilities of advanced technology in the most cost-effective manner;

(E) The Parties are desirous of collaboration to enhance air traffic services in the South East Asia region by mutual sharing of the ADS-B surveillance data and to facilitate direct controller-pilot communications by availing communication facilities to each other (hereinafter referred to as "ADS-B Collaboration");

(F) The Parties have agreed to enter into this Agreement to govern their rights and obligations, to regulate their relationship with each other as Provider and User (defined below) of the ADS-B data and to reap the full potential of ADS-B for the benefit of airlines.

IT IS HEREBY AGREED as follows:

ARTICLE 1 – Definitions and Interpretations

1.1 For the purpose of this Agreement, the following definitions shall apply:

(a) "ADS-B" or "ADS-B OUT" means a function on an aircraft or vehicle that periodically broadcasts its state vector (position and velocity) and other information derived from on-board systems in a format suitable for ADS-B IN capable receivers.

(b) "ADS-B IN" means a function that receives surveillance data from ADS-B OUT data sources.

(c) "ADS-B data" means information regarding aircraft position, altitude and status received from aircraft or other information generated from the ADS-B Ground Stations that receive the information from the aircraft.

(d) "ADS-B Ground Station" means a duplicated ADS-B ground station comprising receivers and communications interfaces.

(e) "ADS-B Filtering System" means the system to process the ADS-B data from the ADS-B ground stations or from other ADS-B sources before the data are sent to the Users. It includes the data fusion equipment, filtering equipment and routers.

(f) Air Traffic Services ("ATS") includes flight information service, alerting service, air traffic advisory service, air traffic control ("ATC") service (area control service, approach control service and aerodrome control service).

(g) All Purpose Structured Eurocontrol Radar Information Exchange ("Asterix") means Eurocontrol standard format for data message exchange.

(h) "Direct Controller-Pilot Communication" ("DCPC") means VHF communications, or other approved communication media in future, which is the required means for communications in order to achieve radar-like separation.

(i) "Private Circuit" means dedicated communication links between equipment sites, including those between the Provider's and the User's premises.

(j) "Provider" means the respective party providing the ADS-B data, DCPC facilities or other services required for ADS-B Collaboration as stated in **Annex A.**

(k) "Premises" of each Party means the building or land belonging to the Party, or to the Party who has possession and control over the building or land, as the case may be.

(l) "User" means the respective party receiving the ADS-B data, using DCPC facilities or other services required for ADS-B Collaboration as stated in **Annex A**.

(m) Very High Frequency ("VHF") means the radio frequency band from 30MHz to 300MHz.

(n) "VHF Station" means a duplicated VHF ground station comprising transmitters, receivers and communications interfaces.

1.2 Unless the context or the provisions of this Agreement otherwise require:

(a) words importing the singular number include the plural number, and vice versa;

(b) references to the neuter gender include the masculine and feminine genders, and vice versa;

(c) words denoting one gender include all other genders;

(d) references to Articles and Annexes are references to Articles and Annexes of this Agreement; and

(e) the headings to the Articles hereof shall not be deemed to be a part thereof nor shall they be taken in consideration in the interpretation or construction of this Agreement.

ARTICLE 2 – Objective of the Agreement

2.1 The objective of this Agreement is to improve safety and operational efficiency in the Parties' respective provision of air traffic services for civil air traffic flow in the Parties' respective flight information regions by providing and enhancing ADS-B coverage, ADS-B data availability and DCPC facilities in these regions and where applicable, the areas including and up to 150 nautical miles from the boundaries of these flight information regions.

2.2 To achieve the objective specified in **Article 2.1**, the Parties shall provide their respective ADS-B data, DCPC facilities and other services required for ADS-B Collaboration in accordance with **Annex A** and according to the Implementation Schedule in **Annex B** and the Technical Scope of Works in **Annex C**.

2.3 The ADS-B data is to be provided for the technical and operational purposes specified in **Article 7.1**, including but not limited to:

(a) ATC situational awareness;
(b) ATC safety nets;
(c) Support of procedural separation procedures; and
(d) Updating flight plans

ARTICLE 3 – Provision of Equipment and Private Circuits

3.1 The Provider and the User shall be responsible for the provision, installation and commissioning of all equipment and private circuits required for the provision of ADS-B data, DCPC facilities and other services required for ADS-B Collaboration under this Agreement at their respective premises, unless otherwise stated in **Annex C**.

3.2 The technical requirement of the required equipment and private circuits are stated in **Annex C**.

3.3 The Provider and the User shall collaborate to test the above-mentioned equipment and private circuits to support ADS-B Collaboration before operational use.

ARTICLE 4 – Operations and Maintenance

4.1 The Provider and the User shall perform the routine maintenance, repair and replacement services of the equipment and the private circuits installed for the provision of ADS-B data, DCPC facilities and other services required for ADS-B Collaboration under this Agreement at their respective premises, unless otherwise stated in **Annex C**. The required standards of such maintenance, repair and replacement services shall be applied by the respective parties performing such services in a manner to keep the equipment and the private circuits in good working condition and fit for its purposes.

4.2 Where reasonably practicable, the Provider shall give the User a minimum of [.] days' notice in respect of any planned periodic break and a minimum of [.] hours' notice for any other planned non-periodic breaks in service.

4.3 The Provider shall report immediately or at the earliest opportunity any failure in the provision of the ADS-B data, DCPC facilities and other services required for ADS-B Collaboration, or any abnormality in the ADS-B data, DCPC facilities and other services required for ADS-B Collaboration, to the User's technical supervisor centre, as listed in **Annex C**.

4.4 The User shall monitor the ADS-B data, DCPC facilities and other services required for ADS-B Collaboration from the Provider and report immediately or at the earliest opportunity any failure in the reception or any abnormality of the ADS-B data, DCPC

facilities or other services required for ADS-B Collaboration, to the Provider's technical supervisor centre, as listed in **Annex C**.

4.5 The User will engage a maintenance agent for the routine maintenance, repair and replacement services of the DCPC facilities and other services required for provision of DCPC facilities.

ARTICLE 5 – Modifications

5.1 From time to time, the equipment, private circuits and facilities provided by the Parties may need to be modified to meet new requirements., in such situations, the Provider and the User shall be responsible, upon agreement being reached pursuant to this Article, to implement such modifications on the equipment and private circuits provided by them respectively, within the agreed timeframe. The apportionment of the modification costs is specified in **Annex D**.

5.2 Any proposal for such modification shall allow at least [.] or any agreed period between agreement of the modification and the date that the modification is proposed to become effective.

5.3 The Provider and the User shall collaborate to test the equipment, private circuits and facilities affected by such modification before operational use.

5.4 No modification to a Party's equipment, private circuits or facilities shall be effected without the express agreement in writing of the other Party if the modification will require the latter to also modify any of its equipment, private circuits or facilities.

ARTICLE 6 – Cost

6.1 The cost apportionment for the use of ADS-B data, DCPC facilities and other services required for ADS-B Collaboration including maintenance costs is specified in **Annex D**.

ARTICLE 7 – Limitations on Use and Communication of ADS-B Data

7.1 The User shall use the ADS-B data provided to ensure the safe, efficient and regular provision of civil air traffic services and activities in support of his civil air traffic services and for investigation or technical demonstration, evaluation, and test purposes. The User shall not, at all times, use such data for any other purpose, nor communicate to any party not specified in this Agreement in any manner or form whatsoever any data supplied pursuant to this Agreement, without the prior written consent of the Provider.

ARTICLE 8 – Liability

8.1 [To be mutually agreed between the Parties]

ARTICLE 9 – Force Majeure

9.1 A Provider shall not be in breach of this Agreement if any failure to perform its duties or to provide the ADS-B data, DCPC facilities and other services required under the ADS-B Collaboration, arises from or is caused by any event or circumstance which is beyond its control and which constitutes force majeure. Such Provider shall promptly inform the User and take all reasonable steps (under the circumstances) to minimise the disruption and to resume normal operations as quickly as possible.

ARTICLE 10– Settlement of Disputes

10.1 [To be mutually agreed between the Parties]

ARTICLE 11 – Final Provisions

11.1 It is understood that nothing in this Agreement shall prejudice or detract from the primary obligation of the Parties whether under domestic law or applicable international law, to ensure the safe, efficient and regular provision of civil air traffic services for the areas within their respective areas of responsibility.

ARTICLE 12 – Duration

12.1 This Agreement shall enter into force on _____ for a contract period of **[.]** years.

12.2 This Agreement shall automatically be extended for a further contract period of [.] years upon expiry of each contract period unless either Party has givenwritten notice to the other of its intention to terminate at least [.] months before the date of expiry of each contract period.

12.3 in the event the provision of any ADS-B data as specified in **Annex A** hereof is to be permanently withdrawn from service, the Provider shall give the User not less than [.] year notice in writing in advance thereof.

ARTICLE 13 – Entire Agreement

13.1 This Agreement (including the Annexes hereto) constitutes the entire agreement between the Parties in relation to its subject matter and supercedes all prior or contemporaneous agreements and understandings whether oral or written with respect to that subject matter.

ARTICLE 14 – Amendment

14.1 This Agreement shall not be amended, modified or supplemented by the Parties in any manner, except by an instrument in writing signed on behalf of each of the Parties by a duly authorized officer or representative.

ARTICLE 15 – Rights of Third Parties

15.1 For the avoidance of doubt, the Parties agree and acknowledge that no person who is not a party to this Agreement may enforce any term of this Agreement in his own right, in particular and to the extent legally possible, the Parties specifically exclude the application of any law in [State of party1], [State of party2] or elsewhere which provides that any third party has the right to enforce this Agreement.

In witness whereof, the parties having been duly authorized, have entered into this Agreement on the day and year first above written.

Signed for and on behalf of
[Party 1]

[Name and title of authorised signatory]

Signed for and on behalf of
[Party 2]

[Name and title of authorised signatory]

ANNEX A

PROVIDERS AND USERS OF ADS-B AND DCPC FACILITIES

1 In this Agreement, the Providers and Users are as specified below:

(a) [Facility 1]

Provider: [.]
User: [.]

(b) [Facility 2]

Provider: [.]
User: [.]

(c) [Facility 3]

Provider: [.]
User: [.]

2 Each Provider authorizes the User to communicate the Provider's ADS-B data to the maintenance agents appointed by the User for the purposes of maintenance and management of ADS-B equipment.

ANNEX B

IMPLEMENTATION SCHEDULE

[To include time line for various facilities]

ANNEX C

TECHNICAL SCOPE OF WORKS

1 Equipment, Facilities And Services To Be Provided By Each Party

1.1 ADS-B Stations

[Description of equipment to be provided by each party]

1.2 ADS-B Filtering System

[Description of equipment to be provided by each party]

1.3 DCPC Facilities (VHF Radio Voice Communication Station)

[Description of equipment to be provided by each party]

1.4 Private Circuits between States

[Description of equipment to be provided by each party]

2 ADS-B Data Sharing Interface Specification

2.1 Data Elements

2.1.1 ADS-B messages will comprise the data elements defined in Eurocontrol Asterix Category 21 version 0.23.

2.1.2 ADS-B Data received from each aircraft will be transmitted from each ADS-B station to the User(s) at an update rate of 1second.

2.1.3 The Asterix Category 21 version 0.23 standard allows packaging of multiple ADS-B records into a single data block, or alternatively to place a single ADS-B record per data block. Record packaging should be performed to the extent possible to minimise communication bandwidth requirements without delaying transmission of any given record.

2.1.4 The ADS-B stations and routers / processors shall not alter the contents of the data elements.

2.2 Message Description

2.2.1 The message format will be in accordance with Asterix Cat 21 version 0.23.

2.3 Communication Protocol

2.3.1 The network layer is to be implemented using the Internet Protocol (IP). The network shall support Internet Group Management Protocol (IGMP) level 0, 1 and 2 as defined in RFC3300.

Note: IGMP level 1 supports transmission of Multicast datagrams, level 2 supports transmission and reception of multicast datagrams, while level 0 corresponds to IP unicast.

2.3.2 For Asterix messages, the Network Layer will use the IP for the delivery of packets. An addressing scheme, as agreed, shall be used. Multicast shall be used.

2.4 Physical Aspects

2.4.1 The communication media will be VSAT data-link communications links and submarine cables. The bandwidth of the media shall be as follows:

[Description of communication media]

3 DCPC Facilities– VHF Radio Voice Communication interface

3.1 Communication Protocol

[Description of communication protocol]

3.2 Physical Aspects

[Description of communication media]

4 Maintenance

4.1 [Description of maintenance requirement]

5 Functional Performance Requirement

5.1 General Performance Requirements

5.1.1 The ADS-B data and DCPC facilities together with the systems and equipment that provide such data and DCPC will meet and comply with the relevant international standards and best practices for applying radar-like separation using ADS-B, or radar if such standards have not been defined for ADS-B.

5.2 Specific Performance Requirements

5.2.1 Unless otherwise stated, the ADS-B stations, ADS-B routers and DCPC facilities will be duplicated with no common point of failure.

5.2.2 The following standard will be met:

Aircraft Updates	1 second update rate
Network Latency	95%: < 2 seconds of ground-station output (from ADS-B ground station to input of the User)
Reliability 1	2 autonomous ground-stations including antennae, each providing data with no common point of failure
Reliability 2 - MTBF	Each ground-station including antenna to have MTBF >10,000 hrs
Reliability – Communications Infrastructure	Completely duplicated, no common point of failure
Reliability – Total ADS-B Service	Total Service MTBF > 50,000 hrs
Availability – Total ADS-B Service	Total Service Availability > 0.999
Integrity – Ground Station	Ground Station shall be checked by Site monitor and monitored by RCMS
Integrity – Data Communications & Processing	All systems up to ATM system, errors < 1 x 10E-6

5.2.3 The following standard for DCPC facilities will be met:

Type	System Monthly Availability Minimum Requirement
VHF Base Stations (Per Frequency)	[State required availability]

5.3 Filtering and Message Modification

5.3.1 The ADS-B data from aircraft is collected and formed into Asterix messages in accordance with the technical specification of the ground station. The content of the Asterix messages should not be removed or modified unless technically required.

6 Location and Contact Number of the Technical Supervisor Centres of Each Party

6.1 All routine co-ordination and fault reporting of the equipment, facilities or services provided by a Party will be addressed to the following technical supervisor centre at the Party's premises:

(a) Technical Supervisor Centre at [Party 1]'s premises:

[Contact details]

(b) Technical Supervisor Centre at [Party 2]'s premises:

[Contact details]

ANNEX D

COST

1 General

1.1 The costs to be borne by the Parties will be on a mutually-agreed basis between the Parties.

1.2 The costs will include equipment costs, installation and testing costs, maintenance and operating costs, private circuit or equipment lease costs, cost of performance reporting, administration costs and costs of relevant taxes including but not limited to goods and services tax and costs of relevant services including but not limited to consultancy services.

2 Costs for Provision of equipment, facilities and services

2.1 Unless otherwise specified in this Annex, each Party will pay for his own costs including all the capital and recurrent costs of the equipment, private circuits, facilities and associated services provided by him as specified in **Annex C**.

2.2 Costs of [Facility 1]

[Description on how cost of Facility 1 will be shared]

2.3 Costs of [Facility 2]

[Description on how cost of Facility 2 will be shared]

2.4 Costs of [Facility 3]

[Description on how cost of Facility 3 will be shared]

3 Technical and operational support costs

3.1 [Description on how technical and operational support costs will be shared]

4 Termination costs

4.1 [Description on how cost due to termination will be shared]

5 Modification costs

5.1 Unless otherwise agreed between the Parties, in the event of modification pursuance to **Article 5** of this Agreement, each Party will bear the modification costs of the equipment, private circuits, facilities and associated services provided by him as specified in **Annex C**.

6 Facilities Fees

6.1 [Description on fees for facilities, if any]

ANNEX E

CORRESPONDENCE

1. The correspondence between the Parties shall be posted and faxed or emailed to the addresses and attention it to the person indicated below:

To [Party 1]:
[Contact details]

To [Party 2]:
[Contact details]

2 Any Party may from time to time, by written notice to the other Party, designate a different person, facsimile or email to whom the correspondences, notices or communications must be attention to.

AMENDMENT TO AIGD

5.9.2 ADS-B Flight Planning Requirements (Before transition to new DOC4444 format in 2012)

Until the new ICAO flight plan, which incorporates ADSB designators, is in use in 2012, the following shall apply:

5.9.2.1 Flight Notification
A remark shall be entered in section 18 of the fight plan to indicate that the flight is capable of transmitting ADS-B messages via the Mode S Extended Squitter data link. The format of the remark should be:
RMK/ADSB

Note: Only flights with ADS-C capability should use the surveillance equipment indicator"D"and only flights with CPDLC capability should use the equipment indicator "J".

5.9.2.2 Aircraft Address (24 Bit Code)
Where required, the aircraft address (in hexadecimal format) may be recorded in section 18 of the ICAO flight plan as per the following example:
CODE/7C432B
States should note that use of hexadecimal code may be prone to human error and is less flexible in regard to airframe changes for a notified flight.

5.9.3 ADS-B Flight Planning Requirements (After transition to new DOC4444 format in 2012)

After transition to the new flight plan format in 2012, the following shall apply:

5.9.3.1 Flight Notification
An appropriate ADS-B designator shall be entered in section 10 of the flight plan to indicate that the flight is capable of transmitting ADS-B messages.

For information, these include:

B1 ADS-B with dedicated 1090 MHz ADS-B "out" capability
B2 ADS-B with dedicated 1090 MHz ADS-B "out" and "in" capability
U1 ADS-B "out" capability using UAT
U2 ADS-B "out" and "in" capability using UAT
V1 ADS-B "out" capability using VDL Mode 4
V2 ADS-B "out" and "in" capability using VDL Mode 4

5.9.3.2 Aircraft Address (24 Bit Code)
Where required, the aircraft address (in hexadecimal format) may be recorded in section 18 of the ICAO flight plan as per the following example:
CODE/7C432B
States should note that use of hexadecimal code may be prone to human error and is less flexible in regard to airframe changes for a notified flight.

5.9.3.3 SSR Mode S

When an aircraft is equipped with a mode S transponder, that transmits ADS-B messages, an appropriate Mode S designator should also be entered in field 10; i.e.: either

- E Transponder — Mode S, including aircraft identification, pressure-altitude and extended squitter (ADS-B) capability, or

- L Transponder — Mode S, including aircraft identification, pressure-altitude, extended squitter (ADS-B) and enhanced surveillance capability.

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ADDITION TO AIGD SECTION 9

SECTION 9 : RELIABILITY & AVAILABILITY CONSIDERATIONS

Reliability and Availability of ADS-B systems should normally be equivalent or better than the reliability and availability of radar systems.

9.1 Reliability

9.1.1 Reliability is a measure of how often a system fails and is usually measured as Mean Time Between Failure (MTBF) expressed in hours. Continuity is a measure equivalent to reliability, but expressed as the probability of system failure over a defined period. In the context of this document,, failure means inability to deliver ADS-B data to the ATC centre. Ie: Failure of the ADS-B system rather than an equipment or component failure.

9.1.2 Poor system MTBF has a safety impact because typically it causes unexpected transition from one operating mode to another. For example, aircraft within surveillance coverage that are safely separated by a surveillance standard distance (say, 5 NM) are unexpectedly no longer separated by a procedural standard distance (say 15 mins), due to an unplanned surveillance outage.

9.1.3 In general, reliability is determined by design (see para 9.3 B below)

9.2 Availability

9.2.1 Availability is a measure of how often the system is available for operational use. It is usually expressed as a percentage of the time that the system is available.

9.2.2 Poor availability usually results in loss of economic benefit because efficiencies are not available when the ATC system is operating in a degraded mode (eg using procedural control instead of say 5 NM separation).

9.2.3 Planned outages are often included as outages because the efficiencies provided to the Industry are lost, no matter what the cause of the outage. However, some organisations do not include planned outages because it is assumed that planned outages only occur when the facility is not required.

9.2.4 Availability is calculated as

Availability (Ao) = MTBF/(MTBF+MDT)

where MTBF= Mean Time Between SYSTEM Failure
MDT = Mean Down Time for the SYSTEM

The MDT includes Mean Time To Repair (MTTR), Turn Around Time (TAT) for spares, and Mean Logistic Delay Time (MLDT)
NB: This relates to the failure of the system to provide a service, rather than the time between individual equipment failures. Some organisations use Mean Time Between Outage (MTBO) rather than MTBF.

9.2.5 Availability is directly a function of how quickly the SYSTEM can be repaired. Ie: directly a function of MDT. Thus availability is highly dependent on the ability & speed of the support organisation to get the system back on-line.

9.3 Recommendations for high reliability/availability ADS-B systems

A : **System design** can keep system failure rate low with long MTBF. Typical techniques are

- to duplicate each element and minimise single points of failure. Automatic changeover or parallel operation of both channels keeps system failure rates low. Ie: the system keeps operating despite individual failures. Examples are :
  - Separate communication channels between ADS-B ground station and ATC centre preferably using different technologies or service providers eg one terrestrial and one satellite
- Consideration of Human factors in design can reduce the number of system failures due to human error. Eg inadvertent switch off, incorrect software load, incorrect maintenance operation.
- Take great care with earthing, cable runs and lightning protection to minimise the risks of system damage
- Take great care to protect against water ingress to cables and systems
- Establish a system baseline that documents the achieved performance of the site that can be later be used as a reference. This can shorten troubleshooting in future.
- System design can also improve the MDT by quickly identifying problems and alerting maintenance staff. Eg Built in equipment test (BITE) can significantly contribute to lowering MDT.

B: **Logistics strategy** aims to keep MDT very low. Typical strategies are :

- Establish availability and reliability objectives that are agreed organisation wide. In particular agree System response times (SRT) for faults and system failure to ensure that MDT is achieved. An agreed SRT can help organisations to decide on the required logistics strategy including number, location and skills of staff to support the system.
- Having appropriate maintenance support contracts in place so that faulty modules are repaired within contractually defined times – preferably with contractual

incentives/penalties for compliance. Such support contracts are best negotiated as part of the acquisition contract when competition between vendors is at play to keep costs down. Sometimes it is appropriate to demand that the support contractor also keep a certain level of buffer stock of spares “in country”.

It is strongly recommended that maintenance support is purchased under the same contract as the acquisition contract.

- Establish baseline preventative maintenance regimes including procedures and performance inspections in conjunction with manufacturer recommendations for all subsystems
- Use remote control & monitoring systems to identify faulty modules before travel to site. This can avoid multiple trips to site and reduce the repair time
- Have handbooks, procedures, tools available at the site or a nearby depot so that travel time does not adversely affect down time
- Have adequate spares and test equipment ready at a maintenance depot near the site or at the site itself. Vendors can be required to perform analysis of the number of spares required to achieve low probability of spare “stock out”
- Have appropriate plans to cope with system and component obsolescence. It is possible to contractually require suppliers to regularly report on the ability to support the system and supply components.
- Have ongoing training programs and competency testing to ensure that staff are able to perform the required role

The detailed set of operational and technical arrangements in place and actions required to maintain a system through the lifecycle are often documented in a Integrated Logistics Support Plan.

C: <u>Configuration Management</u> aims to ensure that the configuration of the ground stations is maintained with integrity. Erroneous configuration can cause unnecessary outages. Normally configuration management is achieved by :

- Having clear organizational & individual responsibilities and accountabilities for system configuration.
- Having clear procedures in place which define who has authority to change configuration and records of the changes made including, inter alia
  - The nature of the change including the reason
  - Impact of the change & safety assessment
  - An appropriate transition or cutover plan
  - Who approved the change
  - When the change was authorized and when the change was implemented

- Having appropriate test and analysis capabilities to confirm that new configurations are acceptable before operational deployment.
- Having appropriate methods to deploy the approved configuration (Logistics of configuration distribution). Suggested methods;
  - Approved configuration published on intranet web pages
  - Approved configuration distributed on approved media

D: <u>Training & Competency plans</u> aim to ensure that staff have the skills to safety repairs Normally this is achieved by :

- Conduct of appropriate Training Needs Analysis (TNA) to identify the gap between trainee skill/knowledge and the required skill/knowledge.
- Development and delivery of appropriate training to maintainers
- Competency based testing of trainees
- Ongoing refresher training to ensure that skills are maintained even when fault rates are low

E: <u>Data collection & Review</u> :

Regular and scheduled review should be undertaken to determine whether reliability/availability objectives are being met. These reviews need to consider :

- Reports of actual achieved availability & reliability
- Data regarding system failures including “down time” needs to be captured and analysed so the ANSP actually knows what is being (or not being) achieved.
- Any failure trends that need to be assessed. This requires data capture of the root cause of failures
- Any environmental impacts on system performance, such coverage obstructions such as trees, planned building developments, corrosion, RFI etc. Changes in infrastructure may also be relevant including airconditioning (temperature/humidity etc) and power system changes.
- System problem reports especially those that relate to software deficiencies (design)
- System and component obsolescence
- Staff skills and need for refresher training

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PROPOSED MODIFICATION TO REGION PROCEDURES – ADS-B

1.1 ADS-B technology is increasingly being adopted by Asia Pacific States. Asia Pacific adopted 1090 Extended squitter technology.

1.2 Reliance on ADS-B transmissions can be expected to increase over the coming years.

1.3 Transitional schemes that require maintenance of lists of approved and/or incorrectly operating aircraft are cumbersome, costly and error prone. List based systems cannot be practically used with ADS-B air-air applications. ADS-B air-air applications are already installed on some aircraft.

1.4 Currently a number of aircraft are transmitting ADS-B data which is misleading or non compliant with the ICAO standards expressed in Annex 10. Examples include:

- Aircraft broadcasting incorrect message formats;
- Aircraft broadcasting inertial positional data and occasionally indicating in the messages that this data has high integrity when it does not;
- Using GPS sources that do not generate correct integrity data, whilst indicating in the messages that the data has high integrity'
- Transmitting ADS-B data with changing (and incorrect) Flight Identity; and
- Transmitting ADS-B data with incorrect Flight Identity continuously

1.5 If the benefits of ADS-B are to flow to the aviation Industry, misleading and non compliant ADS-B transmissions should be stopped. There can be little justification for transmission of misleading data because it generates a potential safety risk if that data is used.

1.6 One state (Australia) promulgated regulations in 2007 that prohibited misleading and non compliant ADS-B transmissions. The regulation

> 9B.2 ADS-B transmitting equipment carried by an aircraft for operational use in Australia must comply with an approved equipment configuration.
>
> 9B.3 If ADS-B transmitting equipment carried by an aircraft does not comply with an approved equipment configuration, it must be deactivated before flight in Australia.

1.7 This regulation became effective in 2007 and applies to all Australian airspace at all flight levels. However, these regulations only apply in the territorial airspace of that state.

1.8 In late 2009 CASA clarified some aspects of the regulations as follows:

9B.6 If an aircraft carries ADS-B transmitting equipment which does not comply with an approved equipment configuration, the aircraft must not fly in Australian territory unless the equipment is:

(a) deactivated; or

(b) set to transmit only a value of zero for the NUCp or NIC.

Note It is considered equivalent to deactivation if NUCp or NIC is set to continually transmit only a value of zero.

Alternative approved equipment configuration — standard for aircraft manufactured on or after 28 June 2012

7 For an aircraft manufactured on or after 28 June 2012, an equipment configuration is approved if:

(a) it has been certified by EASA as meeting the standards of EASA AMC 20-24; and

(b) the aircraft flight manual attests to the certification; and

(c) the GNSS receiver or system complies with the requirements of clause 3 in Part B.

Alternative approved equipment configuration — standard for aircraft manufactured before 28 June 2012

8 For an aircraft manufactured before 28 June 2012, an equipment configuration is approved if:

(a) it has been certified by EASA as meeting the standards of EASA AMC 20-24; and

(b) the aircraft flight manual attests to the certification; and

(c) the GNSS receiver or system complies with the requirements of clause 4 in Part B.

2. ICAO APANPIRG POSITION ON MISLEADING DATA

2.1 The 21st meeting of the Asia/Pacific Air Navigation Planning And Implementation Regional Group (APANPIRG**)** adopted the following Conclusion:

Conclusion 21/42 – Rule on Misleading ADS-B Transmissions

That, States where ADS-B may be used, even voluntarily, promulgate rule for ADS-B Avionics Equipage Requirements consider publishing additional provisions for misleading ADS-B transmission as follows:

After <insert earliest date that ADS-B may be used for any relevant operational purpose> if an aircraft carries ADS-B transmitting equipment which does not comply with

a) EASA AMC 20-24, or
b) the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia.

the aircraft must not fly unless the equipment is:

(a) deactivated; or
(b) set to transmit only a value of zero for the NUCp or NIC.

Note:
1. It is considered equivalent to deactivation if NUCp or NIC is set to continually transmit only a value of zero.

2. Regulators should take appropriate action to ensure that such regulations are complied with.

3. ATC systems should discard ADS-B data when NUC or NIC=0

3. PROPOSAL

3.1 It is proposed that APANPIRG initiate changes to the ICAO Regional Supplementary Procedures Doc7030 to require aircraft operators to disable 1090 ES ADS-B transmissions are that misleading or non compliant.

3.2 Proposed wording is attached at Appendix A. This proposal simply extends the APANPIRG 21 decision into international airspace to ensure that safety of air-air and air-ground operations are maintained.

APPENDIX A: Proposed change to Doc 7030

5.5 AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B)

5. 5.1. *If an aircraft operates within an FIR where ADS-B based surveillance service is provided in the ASIA Region, and*

(A) carries 1090 extended squitter ADS-B transmitting equipment which does not comply with

a) EASA AMC 20-24, or

b) the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia, or

c) FAA Rulemaking: AC No.: 20-165 – Airworthiness Approval of ADS-B

(B) if the aircraft ADS-B transmitting equipment becomes unserviceable resulting in the aircraft transmitting misleading information,

Then

the aircraft must not fly unless the equipment is:

(a) deactivated; or
(b) transmits only a value of zero for the NUCp or NIC.

Note: except for exception of unserviceability authorized by Administrations concerned
Remark: similar PfA will also be required for PAC Region in the SUPPs.

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ATTACHMENT

MAIN POINTS ADDRESSED BY THE UPDATES TO THE ICAO POSITION FOR THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) WORLD RADIOCOMMUNICATION CONFERENCE (2012) (WRC-12)

The updated ICAO Position reflects new developments, resulting from ICAO and ITU studies and are as follows:

a) a further clarification of the spectrum requirement for unmanned aircraft systems (UAS), expressing clearly that in order for ICAO to be in a position to accommodate UAS in civil airspace and to develop SARPs, spectrum for UAS communications systems must be given the necessary status and sufficient protection from harmful interference through an appropriate allocation as an aeronautical safety service, similar to other spectrum used to support the safe operation of aircraft (WRC-12 Agenda Item 1.3 refers);

b) ITU-R studies have been successfully concluded in support of the new allocations made to the aeronautical mobile (route) service (AM(R)S) at WRC-07 and a potential new allocation for aeronautical surface applications at airports (WRC-12 Agenda Item 1.4 refers);

c) studies confirm that long-term aeronautical mobile-satellite (route) service (AMS(R)S) spectrum requirements up to the year 2025 can be accommodated within existing frequency bands available for this service. Provisions, however, are needed in the ITU Radio Regulations to improve transparency in the coordination process (WRC-12 Agenda Item 1.7 refers);

d) the aerospace industry has indicated that they are currently not considering the frequency band 37 - 38 GHz to support a wireless network within aircraft to provide or enhance intra-aircraft safety communications. The aerospace industry, however, has indicated the need to support a future agenda item to consider frequency spectrum requirements for this type of application (WRC-12 Agenda Items 1.12 and 8.2 refer); and

e) ITU-R studies identified a number of candidate frequency bands for expansion of the mobile satellite service (MSS). This includes three potential allocations in bands used by aeronautical radionavigation systems. If new services are to be introduced in these bands, operation of aeronautical safety systems must be protected (WRC-12 Agenda Item 1.25 refers).

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CONSIDERATION OF WRC-12 AGENDA ITEMS AND CURRENT AREAS OF CONCERN TO AVIATION

WRC-12 Agenda Item	Comments
1.1	No comment
1.2	Still unclear how this AI will be addressed – requires close monitoring
1.3*	See ICAO Position. For the satellite component, several methods could be combined. However, methods A2 and A3 are not supported.
1.4*	See ICAO Position. Methods A, B and C2 are supported.
1.5	There is a need to monitor this AI as any changes to the RR provisions and not just allocations may impact civil aviation
1.6	No comment
1.7*	See ICAO Position. Method B is preferred. A combination of methods B and D may also be an option. Methods A and C are not supported.
1.8	No comment
1.9	No comment
1.10	No comment
1.11	No comment
1.12	No currently known future aeronautical system foreseen in this band. Support Method B (PFD limits)
1.13	No comment
1.14	Bands currently being proposed are outside of those used for ARNS and AM(R)S, but further monitoring is required.
1.15	Bands currently being proposed are outside of those used for AM(R)S but further monitoring is required
1.16	No comment
1.17	No comment
1.18	No comment
1.19	None of the methods proposed are in accordance with the ICAO Position. Of the methods proposed for CRS, Method B2 comes closest.
1.20	No comment
1.21	ICAO Position is to protect existing ARNS. Methods A, B and C, proposing new allocation in the band include a WRC Resolution to protect existing ARNS services. Preferred method may depend on outcome of AI1.3/1.25. Method D is also supported.
1.22	Support Methods C and D, while protecting bands used for Aeronautical Safety Services
1.23	Method C is supported. Methods A and B pending confirmation of use by NDB in these bands.
1.24	No comment
1.25*	Support no change to existing aeronautical allocations. Methods A1, E1 and F1 can be supported.
2	Need to monitor
4	Need to monitor. Possible deletion of Res 419 (Aeronautical Security) is not opposed.
8.2	Support the introduction of a new AI, to consider the introduction of WAIC.

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DRAFT

HANDBOOK ON RADIO FREQUENCY SPECTRUM REQUIREMENTS FOR CIVIL AVIATION

PART II _ Frequency assignment planning criteria for aeronautical radio communication and navigation systems

Chapter 1 General methodology for compatibility analysis of aeronautical radio systems

1.1 Introduction

1.1.1 This chapter describes a general methodology, which can be used in interference analysis for different radio systems. The general methodology is mainly based on ITU-R Recommendation SM.337-4 which is logically combining currently available models and parameters of both desired and undesired systems, e.g. signal power and spectral distribution, receiver selectivity, antenna patterns, propagation attenuation etc. Recommendation ITU-R SM.337-6 provides the procedures for calculating distance and frequency separation for an acceptable (agreed) interference level.

1.1.2 The following primary factors, which quantify the interactive effects between interfering transmitters and victim receivers for various combinations of frequency or distance separation, are:

- the frequency dependent rejection (FDR) which is a measure of the rejection produced by a receiver selectivity curve on an unwanted transmitter emission, and

- frequency / distance (FD) which is a measure of the minimum distance separation that is required between a victim receiver and an interfering transmitter as a function of difference between their tuned frequencies.

1.1.3 The frequency/distance rules are an important part of the frequency management process in most radio services. In channelized services, these rules take the following form:

- co-channel or co-frequency transmitters must be separated by at least d_0 (NM),

- first adjacent frequency transmitters (separated by one channel or the applicable frequency separation (e.g. 25 kHz)) must be separated by at least d_1 (NM),

- second adjacent frequency transmitters (separated by two channels or two times the applicable frequency separation (e.g. 2 times 25 kHz)) must be at least d_2 (NM) away and so on.

1.1.4 For the purpose of frequency assignment planning appropriate frequency / distance rules should be applied when similar or dissimilar systems occupy the same (or adjacent) frequency band.

FD and FDR can provide solutions to co- and adjacent frequency sharing and adjacent band interference problems by providing estimates of minimum required frequency and geographic separation between interfering transmitters and victim receivers which are required for an adequate receiver performance.

Note: Throughout this document, capital letters are used to denote logarithmic values (dB) of the corresponding quantities designated with lower-case type, e.g. $P_D = 10 \log p_D$. P_D is the input power to the transmitting antenna (dB) relative to 1 W when p_D is the input power (W).

1.2 Methodology

The electromagnetic compatibility of radio equipment should be calculated by the following method:

- Step 1: determine the desired signal level at the victim receiver front end;
- Step 2: determine the resulting level of interference at the victim receiver's front end;
- Step 3: determine the interactive effects among wanted signals, interference and receiver characteristics for various frequency or distance separations;
- Step 4: determine the appropriate ITU-R propagation model to be used; and
- Step 5: determine, from these data, a relationship between the frequency separation and distance separation that the interference is considered tolerable.

1.3 Procedure

The compatibility analysis between an undesired transmitter and a victim receiver can be performed as follows (see Figure 1-1):

***Step 1*: a. Generic method:**

Determine the desired signal level P_D (dBW) at the desired (victim) receiver front end.

$$P_D = P_{Tx_D} + G_{Tx_D}(\varphi) - L_{Tx_D_FL} + G_{Rx}(\theta_D) - L_{Rx_FL} - L_{POL_Rx_D} - L_b(d_D) \quad (1)$$

where:

P_D : desired signal level P_D (dBW) at the victim receiver front end

P_{Tx_D} : output power of the desired transmitter (dBW)

$G_{Tx_D}(\varphi)$: gain of the desired transmitting antenna in direction of victim receiver with respect to an isotropic antenna (dBi)

$L_{TX_D_FL}$: feeder link losses between output of the desired transmitter and the input of the desired transmitting antenna (dB)

$G_{Rx}(\theta_D)$: gain of the receiving antenna in direction of desired transmitter with respect to an isotropic antenna (dBi)

L_{RX_FL} : feeder link losses between output of the receiving antenna and the input receiver (dB)

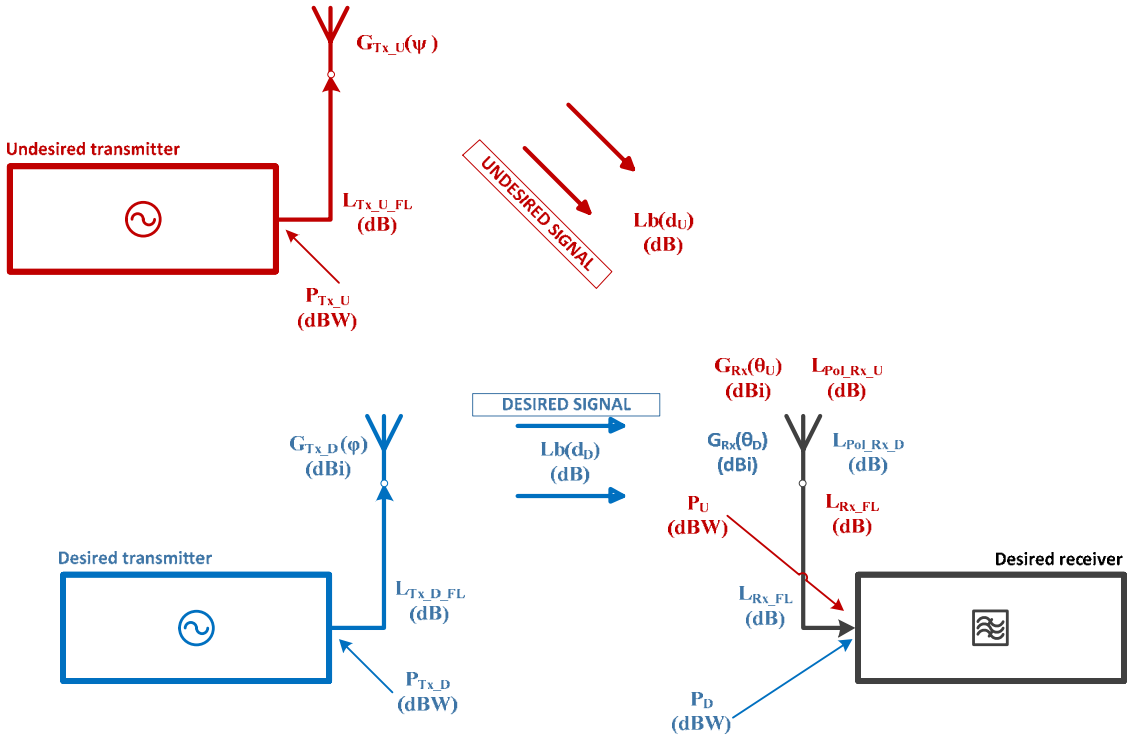
$L_{POL_Rx_D}$: loss due to polarization mismatch of receiving antenna with respect to desired transmitted signal (dB)

$L_b\,(d_D)$: basic transmission loss for a separation distance d_D between desired transmitter and receiver (dB) (see Recommendation ITU-R P.341)

φ: angle between boresight of desired transmitting antenna in the direction of the desired receiving antenna

θ_D angle between boresight of the desired receiving antenna in the direction of the desired transmitting antenna

This formula calculates the level of the desired signal at the (desired) receiver input based on the characteristics of the (desired) transmitter.



$$P_D = P_{Tx_D} - L_{Tx_D_FL} + G_{Tx_D}(\varphi) + G_{Rx}(\theta_D) - L_{Rx_FL} - L_{POL_Rx_D} - L_b(d_D)$$

$$P_U = P_{Tx_U} - L_{Tx_U_FL} + G_{Tx_U}(\psi) + G_{Rx}(\theta_U) - L_{Rx_FL} - L_{POL_Rx_U} - L_b(d_U) + FDR(\Delta f)$$

Figure 1 – 1 Elements of desired and undesired signal

b. Method when the minimum signal strength of the desired signal has been specified:

As an alternative approach the desired signal power level P_D (dBW) at the victim receiver front end can be determined based on the minimum required field strength at the receiver antenna (signal in space) within the service volume. In most cases, Annex 10 contains SARPs for radiocommunication and radionavigation

systems where the minimum fieldstrength at the antenna (signal in space) is determined in the format of e = xx µV/m or as a power flux density of S = yy dBW/m^2. The field strength in µV/m can be converted into dB(W/m^2) as follows:

$$xx\ (\mu V/m) = \frac{\mathbf{xx^2.10^{-12}}}{\mathbf{120.\pi}} \quad \text{or} \quad \mathbf{S = E - 145.8} \quad \text{where S = dB(W/m}^2\text{) and E = dB (µV/m).}$$

The power of the desired signal at the input of the receiver can be calculated as follows (see also Figure 1-2):

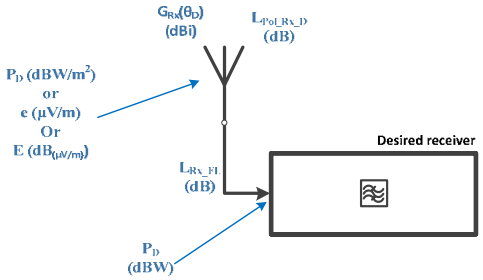


Figure 1 – 2 Calculation of P_D at receiver input

$$P_D = E - 20 \cdot \log f - 107.2 + G_{Rx}(\theta_D) - L_{Rx_FL} - L_{POL_Rx_D} \qquad \text{(1a)}$$

where:

P_D :	desired signal level P_D (dBW) at the victim receiver front end
E :	minimum required electric field strength at the edge of the service area (dB(µV/m))
f:	frequency (MHz)
$G_{Rx(\theta_D)}$:	gain of the receiving antenna in direction of desired transmitter with respect to an isotropic antenna (dBi)
L_{RX_FL} :	feeder link losses between output of the receiving antenna and the receiver input (dB)
$L_{POL_Rx_D}$:	loss due to polarization mismatch of receiving antenna with respect to desired transmitted signal (dB)
θ_D	angle between boresight of receiving antenna and desired transmitting antenna

Note: *When assuming the minimum field strength throughout the service volume than this approach is slightly more conservative since it does not take into account actual field strength values.*

In aeronautical frequency assignment planning, typical (worst case) values are:

$G_{Rx}(\theta_D)$	= 0 dB
L_{Rx_FL}	= -3 dB
$L_{POL_Rx_D}$	= 0 dB

And turns formula (1a) into $P_D = E - 20 \cdot \log f - 110.2$

***Step 2*:** Calculate the resulting level of interference at the victim receiver's front end using the formula:

$$P_U = P_{Tx_U} - L_{Tx_U_FL} + G_{Tx_U}(\psi) + G_{Rx}(\theta_U) - L_{Rx_FL} - L_{POL_Rx_U} - L_b(d_U) + FDR(\Delta f) \quad (2)$$

where:

P_U : undesired signal level PU (dBW) at the victim receiver front end

P_{Tx_U} : output power of the undesired transmitter (dBW)

$L_{TX_U_FL}$: feeder link losses between output of the undesired transmitter and the input of the undesired transmitting antenna (dB)

$G_{Tx_U}(\psi)$: gain of the undesired transmitting antenna in direction of victim receiver with respect to an isotropic antenna (dBi)

$G_{RX}(\theta_U)$: gain of the receiving antenna in direction of undesired transmitter with respect to an isotropic antenna (dBi)

L_{RX_FL} : feeder link losses between output of the receiving antenna and the input of the receiver (dB)

$L_{POL_Rx_U}$: loss due to polarization mismatch of receiving antenna with respect to undesired transmitted signal (dB)

$L_b(d_U)$: basic transmission loss for a separation distance d_U between the undesired transmitter and the receiver (dB) (see Recommendation ITU-R P.341)

$FDR(\Delta f)$: frequency dependent rejection for a frequency separation Δf as expressed by equation (3)

ψ : angle between boresight of undesired transmitting antenna in the direction of the receiving antenna

θ_U angle between boresight of receiving antenna in the direction of the undesired transmitting antenna

FDR is the rejection provided by a receiver to a transmitted signal as a result of the limited bandwidth of the receiver with respect to the transmitted signal and the detuning between the receiver and the transmitter.

$$FDR(\Delta f) = 10 \cdot \log \frac{\int_0^\infty p(f)\,df}{\int_0^\infty p(f) \cdot h(f)\,df} \quad \text{dB} \quad (3)$$

where:

$p(f)$: power spectral density of the interfering signal (W/Hz); and

$h(f)$: normalized frequency response of the receiver.

$$\Delta f = f_{Rx} - f_{Tx_U} \quad (4)$$

where:

f_{RX} : receiver tuned frequency; and

f_{TX_U} : interferer tuned frequency.

The FDR can be divided into two terms, the on-tune rejection (OTR) and the off-frequency rejection (OFR). The OTR is the rejection provided by a receiver selectivity characteristic to a co-tuned transmitter as a result of a transmitted signal exceeding the receiver bandwidth. The OFR is an additional rejection that results from off-tuning between interferer and receiver.

The FDR can also be described in the format of the receiver out-of-band immunity performance.

Note: FDR, OTR and OFR are considered as losses and defined below in a manner to ensure positive values.

$$fdr(\Delta f) = otr \cdot ofr(\Delta f) \tag{5}$$

And in logarithmic values:

$$FDR(\Delta f) = OTR + OFR(\Delta f) \quad \text{dB} \tag{6}$$

where:

$$OTR = 10 \cdot \log \frac{\int_0^{\infty} p(f)\,df}{\int_0^{\infty} p(f) \cdot h(f + \Delta f)\,df} \quad \text{dB} \tag{7}$$

$$OFR(\Delta f) = 10 \cdot \log \frac{\int_0^{\infty} p(f) \cdot h(f + \Delta f)\,df}{\int_0^{\infty} p(f) \cdot h(f)\,df} \quad \text{dB} \tag{8}$$

The on-tune rejection also called the *bandwidth correction factor* can often be approximated by:

$$OTR \approx K \cdot \log\left(\frac{B_T}{B_R}\right) \qquad B_R \le B_T \tag{9}$$

where:

B_R : interfered receiver 3 dB bandwidth (Hz)

B_T : interferer transmitter 3 dB bandwidth (Hz)

K = 10 for non-coherent signals

= 20 for pulse signals.

Note: OTR = 0 if $B_R > B_T$

***Step 3*:** The interference will be considered tolerable if the following inequality is satisfied:

$$P_D - P_U \ge \alpha + ASF \tag{10}$$

where:

P_D : desired signal level P_D (dBW) at the victim receiver front end

P_U : undesired signal level P_U (dBW) at the victim receiver front end

α protection ratio (dB)

ASF aviation safety factor (dB) (see Part I of this Handbook (9.2.22). General material is in Recommendation ITU-R SM.1535 on "*The protection of safety services from unwanted emissions*"

In some cases it is required to calculate the interference-to-noise ratio (I/N) at the IF output or demodulation input of the victim receiver. The interference will be considered tolerable if the following inequality is satisfied:

$$\frac{I}{N} \leq \left(\frac{I}{N}\right)_{req} + ASF \qquad (11)$$

where:

I/N : calculated interference-to-noise ration at the victim receiver input referred to the IF bandwidth (dB)

$(I/N)_{req}$: required interference-to-noise ration at the victim receiver input referred to the IF bandwidth (dB)

ASF aviation safety factor (dB)

The noise at the receiver input referred to the IF bandwidth is given by:

$$N = 10 \cdot \log k \cdot T_0 + 10 \cdot \log B_{IF} + NF \qquad (12)$$

where:

N: receiver noise power (dBm)

k: Boltzmann's constant

T_0 absolute temperature (K)

B_{IF} receiver's intermediate frequency bandwidth (Hz)

NF receiver noise figure (dB)

The I/N ratio is then given by:

$$\frac{I}{N} = P_U - 10 \cdot \log k \cdot T_0 + 10 \cdot \log B_{IF} + NF \qquad (13)$$

Step 4: Determine the appropriate ITU-R propagation model to be used

See paragraph 1.3 for propagation models.

***Step 5*:** Determine a relationship between the frequency separation and distance separation that the interference is considered tolerable

Substitute P_D and P_U of steps 1 and 2 above into equation (10) to derive or numerically compute a relationship between the frequency separation Δf and the distance separation d_U such that the interference is considered tolerable.

1.3 Propagation Model

1.3.1 Free – Space Propagation Model

The propagation loss that would occur if the antennas were replaced by isotropic antennas located in a perfectly dielectric, homogeneous, isotropic and unlimited environment, the distance between the antennas being retained (see Recommendation ITU-R P.525).

$$L_{bf} = 20 \cdot \log\left(\frac{4 \cdot \pi \cdot d}{\lambda}\right) \quad (14)$$

where:

L_{bf} : free-space basic transmission loss (dB)
d : distance
λ : wavelength

where d and λ are expressed in the same unit.

Equation (14) can also be written using the frequency instead of the wavelength.

$$L_{bf} = 32.4 + 20 \cdot \log f + 20 \cdot \log d \quad (15)$$

where:

f : frequency (MHz)
d : distance (km).

or

$$L_{bf} = 37.8 + 20 \cdot \log f + 20 \cdot \log d \quad (16)$$

where:

f : frequency (MHz)
d : distance (NM)

1.3.2 Propagation of radio waves in the atmosphere

The propagation of radio waves, typical VHF and UHF frequencies, is subject to a number of conditions, compare to the free space propagation. These conditions include:

a. Refraction – refraction of radio waves in the atmosphere along the Earth's surface bend slightly towards the Earth. The effect is that radio waves can propagate beyond the horizon with no other (significant) loss than the free space loss. This phenomenon is corrected in radio propagation by using a 4/3 Earth radius. The radio horizon (radio path until it reaches the radio horizon) is calculated using a 4/3 Earth.
b. Ducting – Unusual weather conditions (or other phenomena such as sand storms) can bend the radio waves more than normal and VHF or UHF radio frequencies can be received without significant attenuation over longer distances. In aeronautical frequency assignment planning this phenomenon is not normally taken into account.

The standard propagation model calculates the propagation loss along the radio path as follows:

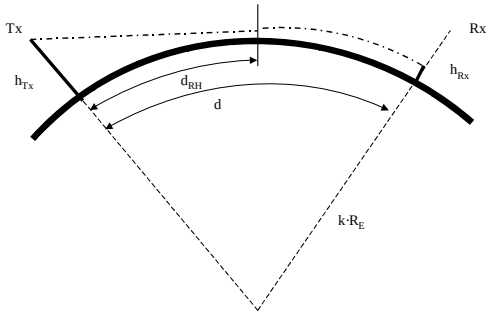


Figure 1 - 3

Radio signals from transmitter Tx in Figure 3 propagate until the radio horizon over the distance d_{RH} under free space propagation conditions. Beyond the radio horizon the radio signals are attenuated with a constant factor *a*, which is depending on the actual frequency as follows

a. in the band 108 – 137 MHz *a* is 0.5 dB/NM
b. in the band 960 – 1215 MHz *a* is 1.6 dB/NM
c. in the band 5030 – 5091 MHz *a* is 2.7 dB/NM

Note: The constant attenuation factor *a* was derived from ITU-R Recommendation P.528 for 125 MHz, 1200 MHz and 5100 MHz for 50 % of the time. These curves are reproduced in Appendix A and are based on the IF 77 electromagnetic wave propagation model. The IF-77 model was developed by the Institute for Telecommunication Sciences and the FAA (US). A Windows version of this model is contained in the ICAO frequency assignment planning program **Search Frequency** and can be used for assessing more precise signal parameters. Normally, for radio paths up to the radio horizon, aeronautical frequency assignment planning is based on free space propagation. Applying the IF-77 model may result in a more accurate prediction of the actual radio wave propagation characteristics.

The distance to the radio horizon can be calculated with the formula:

$$d_{RH} = 1.23\sqrt{h_{Tx}} \text{ where} \qquad (17)$$

d_{RH} is the distance of the station to the radio horizon (NM)
h_{Tx} is the height of the station above the Earth's surface

In Figure 1 – 3 the factor $(d - d_{RH})$ is the distance of the receiver beyond the radio horizon from the transmitter Tx.

If $d \leq d_{RH}$ the basic transmission (or propagation) loss between the transmitter Tx and the receiver Rx is

37.8 + 20.log d + 20.log f (re. (16))

In this case, the receiver is within direct line of (radio) sight of the transmitter.

If $d > d_{RH}$, the basic transmission loss between the transmitter Tx and the receiver Rx is

$37.8 + 20.\log d_{RH} + 20 \log f + (d-d_{RH}).a$ (re. (17)

In this case, the receiver is beyond the radio horizon of the transmitter. The distance dRH is calculated with formula (17). (d is in NM)

1.3.3 Aeronautical Standard Propagation Model

Aeronautical standard propagation model (ASPM) is derived from the ITU-R Recommendation P.528. For distances up to the radio horizon, free space propagation is assumed. Beyond the radio horizon, a constant attenuation factor *a*, which depends on the frequency band under consideration, is used.

The distance to the radio horizon can be calculated using the following formula:

$$d_{RH} = \sqrt{2 \cdot k \cdot R_E} \cdot \left(\sqrt{h_{Tx}} + \sqrt{h_{Rx}}\right) \quad (18)$$

where:

d_{RH} :	distance to the radio horizon
k :	effective Earth radius factor
R_E	Earth radius
h_{TX}	height of transmitting antenna above Earth's surface
h_{RX}	height of receiving antenna above Earth's surface

If heights h_{TX} and h_{RX} are expressed in feet (ft) and the distance d in Nautical Miles (NM), the Earth radius R_E = 6360 km and if the atmospheric conditions are assumed to be normal (effective Earth radius factor k = 4/3) the following practical formula can be used:

$$d_{RH} = 1.23 \cdot \left(\sqrt{h_{Tx}} + \sqrt{h_{Rx}}\right) \quad (19)$$

where:

d_{RH} :	distance to the radio horizon (NM)
h_{TX}	height of transmitting antenna above Earth's surface (ft)
h_{RX}	height of receiving antenna above Earth's surface (ft)

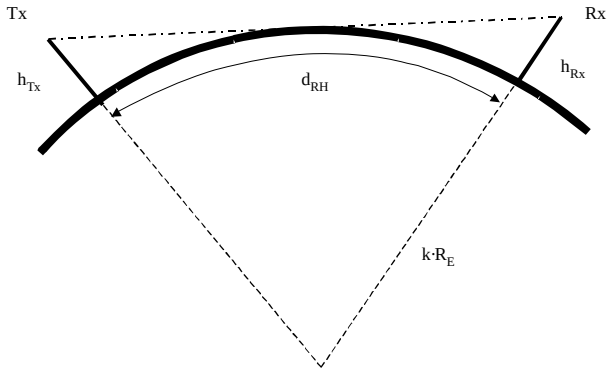


Figure 1 – 4

The situation as depicted in Figure 1 – 4 is typical applied in frequency assignment planning for air-ground communication systems (e.g. operating in the VHF band 112 – 137 MHz. In this situation, the minimum separation distance is between two aircraft each operating within their respective designated operational coverage (DOC) (see also Chapter 2).

1.3.4 Separation distance ratio

In particular for air-ground voice communication systems, the minimum separation distance can be expressed in terms of a distance ratio. This is the ratio of the distance from the (desired ground based) transmitter to the desired (victim) aircraft receiver to the distance of the nearest interfering transmitter (another aircraft).

Formula (1) calculates the desired signal level at the receiver input as follows:

$$P_D = P_{Tx_D} + G_{Tx_D}(\varphi) - L_{Tx_D_FL} + G_{Rx}(\theta_D) - L_{Rx_FL} - L_{POL_Rx_D} - L_b(d_D)$$

and formula (2) calculates the undesired (interfering) signal level at the receiver input:

$$P_U = P_{Tx_U} - L_{Tx_U_FL} + G_{Tx_U}(\psi) + G_{Rx}(\theta_U) - L_{Rx_FL} - L_{POL_Rx_U} - L_b(d_U) + FDR(\Delta f)$$

D/U ratio is 20 dB

The D/U ratio for voice communication systems $P_D - P_U$ = 20 dB ((re (10) and as specified in Annex 10).

Assuming that $P_{Tx_D} = P_{Tx\text{-}U}$; $L_{Tx_D_FL} = L_{Tx_U_FL}$; $G_{Tx_D}(\Psi) = G_{Tx_U}(\Psi)$; $L_{Pol_Rx_U} = 0$ and FDR (Δf) = 0

(the desired and undesired transmitter have the same power output; the same cable losses and the same antenna gain, they have the same antenna gain in the direction of the desired (victim) receiver, have the same polarization and operate on the same frequency) $P_D - P_U$ can be re-written using the formulas (1) and (2) as:

$P_D - P_U = (- L_b(d_D)) - (-L_b(d_U)) = 20$ dB.

$L_b(d_D)$ is the distance from the (desired) aircraft to the (desired) ground transmitter and $L_b(d_U)$ is the distance from the (desired) aircraft to the (undesired or interfering) aircraft.

Under free space propagation conditions, using formula 16 gives:

$L_b(d_U) - L_b(d_D) = 37.8 + 20 \cdot \log f + 20 \cdot \log d_U - (37.8 + 20 \cdot \log f + 20 \cdot \log d_D) = 20$

or

$20 \cdot \log d_U - 20 \cdot \log d_D = 20 \quad >> 20 \cdot \log \frac{d_U}{d_D} = 20 \quad >> \log \frac{d_U}{d_D} = 1 \quad >> \frac{d_U}{d_D} =$ **10**

D/U ratio is 14 dB

If the D/U ratio for voice communication systems $P_D - P_U = 14$ dB (as specified in Annex 10 and used in congested areas) the separation distance ratio can be calculated as follows:

$P_D - P_U = =(- L_b(d_D)) - (-L_b(d_U)) = 14$ dB.

$L_b(d_U) - L_b(d_D) = 37.8 + 20 \cdot \log f + 20 \cdot \log d_U - (37.8 + 20 \cdot \log f + 20 \cdot \log d_D) = 14$

or

$20 \cdot \log d_U - 20 \cdot \log d_D = 14 \quad >> 20 \cdot \log \frac{d_U}{d_D} = 14 \quad >> \log \frac{d_U}{d_D} = 0.7 \quad >> \frac{d_U}{d_D} =$ **5**

In many cases, applying the separation distance 1 : 10 leads to separation distances which are (far) beyond the radio horizon.

1.3.4.1 The effect of the radio horizon

The effect of the radio horizon is demonstrated in the following example. (Re Figure 1 – 5)

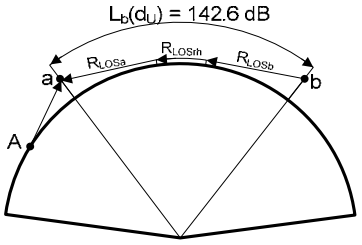


Figure 1 – 5 Separation distances (aircraft are not within line of sight)

In order to protect (aircraft) station **a** from interference from (aircraft) station **b** (with the same characteristics as in 1.3.4.1), $L_b(d_U)$ needs to be 142.6 dB

When aircraft station a is at an altitude of FL 250 (25000 ft) and aircraft b is at an altitude of FL 450 (45000 ft) the minimum separation between the two aircraft can be calculated as follows:

For station **a** the distance to the radio horizon (R_{LOSa}) is 194 NM

For station **b** the distance to the radio horizon (R_{LOSb}) is 261 NM

$L_b(d_U)$ = 37.8 + 20.log(f) + 20.log(R_{LOSa} + R_{LOSb}) + 0.5.d_{rh} (dB)

= 79.7 + 455 +0.5 d_{rh} = 142.6 d_{rh} = 19.5 NM

The total minimum distance required between the two aircraft stations **a** and **b** is **474.5 NM.**

In aeronautical frequency assignment planning, the distance d_{rh} is normally not taken into consideration; protection is sufficient when the two aircraft are separated by the sum of their distances to the radio horizon. The probability that two aircraft at the same time are at the maximum altitude and the maximum range of the closest point of the designated operational coverage can be ignored. Although 20 dB may be used in frequency assignment planning in Regions where frequency congestion is not severe or is not anticipated to become severe, Annex 10 stipulates that a desired to undesired protection ratio of 14 dB is sufficient to protect air/ground communication systems from harmful interference.(Re. Annex 10, Volume 5, paragraph 4.1.5.1)

The minimum separation distance between two ground stations "A" and "B", which have a designated operational range of R_A and R_B respectively becomes:

$$\mathbf{R_A + R_{LOSa} + R_{LOSb} + R_B} \qquad (20)$$

This separation distance protects two aircraft, operating on the same frequency and which are at the same time at the closest point and the maximum altitude of their respective designated operational coverage areas. These criteria are implemented in the ICAO frequency assignment planning program "**Search Frequency**" and are in conformity with the provisions in Annex 10, Volume 5.

When applying the 20 dB D/U protection ratio, the method for calculating the minimum separation distance described in this paragraph results (in almost all cases) in a minimum separation distance which is less than the separation distance calculated with the 1 :10 distance ratio; therefore using the 1 : 10 separation distance ratio method is not recommended or practical.

1.3.4.2 In (congested) areas cases where the 14 dB D/U ratio is applied, the separation distance ratio 5 as shown in paragraph 1.3.4 can be used.

In some cases (depending on the size of the designated operational coverage), applying a 1 : 5 distance ratio may result in smaller minimum separation distances compared to using the line-of-sight criterion.

Using formula (20) (line-of-sight criterion) calculates a minimum separation distance *between the closest point at the edge of the designated operational coverage for each service* of:

$\mathbf{D_{sep} = R_{LOSa} + R_{LOSb} = 1.23\sqrt{H_a} + 1.23\sqrt{H_b}}$

(H_a and H_b are the maximum altitude of the different designated operational coverage areas).

Using the 1 : 5 distance ratio will give a minimum separation distance *between the closest point at the edge of the designated operational coverage for each service* of

$\mathbf{D_{sep} = 5R_A}$ **or** $\mathbf{5R_B}$, whichever of these two is the largest distance (R_A and R_B are the ranges of the different designated operational coverage areas).

Note 1: the line-of-sight criterion should be applied where this provides a smaller minimum separation distance compared to the 1 : 5 separation distance ratio method.

The 1 : 5 separation distance criterion assumes that both the (desired) ground transmitter and the (undesired) aircraft transmitter have the same e.i.r.p. Typical value for aircraft e.i.r.p. is 43 dBm or 12.5 W (with a 25 W transmitter, 0 dB antenna gain and 3 dB cable losses). When the ground station e.i.r.p. is less than 12.5 W, the 14 dB protection ratio is not provided. In case the interfering ground station is within line-of-sight of the (desired) aircraft station and has an e.i.r.p greater than 12.5 W, the 14 dB protection ratio is not provided. Therefore, the 1 : 5 distance ratio should be used with caution.

Example calculations:

(i) a. Application of the line-of-sight criterion gives a minimum separation distance between two designated operational coverage areas for a TWR service (25 NM / 4000ft) of 156 NM (the radio horizon for 4000 ft is 78 NM).

b. Application of the 1 : 5 distance ratio gives a minimum separation between the two designated operational coverage areas of a TWR service of 5*25 NM or 125 NM.

In this case, the 1 : 5 separation distance criterion could be applied.

(ii) a. For two APP/U services (250 NM/45000 ft), using the line of sight criterion, the minimum separation distance between the designated operational coverage areas is 520 NM (the radio horizon for 45000 ft is 260 NM)

b. Application of the 1:5 distance ratio would give a minimum separation distance 0f 5*250 NM or 1250 NM.

In this case, the line-of-sight criterion should be applied.

Application of the 5:1 distance ratio gives only marginal relief in frequency assignment planning.

*Note: The ICAO frequency assignment planning program **SEARCH FREQUENCY** has implemented the frequency assignment planning criteria based on the line-of-sight (radio horizon) criterion (D/U ratio is 20dB.)*

*The program **SEARCH FREQUENCY** also includes the regional frequency assignment planning criteria as these are currently used in the AFI, APAC, CAR, MID and SAM Regions. Until such time that the Regional frequency assignment planning criteria have been updated and in line with the planning criteria are per Annex 10, the current regional frequency assignment planning criteria should be used.*

Implementation of the 14 dB D/U ratio with the 1 : 5 distance ratio is applied in the EUR Region.

Chapter 2

Aeronautical VHF radio air-ground radio communication systems operating in the band 117.975 – 137 MHz

2.1 Introduction

2.1.1 The frequency band 108 – 137 MHz is allocated by the International Telecommunication Union (ITU) to the Aeronautical Mobile (Route) Service (AM(R)S) and used for air-ground voice as well as air-ground and air-air data link communications. The ITU has published details concerning the allocation of radio frequency spectrum for all radio services in its Radio Regulations and relevant Resolutions and Recommendations to the Radio Regulations. Technical material on the use of this band is contained in ITU-R Recommendations and Reports. Part I of this Handbook includes details pertinent to this allocation as agreed within the ITU. The use of the band 102 – 137 MHz by aviation for air/ground communication systems (aeronautical mobile (R) service) is in full accordance with the provisions of the ITU, as contained in the ITU Radio Regulations. This chapter contains technical and operational material pertaining to the assignment and use of frequencies in the band 117.975 – 137 MHz.

Note: The allocation to the aeronautical mobile (R) service in the band 108 – 117.975 is subject to the conditions as contained in ITU Resolution 413 (WRC-07).

2.1.2 ICAO documents relevant to frequency assignment planning include:

- *Annex 10 Volume III (Communication systems),*
  - Part I (Digital data communication systems) – Chapter 6 – *VHF air-ground digital link*
  - Part II (Voice communication systems) – Chapter 2 – *Aeronautical Mobile Service*

- *Annex 10 Volume V,* Chapter 4 – *Utilization of frequencies above 30 MHz* and Attachment A – *Considerations affecting the deployment of VHF communication frequencies*
  Note: This material is reproduced in Appendix B

- *ICAO Regional Air Navigation Plans and relevant ICAO Regional Air Navigation Agreements.*

2.2 Interference model

2.2.1 General

2.2.1.1 An aircraft can be subject to interference caused by transmissions from other (nearby) aircraft and from ground stations. These transmissions can be generated on the desired frequency (co-frequency) or on frequencies adjacent to the desired frequency (adjacent frequency). Communications between aircraft and ground stations, operating on the same frequency within the same designated operational coverage of a particular frequency is not considered as harmful interference as indeed all relevant aircraft and ground stations are expected to use the communication services provided on this frequency (all transmissions from aircraft and ground station(s) within either area A or area B in Figure 2-1). Other co-frequency communications (from outside the designated operational coverage of the desired

station / service, e.g. transmissions from within area B in Figure 2-1 may interfere with communications within area A in Figure 2-1 and vice versa) may cause interference which may be harmful. Similarly, the use of frequencies adjacent to the frequency in use may cause harmful interference.

2.2.2 Interference model used in aeronautical frequency assignment planning for air/ground VHF communication systems.

2.2.2.1 The model used for establishing co-frequency separation distances in aeronautical frequency assignment planning for systems used for both air-ground and ground-air communications is shown in Figure 2 – 1. When the (protection) distance between aircraft **a** and aircraft **b** is equal or greater than the sum of the radio horizon (line-of-sight) of each aircraft, the aircraft stations are mutually protected from interference from each other (see also paragraph 1.3.4).
Note: The calculation of minimum separation distances is described in paragraph 2.7.

When the minimum protection distance has been established between the closest points of the respective designated operational coverage (DOC) areas, all aircraft (and the ground station) operating within the DOC area "A" are protected from harmful interference from all aircraft (and the ground station) operating within DOC area "B" as these are operating well beyond the radio horizon of each other.

This method also protects aircraft if the e.i.r.p of the ground stations is different because the ground station is normally situated well beyond the radio horizon if the minimum separation distance between aircraft stations is met. Paragraph 2 – 7 describes in detail the different interference mechanisms that need to be considered in frequency assignment planning to protect frequency assignments from co-frequency interference (paragraph 2.7.3) and adjacent frequency interference (paragraph 2.7.4).

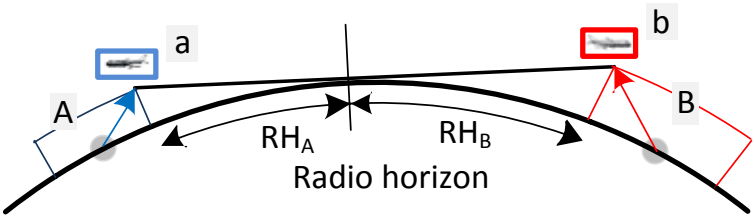


Figure 2 – 1 Model for establishing separation distances

In VHF air/ground communication frequency assignment planning, the following three interference models, based on the model in Figure 2 – 1 apply:

a. Both the desired and the undesired transmitting / receiving stations involve aircraft stations communicating with a ground station (see paragraph 2.7.3.1)
b. The desired ground station is transmitting (broadcasting) from the ground and the desired aircraft station is being interfered by another aircraft communicating with (transmitting) another ground station (see paragraph 2.7.3.2)

c. The desired ground station is transmitting (broadcasting) from the ground and the desired aircraft station is being interfered by a undesired transmitting (broadcasting) ground station (see paragraph 2.7.3.3)

2.3 Protection requirements for air/ground voice communication systems operating in the band 117.975 – 137 MHz.

2.3.1 Provisions concerning the deployment of VHF frequencies and the avoidance of harmful interference are contained in Annex 10, Volume V, Chapter 4 (4.1.5) and are reproduced in Appendix B for information and reference.

2.3.2 In summary, Annex 10 Volume V stipulates in paragraph 4.1.5.1 that:

a. The D/U protection ratio between the desired (wanted) and the undesired (interfering) signal shall be 14 dB. (This provision is to be implemented on the bases of a regional air navigation agreement)

b. The D/U protection ratio may be 20 dB in areas where frequency congestion is not severe

c. These protection ratios are to be achieved at the limit of the designated operational coverage (DOC) which automatically protects all aircraft within the DOC.

The requirement for a D/U ratio of 14 dB has been implemented through a regional agreement in Europe and is used in North America. Other Regions apply the 20 dB protection ratio (which is equivalent to the radio line-of sight criterion as described in paragraph 2.2.1).

2.3.3 Protection of signals in space.

2.3.3.1 Annex 10 has established minimum field strength levels (signal in space) for the various air/ground communication systems that can operate in the frequency band 112 – 137 MHz. These field strength levels, together with other relevant data such as typical values for ground and airborne transmitter power, are reproduced in Tables 2 – 1a and 2 – 1b. Protection of aeronautical VHF air/ground communication systems is based on the principle that these minimum field strength levels are not subject to harmful interference if the interfering (undesired) signal is either more than 14 dB (re. paragraph 2.3.2 a) or more than 20 dB (re. paragraph 2.3.2. b) below the specified minimum field strength (of the desired signal).

Protection is achieved by securing that the potential interferer is located at a distance that will allow for the interfering signal to sufficiently below the minimum field strength (see paragraph 1.3.3 which describes the line-of-sight method or paragraph 1.3.4 which describers the separation distance ratio method). The line-of-sight method is used in all ICAO Regions, except Europe and [parts of[North America, where a combination of the two methods is being used.

Table 2 – 1a also contains typical values for ground and airborne transmitter power that can be used in interference assessment.

Parameter	DSB-AM	DSB-AM	VDL-M2	VDL-M2	VDL-M3	VDL-M3	VDL-M4	VDL-M4
TRANSMITTER	Airborne	Ground	Airborne	Ground	Airborne	Ground	Airborne	Ground

Output power transmitter (typical ground station output power is 25 or 50 W (44 or 47 dBm)	44 dBm (25 W)	50 dBm (100 W)	42 dBm (16 W)	44 dBm (25 W)	44 dBm (25 W)	44 dBm (25 W)	42 dBm (15 W)	45 dBm (32 W)
Feeder loss (assumed)	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB
Antenna gain (assumed)	0 dB	2 dB	0 dB	2 dB	0 dB	2 dB	0 dB	2 dB
EIRP	41 dBm (12.5 W)	49 dBm (80 W)	39 dBm (8W)	43 dBm (20 W)	41 dBm (12.5 W)	43 dBm (20 W)	40 dBm (10 W)	44 dBm (25 W)
Adjacent frequency emission (Transmitter) for VDL specified in Annex 10, Vol. III, Part I, paragraph 6.3.4								
1st adj fr. (16 kHz bandwidth)	Not specified in Annex 10		-18 dBm	-18 dBm	-18 dBm	-18 dBm	-18 dBm	-18 dBm
2nd adj fr. (25 kHz bandwidth)	Not specified in Annex 10		-28 dBm	-28 dBm	-28 dBm	-28 dBm	-28 dBm	-28 dBm
4th adj fr. (25 kHz bandwidth)	Not specified in Annex 10		-38 dBm	-38 dBm	-38 dBm	-38 dBm	-38 dBm	-38 dBm
8th adj fr. (25 kHz bandwidth)	Not specified in Annex 10		-43 dBm	-43 dBm	-43 dBm	-43 dBm	-43 dBm	-43 dBm
16th adj fr. (25 kHz bandwidth)	Not specified in Annex 10		-48 dBm	-48 dBm	-48 dBm	-48 dBm	-48 dBm	-48 dBm
32nd adj fr. (25 kHz bandwidth)	Not specified in Annex 10		-53.dBm	-53.dBm	-53.dBm	-53.dBm	-53.dBm	-53.dBm

Table 2 – 1a Typical values for various parameters for VHF communication systems (transmitter)

Parameter	DSB-AM	DSB-AM	VDL-M2	VDL-M2	VDL-M3	VDL-M3	VDL-M4	VDL-M4
RECEIVER								
Min signal at receiver antenna (Annex 10, Vol. III)	75 µV/m (-82 dBm) part II 2.2.1.2	20 µV/m (-93 dBm) part II 2.3.1.2	75 µV/m (-82 dBm) part I 6.2.2.	20 µV/m (-93 dBm) part I 6.3.2	75 µV/m (-82 dBm) part I 6.2.2.	20 µV/m (-93 dBm) part I 6.3.2	35 µV/m (-88 dBm) part I 6.9.5.1.1.1	35 µV/m (-88 dBm) part I 6.9.5.1.1.1
Feeder loss	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB	-3 dB
Antenna gain	0 dB	2 dB	0 dB	2 dB	0 dB	2 dB	0 dB	2 dB
Min. signal at receiver input	-85 dBm	-94 dBm	-85 dBm	-94 dBm	-85 dBm	-94 dBm	-91 dBm	-89 dBm
Out-of-band immunity performance of receiver as per Annex 10, Volume III, Part I, paragraph 6.3.5.3.(VDL) and Volume III, Part II, paragraph 2.3.2.8 (DSB-AM).								
1st adj. Ch			-40 dB	-40 dB	-40 dB	-40 dB	-40 dB	-40 dB
4th adj. Ch	-50 dB	-50 dB	-60 dB	-60 dB	-60 dB	-60 dB	-60 dB	-60 dB

Table 2 – 1b Typical values for various parameters for VHF communication systems (receiver)

Conversion from input power (dBm) to field strength (µV/m and v.v.) was done on the basis of the following formula:
Pr = E - 20logF - 167.2;
Where:
Pr is isotropically received power (dB(W))
E is the electric field strength (dB(µV/m) and
F is the frequency (GHz)
(ITU-R Recommendation PN.525-2 refers).
dBm is power relative to 1 milliwatt.
This formula can be converted in

10logPr = 20logE – 20logF-77.2

where Pr is signal at receiver antenna (in space) in mW, E is the field strength at the antenna in µV/m and F is the frequency f in MHz.
[dB(µV/m) = 20log(µV/m)]

2.4 Allotment of the frequency band 117.975 – 137 MHz.

2.4.1 Annex 10, Volume V, Chapter 4, paragraph 4.1.1 and Table 4 – 1 has established a general allotment of the frequency band 117.975 – 137 MHz. The main sub-divisions of this band are the frequency bands allocated to both international and national services and frequency bands solely allocated to national services. The provisions of this paragraph are reproduced in Appendix B.

2.4.2 Annex 10, Volume V includes provisions for the use of specific frequencies as follows:
121.5 MHz – Emergency frequency; the guard band for this frequency includes the band 121.425 – 121.575 MHz. (See also Annex 10, Volume V, paragraph 4.1.3.1)
121.6 – 121.9917 MHz (121.975 where 25 kHz frequency separation is deployed) – This band is reserved for ground movement communications, pre-flight checking and ATS clearance services.
123.1 MHz – Auxiliary frequency for SAR purposes. The guard band for this frequency includes the band 123.075 – 123.125 MHz. (See also Annex 10, Volume V, paragraph 4.1.4)
123.450 MHz – Air to air communications channel; to be used when the aircraft is out of the range of VHF ground stations. (See also Annex 10, Volume V, paragraph 4.1.3.2)
136.975 MHz – Common signaling frequency for VDL; this frequency uses the VDL Mode 2 modulation scheme. (See also Annex 10, Volume 5, paragraph 4.1.3.3)
Frequencies in the band **136.500 – 137 MHz** are not available for assignment to frequencies with a bandwidth of less than 25 kHz (See Annex 10, Volume V, paragraph 4.1.8.1.1, note 1).

2.4.3 In addition to the general allotment plan, all Regions have developed a more detailed allotment plan through which operational services are allotted to certain frequency bands and included these in the relevant ICAO Air Navigation Plans (ANP). The prime goal of these allotment plans is to accommodate new frequency assignments in the sub-bands allotted to a particular service. **Appendix E** contains a detailed overview of these allotment plans. The Regional allotment plans are incorporated in the ICAO frequency assignment planning program **SEARCH FREQUENCY**.

2.4.4 Frequency assignments should preferably be made in accordance with the provisions of the Regional allotment table. However, in case a particular requirement for a frequency assignment cannot be made from within the sub-band that is allotted to a particular service, other sub-bands can be considered to satisfy the requirement. The Regional frequency allotment plans also include provisions for sub-bands for aeronautical operational control (AOC) communications.

2.5 Frequency separation and channeling

2.5.1 Annex 10 stipulates that the minimum separation between assignable frequencies in the aeronautical mobile (R) service shall be 8.33 kHz. (Annex 10, Volume V, paragraph 4.1.2.1.)

2.5.2 Currently, 8.33 kHz frequency separation has only been introduced in the EUR Region. All other Regions have agreed to base frequency assignment planning on 25 kHz frequency separation. This implies that radio equipment designed for 50 kHz or 100 kHz frequency separation may not always be protected from harmful interference that can be caused by stations operating on adjacent 25 kHz or 8.33 kHz frequencies.

2.5.3 The ICAO program for frequency assignment planning **SEARCH FREQUENCY** has implemented compatibility calculations for all frequency assignments with 25 kHz frequency separation. In this program the user can select to search for frequencies on multiples of 50 kHz and 100 kHz; however, the planning and protection criteria that are applied relate to 25 kHz frequency separation only.

*Note: Criteria for frequency assignment planning in a mixed 8.33 kHz/25 kHz environment is being implemented in the program **SEARCH FREQUENCY**.*

2.5.4 Annex 10, Volume V, Chapter 4 (*Utilization of frequencies above 30 MHz*), Paragraph 4.1.2 (*Utilization in the band 117.975 – 137 MHz; Frequency separation and limits of assignable frequencies*) contains more material regarding the frequency separation and the protection dates of the different systems that can operate in the band 117.975 – 137 MHz.
Note: the protection dates specified in the relevant SARPs require updating.

2.5.5 Protection of 25 kHz frequency assignments

2.5.5.1 In Regions that continue operation with a frequency separation of 25 kHz, frequency assignments are protected from harmful interference from the use of frequencies operating on multiples of 8.33 kHz in (adjacent) Regions (see Annex 10, Volume V, paragraph 4.1.2.2.1, note and 4.1.8.1.1, note 2).

2.5.6 Channeling

2.5.6.1 Normally, in aviation the frequency in use is identified through the frequency (and not a channel number) (e.g. *frequency* 118.150 (as used in radio telephony) is the frequency 118.850 MHz and *frequency* 118.975 is the frequency 118.975 MHz.) For the use of 8.33 kHz frequencies in one single radio that can operate in 8.33 kHz frequency separation mode as well as in 25 kHz frequency separation mode, the frequency identification for 8.33 kHz frequencies was replaced with a channel identification similar to the method used for identifying frequencies. The channel/frequency identification is in accordance with Table 2 – 2. (See also Appendix C).

Frequency (MHz)	Frequency separation (kHz)	Channel #
118.0000	25	118.000
118.0000	8.33	118.005
118.0083	8.33	118.010
118.0167	8.33	118.015
118.0250	25	118.025
118.0250	8.33	118.030
118.0333	8.33	118.035
118.0417	8.33	118.040
118.0500	25	118.050
118.0500	8.33	118.055
118.0583	8.33	118.060
118.0667	8.33	118.065
118.0750	25	118.075
118.0750	8.33	118.080
118.0833	8.33	118.085
118.0917	8.33	118.090
118.1000	25	118.100
etc.		

Table 2 – 2 Channeling / frequency pairing for frequencies with 25 kHz and 8.33 kHz separation

2.6 Services and designated operational coverage

2.6.1 Frequency assignments are made to implement specific aeronautical services as follows:

Aerodrome

TWR Aerodrome control service
AS Aerodrome surface communications
AFIS Aerodrome flight information service

Approach

APP Approach control service
ATIS Automatic terminal information service

En route

FIS Flight information service
ACC Area control service

Other functions

A/A Air-to-air
A/G Air-to-ground
AOC Aeronautical operational control
VOLMET Meteorological broadcast for aircraft in flight
GPS VHF En-Route General Purpose System
EMERGENCY Emergency
SAR Search and rescue

2.6.1.1 No frequency coordination of frequency assignment planning is necessary for the emergency frequency (121.500 MHz) and the SAR frequency (123.100 MHz) as these services are available globally at each station where this service is required. Also, no specific frequency assignment planning is required for the air-to-air communication channel 123.450 MHz as this channel is to be used only in remote and oceanic areas when the aircraft is outside VHF coverage and does not involve ground stations.

2.6.2 Table of uniform values for designated operational coverage (DOC)

Frequencies for aeronautical radio communication services are (normally) implemented to satisfy the operational need for specific services. These services, and their uniform designated operational coverage areas, are as in Table 2 – 3.

Service	Designated Operational Coverage			
	Range (NM)	Height (ft)	Comments	
Aerodrome				
TWR	25	4000*		
PAR	25	4000*	Also APP-PAR	
AFIS	25	4000*		
AS	Limits of aerodrome	surface		

Approach				
APP–L	50	12000	Also APP-SR-L	
APP–I	75	25000	Also APP-SR-I	
APP–U	150	45000	Also APP-SR-U	
En-Route				
ACC–L	Area	25000	Within specified area; also ACC-SR-L	
ACC-I	Area	25000	Within specified area; also ACC-SR-I	
ACC–U	Area	45000	Within specified area; also ACC-SR-U	
FIS	Area	45000	Within specified area	
FIS-L	Area	25000	Within specified area	
FIS-U	Area	45000	Within specified area	
VOLMET	260	45000	Maximum coverage	
Other functions				
ATIS	260	45000	In EUR the uniform DOC is 60/200	
A-A	-	-	DOC to be determined by States	
A-G	-	-	DOC to be determined by States	
AOC	Not protected	Not protected		
EMERG	N/A	N/A		
SAR	N/A	N/A		
GPS			To be determined by States	

Table 2 – 3 Table of uniform designated operational coverage

*Notes: * Height above ground*

Additional functionality in the column "comments" may be added to the services as follows:

CD Clearance delivery
CTA CTA
DF Direction finding
ER Extended range
RCAG Remote controlled air-ground communications
SR Surveillance Radar

These additions do not alter the basic service or the DOC for which the frequency is required and should be included as a remark to the frequency assignment in the COM list in the global table of frequency assignments and the program **SEARCH FREQUENCY**.

2.6.3 Non-standard DOC (Range and Height) may be implemented as and when required. Reduced DOC may alleviate frequency congestion.

2.6.4 The use of common frequencies, preferably Region wide, to satisfy requirements for specific non-protected applications such as light aviation, gliding and balloon activities is recommended as such use increases the efficiency in frequency assignment planning. Normally, these applications operate on a non-protected basis.

2.6.5 Frequencies for aeronautical operational control are not protected through frequency planning. These frequencies are normally assigned on the basis of the traffic loading that is expected. (E.g. within the same area, smaller airlines can share the same frequency for operational control purposes).

2.6.6 The risk of interference from FM broadcasting stations operating in the band 87 – 108 MHz is generally not considered for frequency assignments in the band 117.975 – 137 MHz.

2.6.7 ICAO frequency assignment planning does not include protection against interference that may be caused in case facilities are co-located (e.g. interference due to intermodulation products)

2.6.8 Frequency coordination must take place with all States which may be affected by a proposal for a new frequency assignment or where the characteristics of an existing assignment are modified. Normally, such coordination is effected through the ICAO Regional Offices which have a central and coordinating role in frequency assignment planning.

2.7 Calculation of separation distances

Note: The material contained in this section can be used in areas where frequency assignment planning is based solely on 25 kHz or 8.33 kHz frequency separation. Paragraph 2.7.5 contains material to be considered when establishing separation distances in a mixed 25 kHz and 8.33 kHz environment

2.7.1 Protection of frequency assignments from harmful interference is achieved through frequency and/or distance separation. Normally, the determining factor in frequency assignment planning is the risk of interference between two aircraft, operating within different DOC areas at the closest point. As normally the ground station is located well within the DOC area, the ground station is protected when the aircraft (receiver) is protected from harmful interference.

2.7.2 The separation distances provided in this paragraph are the minimum distances that need to be maintained between the ground stations that provide the relevant service. The separation distances have been established using the method in paragraph 1.3 and 2.2 and the protection requirements as in paragraph 2.3.

2.7.3 Co-frequency separation distances

2.7.3.1 Air/ground communication services. Protection of co-frequency assignments for air/ground communication services (involving aircraft transmissions) is obtained by securing that the D/U ratio is in accordance with the regionally agreed value. The D/U ratio can be either 14 dB or 20 dB. (Re. paragraph 2.3.2).

2.7.3.1.1 Co-frequency separation distance for air/ground communications

D/U is 20 dB (radio line-of-sight)

As described in 1.3.4.2 and 2.2.1, in Regions where a protection ratio (desired over undesired signal, D/U) of 20 dB has been agreed, the minimum separation distance from the edge of the DOC (of the desired) ground station A to another (undesired) aircraft, operating on the same frequency (and outside the desired DOC), should be the sum of the distance to the radio horizon from each aircraft station. As shown in Figure 2 - 2, when the ground stations have a designated operational range of $\mathbf{R_A}$ and $\mathbf{R_B}$ respectively and $\mathbf{RH_A}$ and $\mathbf{R_B}$ is

the distance from the respective aircraft to the radio horizon, the minimum separation distance *between the ground stations* should be

$$\mathbf{R_A + RH_A + RH_B + R_B.}$$

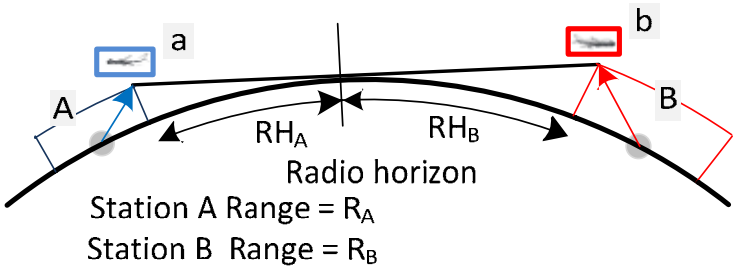


Figure 2 – 2 Separation distance based on Radio line-of-sight

Separation distance for D/U is 14 dB (1 : 5 separation distance ratio)

As described in 1.3.4, where a D/U protection ration of 14 dB is applied, the 1:5 distance ratio is to be used. To meet the 14 dB protection requirement, the distance between the aircraft receiver and the (interfering) aircraft transmitter needs to be at least 5 times the distance between the aircraft receiver and the desired ground station. This assumes that the e.i.r.p of both the [desired] station and the [undesired; interfering] station is the same. Where the e.i.r.p of the transmitters is different, adjustments to this formula are necessary (see paragraph 1.3.4).

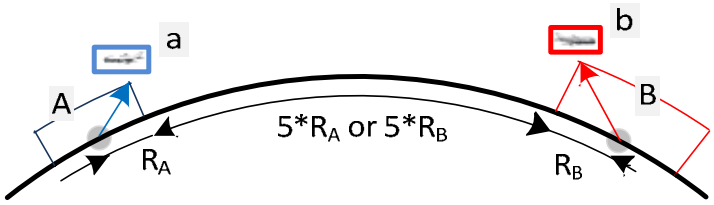


Figure 2 – 3 Separation distance based on 5 to 1 distance ratio

In Figure 2 – 3 the designated operational range for ground station A is $\mathbf{R_A}$ and for ground station B is $\mathbf{R_B}$. If the (minimum separation) distance from aircraft station **a** to aircraft station **b** is at least 5 times the distance from aircraft station a to ground station A ($\mathbf{5*R_A}$) aircraft station **a** is protected from interference from aircraft station **b**. Vice versa, if the distance from aircraft station **b** to aircraft station **a** is at least 5 times the distance from aircraft station **b** to ground station B ($\mathbf{5*R_B}$) aircraft station **b** is protected from interference from aircraft station a. The minimum separation distance between the two aircraft stations a and b is the largest of $\mathbf{5*R_A}$ and $\mathbf{5*R_B}$. The minimum separation *between the ground stations* is the larger value of

$$\mathbf{R_A + 5R_A + R_B} \textit{ or } \mathbf{R_A + 5R_B + R_B.}$$

In cases where this value is larger than $\mathbf{R_A + RH_{SA} + RH_B + R_B}$ (as described in paragraph 2.7.3.1.1 above) the line-of-sight criterion should be used.

2.7.3.1.2 Area services

For area services (such as ACC or FIS) the minimum separation distance that should be applied is the minimum distance between the closest point between the limit of the area services at maximum height (and, if applicable, also circular). The distance between these points at the limit of the DOC shall be at least the sum of the radio horizon of each aircraft at maximum protected flight level. The minimum separation distance between area services (and in cases where one service is an area service and the other service is a circular service) is **RH_A + RH_B** *between* the closest points of the respective service area. (See also paragraph 2.7.6)

The ICAO frequency assignment planning program **SEARCH FREQUENCY** currently has implemented planning criteria applicable to the 20 dB D/U protection ratio (radio line-of-sight), as established in paragraph 2.7.3.1.1. In line with current practice in many Regional Offices, area services are protected as a circular service, with a maximum operational range to the radio horizon for the specified height (e.g. 260 NM for an ACC/U service with a maximum flight level of 450 (45000 ft). The program plots on a map any potential interference that can be predicted within the designated operational coverage of the area service.

2.7.3.1.3 Co-frequency separation distances – broadcast services (ATIS and VOLMET)

Broadcast services such as ATIS and VOLMET are characterized by ground-to-air transmissions only and do not involve airborne transmissions. As a consequence, the separation distance between broadcast (ground) stations can be smaller compared to the case where aircraft transmissions are involved.

To protect an aircraft which is receiving broadcasts from an aeronautical ground broadcast station from interference from another aeronautical ground broadcast station, the minimum co-frequency separation distance between the (wanted) aircraft to the (unwanted) ground station is the distance to the radio horizon from the (wanted) aircraft plus 30 NM. This separation distance secures that the undesired VOLMET or ATIS station is located well beyond the radio horizon of the (desired) aircraft and accommodates a normally higher e.i.r.p for VOLMET (or ATIS) transmitters (typically 100 W). The designated operational coverage for these broadcast stations is normally the maximum that can be achieved (260 NM at flight level 450). The interference mechanism is shown in Figure 2 –45.

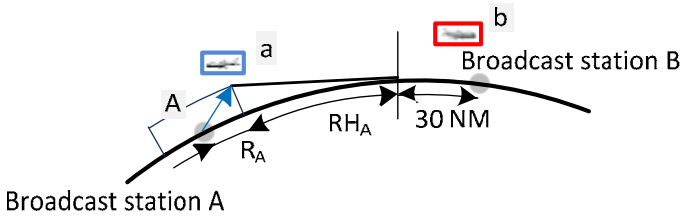


Figure 2 – 4 Interference mechanism between broadcast services

The minimum separation distance between two (ground) broadcast stations is

$$R_A+RH_A+30 \text{ (NM)}$$

To secure compatibility when station B is the wanted broadcast station and aircraft B is the desired receving aircraft station, the minimum separation distance between the (ground) broadcast stations A and B is

$$\mathbf{R_B+RH_B+30\ (NM)}$$

To secure compatibility between the two broadcast stations the minimum separation distance to be maintained *between the ground* broadcast stations **A** and **B** respectively is the larger value of:

$$\mathbf{(Max)\ RH_A + RA + 30}\ \textit{or}\ \mathbf{RH_B + RB + 30}$$

Where: R_A is the designated operational range for ground broadcasting station "A"
R_B is the designated operational range for ground broadcasting station "B"
RH_A is the distance to the radio horizon of aircraft A
RH_B is the distance to the radio horizon of aircraft B
(Distances in NM)

Note: these values are specified for VOLMET in Annex 10, Volume V, Attachment A paragraph 5.
[In the EUR Region, where the protection requirement of 14 dB D/U is used, the minimum separation distance to the (undesired) broadcast station is 5 times the designated operational range of the (desired) broadcast service or the distance to the radio horizon from the edge of the range of the (desired) broadcast signal, whichever distance is less].

2.7.3.1.4 Co-frequency separation distances – broadcast and air-ground services

To protect an aircraft station receiving broadcasts from a ground station from another station providing air/ground communications the mechanism as shown in Figure 2 - 5 applies

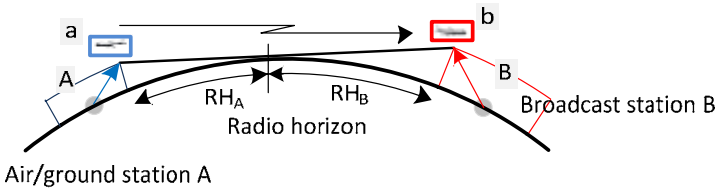


Figure 2-5 Interference mechanism between broadcast service and air/ground service

In order to protect aircraft B, which is receiving (only) broadcast information from ground broadcast station B (e.g. VOLMET or ATIS), from interference that can be caused by transmissions from aircraft station B, the minimum separation between the two aircraft stations needs to be the sum of the radio horizon of aircraft station A (RH_A) and the radio horizon of aircraft station B (RH_B). The minimum separation distance between the two ground stations then becomes:

$$\mathbf{R_A + RH_A + RH_B + RB}$$

Where: R_A is the designated operational range for station "A"

R_B is the designated operational range for broadcasting station "B"
RH_A is the distance to the radio horizon of aircraft A
RH_B is the distance to the radio horizon of aircraft B
(Distances in NM)

This distance is the same as in the case where both services are air/ground communication services (see paragraph 2.7.3.1.1).

To protect aircraft A from interference that can be caused by (ground) broadcast station B, the minimum separation between the two ground stations needs to be (see paragraph 2.7.3.1.3):

$$\mathbf{R_A+RH_A+30\ NM}$$

To protect both stations from interference that can be caused by each other, the maximum of the distances to be applied is

$$\mathbf{(Max)\ R_A + RH_A + RH_B + R_B}\ \textit{or}\ \mathbf{R_A+RH_A+30\ NM}$$

2.7.3.4 Unprotected services.

2.7.3.4.1 Certain services are not protected from interference and in many cases, no coverage has been determined for these services. An example is the use of frequencies for aeronautical operational control or for special uses such as for gliders and balloons.

2.7.3.4.2 Assignment of frequencies to stations is in these cases normally determined on the basis of the traffic loading that can be expected by the users of these -unprotected- frequencies. As long as these frequencies are in operation exclusively for unprotected use, these assignments are not subject to interference calculations. When these frequencies are shared with protected services, consideration needs to be given whether the use of the unprotected frequencies may cause interference to frequencies (co- and adjacent frequency) which do require protection from harmful interference and an assessment of potential interference should be undertaken. This may result in a situation that while the protected service is to be protected from interference from the unprotected service, the unprotected service is in turn also protected from interference from the protected service.

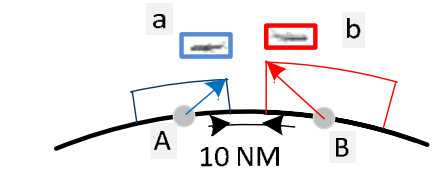
2.7.3.4.4 In the interest of efficient frequency assignment planning it is important to realize that when frequency assignments to unprotected services are being made, these should preferably be concentrated in one (or more) sub-bands solely reserved for unprotected services. Where feasible, such sub-bands should be established.

2.7.3.4.5 The program **SEARCH FREQUENCY** calculates the potential interference between frequency assignments for unprotected services as well as between frequency assignments for unprotected and for protected services. When presenting the calculation results, interference into unprotected services (or between unprotected services) can omitted from the calculation results.

2.7.4 Adjacent frequency separation distances

2.7.4.1 Air/ground communication services (25 kHz frequency separation).

2.7.4.1.1 The minimum separation between aircraft operating on the first adjacent (25 kHz) frequency is 10 NM (Re. Figure 2 – 6). An effective (first) adjacent frequency rejection of 60 dB is assumed which may lead to interference in cases where 50 kHz equipment is still in use. Annex 10 shows that, for aircraft receivers designed for operation in an environment where the minimum frequency separation is 25 kHz and assuming an effective adjacent frequency rejection of 60 dB or better, the minimum separation to be maintained between aircraft operating on adjacent frequencies is 3 NM. This also applies for receivers operating with a frequency separation of 8.33 kHz and to the first adjacent (8.33 kHz) frequency. These criteria protect the receiver by muting. A 20 dB D/U ratio is considered with this separation distance. Current practice is to use a value of 10 NM instead of 3 NM to secure adjacent frequency protection through frequency assignment planning.



Station A Range = R_A
Station B Range = R_B

Figure 2 – 6 Adjacent frequency separation for air-ground services.

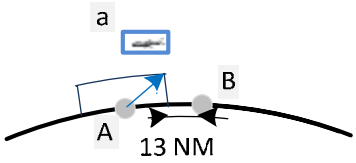
The minimum separation between two ground stations operating on the first adjacent 25 kHz frequency is:

$$R_A + 10 \text{ NM} + R_B$$

This minimum separation distance prevents adjacent frequency interference between two aircraft and applies when one (or both) aircraft stations provides air/ground communications

2.7.4.2 Adjacent frequency separation distances between broadcast services (ATIS, VOLMET).

2.7.4.2.1 In case both ground stations are broadcast (VOLMET, ATIS) stations, the minimum adjacent frequency separation distance between the aircraft and an unwanted (interfering) ground broadcasting station is 13 NM as shown in Figure 2 – 7.



Station A Range = R_A

Figure 2 – 7 Adjacent frequency separation between broadcast services

The minimum separation between two ground broadcast stations, operating on adjacent frequency, is

$$R_A + 13 \text{ NM}$$

where: **R_A** is the designated operational range for ground broadcast station **A**

Similarly, for broadcast station B, the minimum separation distance between the two ground stations is

RB + 13 NM

where: **R_B** is the designated operational range for ground broadcast station B (not shown in Figure 2 – 7)

The minimum separation distance that needs to be secured between the broadcast stations A and B is the larger value of:

(Max) R_A + 13 NM *or* **RB + 13 NM**

2.7.4.3 Adjacent frequency separation distances – broadcast and air-ground services

2.7.4.3.1 In this case, two different interference mechanisms need to be analyzed. The minimum separation distance can be calculated as follows:

Aircraft a is involved in air/ground communications with ground station A (Range R_A)
Aircraft b is receiving broadcast messages only from ground station B (Range R_B)

a. minimum separation distance between the two ground stations to protect the aircraft station **a** from interference from the (broadcasting) ground station **b,** as described in paragraph 2.7.4.2, is

R_A +13 NM

where **R_A** is the designated operational range of the station providing air/ground communications.

b. minimum separation distance between the two ground stations to protect the broadcast receiver (aircraft station **b**) from interference from aircraft station **a**. With the method as described in paragraph 2.7.4.1, the minimum distance between the aircraft stations is 10 NM. The minimum distance between the ground stations is

RA +10 + RB

where: RA is the designated operational range of the air-ground communication service
RB is the designated operational range of the broadcast service

To secure protection of both services, the minimum separation between the ground stations is the larger value of:

(Max) R_A +13 NM *or* **RA +10 + RB**

2.7.5 Co – and adjacent frequency consideration in a mixed environment where 8.33 kHz and 25 kHz frequency separation is being used.

Note: The following criteria are contained in the EUR Frequency management manual and require further consideration, in particular with regard to the protection of frequencies using off-set carrier (CLIMAX) systems.

2.7.5.1 Co-frequency separation criteria should be used when the 8.33 kHz frequency and the 25 kHz frequency are the same (e.g. channel 119.000 and 119.005 operate both on the frequency 119.000 MHz). Co-frequency separation criteria should also be applied between an 8.33 kHz frequency and a 25 kHz frequency which are separated by 8.33 kHz MHz. (e.g. channels 119.010 and 118.990, using frequencies 119.0083 MHz and 118.9917 MHz respectively) are considered both co-frequency to the [25 kHz] frequency 119.000 (119.000 MHz))

2.7.5.2 At least [33] NM should be the separation distance between the edges of the DOC's when the 8.33 kHz and a 25 kHz frequencies are separated by 16.67 MHz (e.g. channels 119.015 and 118.985, using frequencies 119.0167 MHz and 118.9833 MHz).
Note: These frequencies are considered co-frequency to the next 25 kHz frequency (e.g. co-frequency to 119.025 MHz and 118.975 MHz.

2.7.5.3 At least 10 NM should be the separation between the edges of the DOC's when the 8.33 KHz frequency and the 25 kHz frequency are separated by 20 kHz (*i.e.* the same criteria as for a 25 kHz adjacent frequency.

2.7.5.4 At least 4 NM should be the separation distance between an 8.33 kHz frequency and a 25 kHz frequency which are separated by 25 kHz (e.g. channel 118.000 (25 kHz) and 118.030 (8.33 kHz) which use the frequency 118.000 MHz and the frequency 118.025 MHz respectively)

2.7.5.5 Table 2 – 4 gives an overview of the separation distances to be maintained in a mixed 25 / 8.33 kHz environment. The values for the adjacent frequency separation are in NM. "C" indicates that the co-frequency separation criteria (line-of-sight or the 1 : 5 distance ratio needs to be applied.

	118.0000 118.000	118.0000 118.005	118.0083 118.010	118.0167 118.015	118.0250 118.025	118.0250 118.030	118.0333 118.035	118.0417 118.040	118.0500 118.050	118.0500 118.055	118.0583 118.060	118.0667 118.065	118.0750 118.075	118.0750 118.080	118.0833 118.085	118.0917 118.090	118.1000 118.100	118.1000 118.105	118.0000	118.0000	118.0000
118.0000 118.000	C	C	C	33	10	4															
118.0000 118.005	C	C	10		4																
118.0083 118.010	C	10	C	10	33																
118.0167 118.015	33		10	C	C	10			4												
118.0250 118.025	10	4	33	C	C	C	C	33	10												
118.0250 118.030	4			10	C	C	10		4												
118.0333 118.035					C	10	C	10	33												
118.0417 118.040					33		10	C	C	10			4								
118.0500 118.050				4	10	4	33	C	C	C	C	33	10								
118.0500 118.055					4			10	C	C	10		4								
118.0583 118.060									C	10	C	10	33								

118.0667 118.065									33		10	C	C	10							
118.0750 118.075									10	4	33	C	C	C	C	33	10				
118.0750 118.080									4			10	C	C	10		4				
118.0833 118.085													C	10	C	10	33				
118.0917 118.090													33		10	C	C	10			
118.1000 118.100													10	4	33	C	C	C	C		
118.1000 118.105													4			10	C	C			

Table 2 – 4 Adjacent frequency separation distances for a mixed 25 kHz/8.33 kHz environment

2.7.6 Frequency planning criteria for area services

2.7.6.1 For area services, the separation distance is measured from the edge of the coverage of the area service. When the two services considered include a circular service, the separation distance is from the station providing the circular service to the closest point of the edge of coverage of the area service.

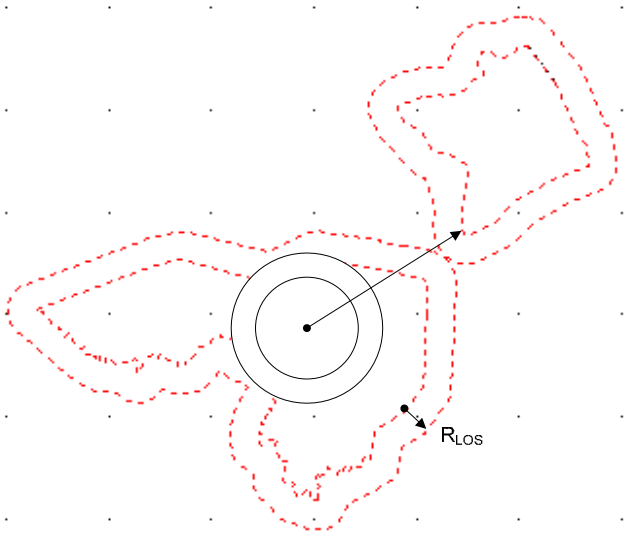


Figure 2 – 8 Minimum separation of area services

Note: R_{LOS} is radio line-of-sight

2.7.6.2 Co-frequency separation

The minimum separation between the designated operational coverage of two area services is equal to the sum of the radio line-of-sight for each area service at the limit of the DOC (coverage). This method provides frequency protection throughout the DOC of the area service. In Figure 2 – 8 around the each of the area services a buffer zone equal to the distance to the radio horizon for an aircraft at maximum altitude of the relevant DOC has been established. The minimum separation to protect the two area services from harmful interference is established at the closest point between the service areas.

2.7.6.2.1 In many cases, for large designated operational coverage areas of area services, a single ground station cannot provide coverage throughout the service area. In these cases, where required, additional coverage is provided through installing extended range stations (forward relay). These stations can operate on the same frequency (using the off-set carrier system as specified in Annex 10, Volume III) or on a discrete frequency. Not in all cases full VHF coverage is provided, in particular for lower flight levels. The program **SEARCH FREQUENCY** can display these coverage areas for Flight Information Regions on a map.

2.7.6.2.2 Frequency protection is being calculated in the program **SEARCH FREQUENCY** for the circular coverage area at the maximum altitude of the station providing the area service. This may lead to overprotection in cases where the coverage of these stations extends outside the area service.

2.7.6.2.3 When the same frequency used by an area service is also used by a broadcasting service (which is a circular service), the minimum separation is the larger value of the following:

a. to protect the aircraft receiver at the edge of the area coverage, the minimum distance to the ground broadcast transmitter should be at least the distance to the radio horizon + 30 NM from the limit of the DOC of the area service

b. the minimum distance from the aircraft broadcast receiver to the airborne transmitter at the edge of the area service should be at least the sum of the distance to the radio horizon (radio line-of-sight) for each aircraft. The minimum distance from the edge of the DOC of the area service to the broadcast transmitter should be at least the sum of the distance to the radio horizon for each aircraft plus the range of the broadcast station.

The methodology for establishing the minimum separation distances is the same as provided in paragraphs 2.7.3 and 2.7.4. However, in order to secure protection of area services throughout the DOC, separation distances are measured from the limit of the DOC rather than from the ground station(s) providing the area service.

2.7.6.3 Adjacent frequency separation for area services.

2.7.6.3.1 The minimum separation distance between the designated operational coverage of two area services are to be separated (at the edge of coverage) by at least 10 NM when in each of the two areas the first adjacent frequencies is being used. (In this case, in figure 2 – 8 the buffer zone around the area service is 10 NM)

2.7.6.3.2 The same condition applies when one of the services is a circular service. In this case, the minimum separation between the edge of the designated operational coverage of the area service and the ground station of the circular service is the range of the circular service + 10 NM

2.7.6.3.3 When the adjacent frequency used by an area service is used by a broadcasting service (which is a circular service), the minimum separation is the larger value of the following:

a. to protect the aircraft receiver at the edge of coverage, the minimum distance to the ground broadcast transmitter from the edge of coverage should be at least 13 NM.

b. the minimum distance from the aircraft broadcast receiving to the airborne transmitter at the edge of the area service should be at least the sum of the distance to the radio horizon (radio line-of-

sight) for each aircraft plus 13 NM. The minimum distance from the edge of the DOC of the area service to the broadcast transmitter should be at least 13 NM plus the range of the broadcast station.

2.8 Separation distances for VDL (VDL Mode 2 and VDL Mode 4)

2.8.1 VDL operating co-frequency with other VDL or DSB-AM air/ground communication systems.

The same planning criteria as used between VHF voice systems (20 dB protection ratio) should be used. The separation criteria are those as described in paragraph 2.7.3 above.
Note: This applies to VDL vs. DSB-AM as well as between VDL assignments)

2.8.2 VDL operating on adjacent frequencies:

The 1st frequency, adjacent to either a DSB-AM frequency or a VDL frequency should not be used in the same airspace.

The 2nd frequency, adjacent to a DSB-AM frequency should not be used in the same airspace for VDL Mode 4.

Vs.		Interference source		
		DSB-AM	VDL 2	VDL 4
Victim	DSB-AM		1	2
	VDL 2	1	1	1
	VDL 4	2	1	1

Table 2 – 5 25 kHz guard band (channels) between DSB-AM, VDL mode 2 and VDL mode 4

Note: The numbers in Table 4 are guard-bands (channels). The next frequency that can be used without frequency planning constrain is 1 channel higher (e.g. a desired DSB-AM station that is interfered by a VDL Mode 2 aircraft station requires one 25 kHz guard band.. The next frequency, 50 kHz away, can be used in the same designated operational coverage without any frequency assignment planning constraint.

2.8.3. Attention is drawn to the possibility of interference between DSB-AM and VDL Mode 2/4 when these systems are used on the surface of an airport. Interference can occur if the frequency separation (guard band) is four channels (25 kHz) or less. In this case interference between aircraft stations can be prevented through securing that the minimum field strength of these systems is 70 dBm at the antenna. Any interference that may be caused in ground based receiving stations (i.e. not aircraft stations) can be mitigated through using cavity filters that block in these receivers the reception of unwanted signals from transmissions from aircraft operating on the surface of an airport.

2.9 Separation distances (air ground communication services and ground based broadcasting services)

2.9.1 Applying the methodology as described in paragraph 2.7, separation distances between the edges of the DOC have been calculated using the distance to the radio horizon (R_{LOS}) as below:

Symbol	Service range (NM)	Service height	Radio horizon
TWR	25 NM	4000 ft	78 NM
AFIS	25 NM	4000 ft	78 NM
AS	Limits of aerodrome	Surface	N/A
APP-U	150 NM	45000 ft	260 NM
APP-I	75 NM	25000 ft	195 NM
APP-L	50 NM	12000 ft	134 NM
ACC-U	Specified area	45000 ft	260 NM
ACC-L	Specified area	25000 ft	195 NM
FIS-U	Specified area	45000 ft	260 NM
FIS-L	Specified area	25000 ft	195 NM
VOLMET	260 NM	45000 ft	260 NM
ATIS	260 NM	45000 ft	260 NM

Table 2 – 6 Distance to radio horizon with aircraft at maximum altitude

Note: Radio horizon of the aircraft from the edge of DOC.

The minimum separation distances between the ground stations are summarized in Table 2 – 7 and are in accordance with the methods described in paragraph 2.7.3.

2.9.1.1 Automatic Terminal Information Service, or ATIS, is a continuous broadcast of recorded information in busier terminal (i.e. airport) areas. ATIS broadcasts contain essential information, such as weather information, which runways are active, available approaches, and any other information required by the pilots, such as important NOTAMs. As a terminal service, ATIS may not require a DOC greater than APP/U.*(to be confirmed).* In Tables 2 – 6 and 2 – 7 the designated operational coverage for ATIS is assumed to be the maximum achievable (260 NM / 45000 ft.), in accordance with current practice in various Regions.

		VICTIM											
	Service	**TWR 25/40**	**AFIS 25/40**	**AS 10/1.5**	**APP-U 150/450**	**APP- I 75/250**	**APP-L 50/120**	**ACC-U 260/260**	**ACC-L 195/195**	**FIS-U 260/260**	**FIS- L 195/195**	**VOLMET 260/260**	**ATIS 260/260**
INTERFER	**TWR**	206	206	128	513	373	287	623	493	623	493	623	623
	AFIS	206	206	128	513	373	287	623	493	623	493	623	623
	AS *(Note 2)*	128	128	50	435	295	209	545	415	545	415	545	545
	APP-U	513	513	435	820	680	594	930	800	930	800	930	930
	APP-I	373	373	295	680	540	454	790	660	790	660	790	790
	APP-L	287	287	209	594	454	368	704	574	704	574	704	704
	ACC-U *(Note 1)*	623	623	545	930	790	704	1040	910	1040	910	1040	1040
	ACC-L *(Note 1)*	493	493	415	800	660	574	910	780	910	780	910	910

	FIS-U *(Note 1)*	623	623	545	930	790	704	1040	910	1040	910	1040	1040
	FIS-L *(Note 1)*	493	493	415	800	660	574	910	780	910	780	910	910
	VOLMET	133*	133*	55*	440*	300*	214*	550*	420*	550*	420*	550	550
	ATIS	133*	133*	55*	440*	300*	214*	550*	420*	550*	420*	550	550

Table 2 -7 – Minimum geographical co-frequency separation distances between stations

*Note 1: All distances are in NM. Separation distances are between the facilities (ground stations) for (circular) services. For area services, the separation distance between the ground stations has been calculated on the basis of the maximum circular coverage that can be obtained at the maximum flight level or the relevant service. Different combinations of the designated operational range and height will result in minimum separation distances that differ from those in Table 2 – 7. The program **SEARCH FREQENCY** calculates the minimum required separation distance on the actual designated operational coverage as specified in the relevant COM List.*

Note 2: For Aerodrome Surface communications, a co-frequency separation distance of 50 NM between two stations has been used. (A DOC of 10 NM / 150 ft. has been assumed). Frequencies for aerodrome surface communications should be selected from the band 121.600 – 121.975 MHz. This band is reserved exclusively for aerodrome surface communications.

Note 3: The designated operational coverage for area services (ACC and FIS) in Table 2 – 7 is assumed to be circular with the following values:

ACC/L and FIS/L: 194 NM / 25000 ft.
ACC/U and FIS/U: 360 NM / 45000 ft.

Note 4: Separation distances marked with an asterix (*) are sufficient to protect an air/ground communication service from interference that can be caused by a (ground) broadcasting station (VOLMET, ATIS). (ATIS/VOLMET stations are the interferer and the air/ground communication service (at the aircraft) is the victim. However, to protect also the broadcasting service, the separation distances for the air/ground communication services as interferer need to be used. (See also 2.7.3.3, 2.9.1.2 and 2.9.1.2.1.)

(Table2-7A – separation distances based on 5:1 distance ratio (14 dB D/U) to be added)

2.9.1.2 VOLMET and ATIS are one-way transmissions from a ground transmitter to the aircraft. Since the VOLMET DOC has been calculated upon the maximum coverage that can be obtained at 45000 ft (260 NM), protection between VOLMET stations can be secured if the separation distance between these DOC is 30 NM, assuming a VOLMET transmitter height of 100ft and results in a VOLMET/VOLMET co-frequency separation distance of 260 + 30 + 260 = 550 NM. This distance would also be sufficient for the protection of ATIS from interference from VOLMET transmissions.

2.9.1.2.1 Not in all cases where interference can be caused by an air/ground communication service into the on-board reception of ATIS/VOLMET broadcast transmission, the ATIS/VOLMET broadcast

transmissions will, vice versa, interfere with the (on-board) reception of the air/ground communication service transmission (see 2.7.3.3).

For example, to protect the reception of a TWR service from interference from the transmission of a (ground) VOLMET station (the VOLMET station is the interfere) , the minimum separation distance between the ground TWR station and the ground VOLMET station is the sum of the DOC-range and the radio horizon for the TWR service and 30 NM:

25 NM + 78 NM +30 NM = 133 NM.

To protect also the reception of the VOLMET service from interference from the transmission of the (airborne) TWR station, the minimum separation between the ground VOLMET station and the ground TWR stations is the sum of the DOC range and the radio horizon of the VOLMET station and the sum of the DOC range and the radio horizon of the TWR service:

260 NM + 260 NM +25 NM +78 NM = 623 NM.

To secure compatibility between both stations / services, the minimum separation distance between the two stations needs to be 633 NM.

*Note: In these cases the program **SEARCH FREQUENCY** shows the interference caused by the TWR service into the VOLMET service. The TWR service is printed on the map as a protected service.*

2.9.1.3 Minimum separation distances for aerodrome surface communications (AS) are calculated assuming a designated operational range for AS communications of 10 NM and a designated operational height of 150 ft. This results in a minimum co-frequency separation distance of 50 NM. Should the difference in height between the two aerodromes be significantly different, additional margins may need to be added. Separation distances (between facilities) providing air/ground communications operating on the same frequency as the aerodrome communications service have been calculated as the sum of 25 NM (AS) plus the radio horizon plus DOC-range of the air/ground communication service; (see paragraph 2.7.3.1.1). In case the airborne service is an area service (ACC or FIS), only the distance of the radio horizon to the nearest limit of the airborne service has been provided (25 NM (AS plus DOC range airborne service) should apply. Sharing of frequencies with aerodrome surface communications and air/ground communication services is unlikely to occur since an (exclusive) sub-band has been allotted by ICAO for AS communication (121.600-121.975 MHz).

2.9.10 Geographical separation criteria currently used in the AFI, APAC, CAR, MID and SAM Regions.

2.9.10.1 Currently, minimum co-frequency separation distances are being used in the AFI, APAC, CAR, MID and SAM Regions that differ from the separation distances described in paragraph 2.9.1. The regional plans for these regions include provisions for the designated operational coverage and the minimum co-frequency (and in some cases also adjacent frequency) separation distances as summarized in Table 2 – 8.

For information purposes, Table 2 – 8 includes the co-frequency separation distances that have been incorporated in the program **SEARCH FREQUENCY** for similar services (e.g. TWR vs. TWR)

Table 1

Air/ground communication for	Symbol	Designated Operational Coverage (DOC)		Minimum co-frequency separation (NM)	Minimum adjacent frequency separation (NM)	Separation distances implemented in the program SEARCH FREQUENCY	
		Range (NM)	Height (ft.)			Minimum co-frequency geographical separation (NM)	Minimum adjacent frequency Separation (NM)
Aerodrome control	TWR	25	4000	175	25	206	60
Surface movement control	AS	Limits of aerodrome	Surface of aerodrome	25	25	50	30
Approach control up to FL 120	APP-L	50	12000	370	60	368	110
Approach control and Flight information up to FL 250	APP-I	75	25000	550	95	540	160
Approach control up to FL 450	APP-U	100	45000	820	180	822	210
Area control or Flight Information up to FL 250	ACC-L FIS-L	Within area plus 50 NM	25000	390*	95*	780	400
Area control or Flight Information up to FL 120	ACC-U FIS-U	Within area plus 50 NM	45000	520*	180*	1040	530
Area control or Flight Information up to FL 120 extended range (also VHF extended range)	ACC-ER or FIS-ER	To be specified	45000	1000 (1300?)	(380)	1040	530
VOLMET up to FL 450	VOLMET	Maximum onmi-directional available	45000	520	180	550	270

Table 2 – 8

Notes:

1. The figure printed in red are the separation distances for similar services (e.g. TWR vs TWR on the same or the first adjacent (25 kHz) frequency) as implemented in the program SEARCH FREQUENCY. In all cases these are the separation distances between stations. For area services the DOC has been assumed to be the maximum range at the maximum specified height. The margin of 50 NM is not included in these separation distances.
2. Separation distances marked with an asterix (*) are separation distances between the DOC of the relevant area services (ACC and FIS).

2.9.10.2 These separation criteria apply to similar services (e.g. TWR vs TWR) only. The application of the detailed allotment plans in each Region (see paragraph 2.4.3 and 2.4.4 and Appendices E and G) whereby a particular service has to be assigned a frequency only allotted to that service facilitates the application of these separation criteria.

2.9.10.3 However, some of the allotments are already made to dissimilar services (e.g. APP-L and APP-I) and in practice, the principle of assigning only frequency within the frequency range determined by the allotment plan (or frequency pool) is not always applied. In these case is it practical, in the absence of more detailed separation criteria, to apply as a minimum separation distance between to dissimilar service the separation distance that applies to the largest required separation distance.

Under this principle, the minimum separation distance between a TWR service and an APP-U service would be 820 NM (which is also the minimum co-frequency separation distance between two APP-U services).

2.9.10.4 Following the principle outlined in this paragraph, the following table (Table 2 – 9) of minimum co-frequency separation has been established that reflects the current practice in various Regions.

Service	**TWR**	**AFIS**	**AS**	**APP-U**	**APP-I**	**APP-L**	**ACC-U**	**ACC-L**	**FIS-U**	**FIS- L**	**VOLMET**	**ATIS**
TWR	175	175	175	820	550	370	1000	750	1000	750	520	660
AFIS	175	175	175	820	550	370	1000	750	1000	750	520	660
AS *(Note 2)*	175	175	50	820	550	370	1000	750	1000	750	520	660
APP-U	820	820	820	820	820	820	1000	820	1000	820	820	820
APP-I	550	550	550	820	550	550	1000	750	1000	750	520	660
APP-L	370	370	370	820	550	370	1000	750	1000	750	520	660
ACC-U *(Note 1)*	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
ACC-L *(Note 1)*	750	750	750	820	750	750	1000	750	1000	750	750	750
FIS-U *(Note 1)*	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
FIS-L *(Note 1)*	750	750	750	820	750	750	1000	750	1000	750	750	750
VOLMET	520	520	520	820	520	550	1000	750	1000	750	520	660
ATIS	660	660	660	820	660	660	1000	750	1000	750	660	660

Table 2 – 9 Minimum co-frequency separation distances applied in the AFI, APAC, CAR, MID and SAM Regions

Chapter 3 Aeronautical VHF and UHF radio air-ground radio navigation systems operating in the band 108 – 117.975 MHz and 960 – 12156 MHz (ILS, VOR, DME, GBAS and VDL Mode 4)

3.1. Introduction

3.1.1 The frequency bands 108 – 117.975 MHz and 960 – 1215 MHz are allocated by the International Telecommunication Union (ITU) to the aeronautical radionavigation service and used for the ICAO standardized Instrument Landing System (ILS), VHF Omnidirectional Range (VOR) and the Distance measuring Equipment (DME). In addition, the band 108 – 117.975 MHz and the band 960 – 1164 MHz is also allocated to the aeronautical mobile (R) service. In the band 108 – 117.975 MHz this allocation was made to enable the use of this band for GBAS (108 – 117.975 MHz) and VDL Mode 4 (112 – 117.975 MHz). The band 960 – 1164 MHz is considered for the implementation of new air-ground data link systems.

3.1.2 ICAO documents relevant to the frequency assignment planning for ILS, VOR, DME, GBAS and VDL Mode 4 systems include:

- *Annex 10, Volume 1 (Radio Navigation Aids)*
- *Annex 10, Volume III*
- *Annex 10, Volume V*
- *ICAO Regional Air Navigation Plans and relevant ICAO Regional Air Navigation Agreements*

3.1.3 For the different radio navigation systems, interference models have been established by ICAO as further documented in this Chapter.

3.1.4 Frequencies for ILS (Localizer and Glide Path), VOR and DME are paired as shown in Figure 3-1.

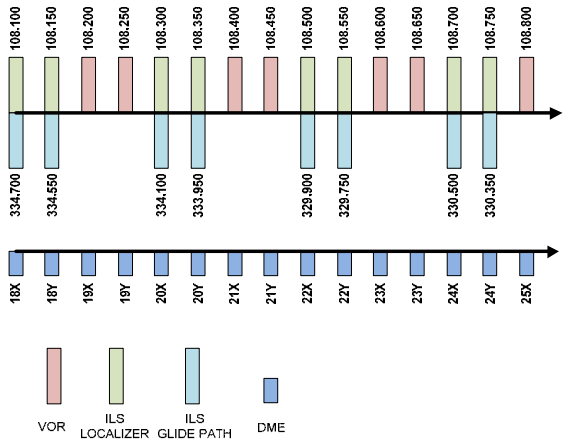


Figure 3-1 Pairing of ILS, VOR and DME frequencies

3.1.4 The coverage of the ILS facility is shown in Figure 3-2. (*For localizer see Annex 10, Volume I, 3.1.3.3 and for glide path see Annex 10, Volume I, 3.5.3*).

The points P_{LLZ} and P_{GP} in Figure 3 – 2 are the protection points for the localizer and the glide path respectively. However, with the introduction of highly directional localizer antenna arrays, the most critical protection point will not be along the extended runway center line. Directive antennas result in critical protection points at maximum distance, either plus or minus 10 degrees or plus or minus 35 degrees off the runway center line. Protection of these points should be examined during the frequency assignment process. It is therefore safe to assume that the protection points are located throughout the edge of the coverage for the ILS localizer and the ILS glide path.

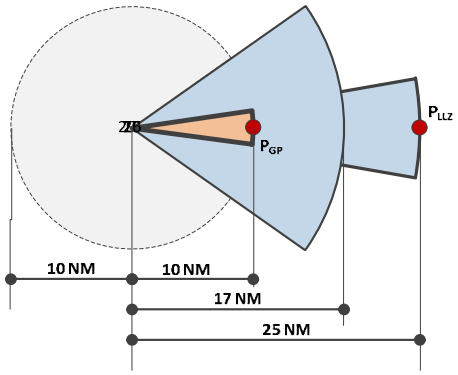


Figure 3 – 2; Coverage of ILS localizer (blue) and ILS glide path (pink)

Where the ILS facility is associated with a DME, the coverage of the DME should be at least that of the ILS facility. In such cases and where the bearing of the ILS is not known and no DME coverage is specified, a circular coverage of 25 NM / 10000 ft could be assumed for frequency assignment planning purposes. The DME coverage can be specified to a DOC different from the ILS DOC.

3.2 Frequency assignment planning criteria for the Instrument Landing System (ILS)

3.2.1 Frequencies and channeling.

The ILS localizer shall operate in the band 108 – 111.950 MHz. The emissions from the localizer are horizontally polarized. (*Annex 10, Volume I, 3.1.2.1).* The channel spacing for ILS localizer frequencies is 100 kHz. In some Regions or areas where congestion for ILS-localizer frequency assignments is expected, the channel spacing is 50 kHz. The correspondent channel spacing for the ILS glide path is either 300 kHz or 150 kHz. ILS localizer frequencies and ILS glide path frequencies are paired as shown in Appendix F. The channel spacing applied in the Regions is as follows (*Note: this list needs to be confirmed*):

Region	Channel spacing
AFI	100/50 kHz
APAC	100/50 kHz
CAR	100 /50kHz
EUR	50 kHz
MID	100/50 kHz
SAM	100/50 kHz

Table 3 – 1 Channel spacing in the VHF band in the Regions

3.2.2 Frequency assignment planning criteria.

3.2.2.1 The frequency assignment planning criteria for the ILS are in *Annex 10, Volume I, Attachment C, paragraph 2.6.* These planning criteria provide for separation distance for areas where ILS localizer receivers are in operation designed for 200 kHz channel spacing, receivers for 100 kHz channel spacing and receivers for 50 kHz channel spacing are in operation.

The minimum separation distances to be applied between ILS facilities are specified in *Annex 10, Volume 1, Attachment C, paragraph 2.6*, as in Table 3 – 2:

	Frequency separation	Minimum separation distance between second facility and the protection point of the first facility (NM)	
		100 kHz channel separation[1]	50 kHz channel separation[2]
Localizer	Co-frequency	80	80
	50 kHz	20	5
	100 kHz	5	0
	150 kHz	0	0
	200 kHz	0	0
Glide path	Co-frequency	50	50
	150 kHz	11	1
	300 kHz	1	0
	450 kHz	0	0
	600 kHz	0	0

Table 3 – 2 Required separation distances

Note 1.— The above figures are based on the assumption of protection points for the localizer at 46 km (25 NM) distance and 1 900 m (6 250 ft) height and for the ILS glide path at 18.5 km (10 NM) distance and 760 m (2 500 ft) height .
Note 2.— States, in applying the separations shown in the table, have to recognize the necessity to site the ILS and VOR facilities in a manner which will preclude the possibility of airborne receiver error due to overloading by high unwanted signal levels when the aircraft is in the initial and final approach phases.
Note 3.— States, in applying the separations shown in the table, have to recognize the necessity to site the ILS glide path facilities in a manner which will preclude the possibility of erroneous glide path indications due to reception of adjacent channel signals when the desired signal ceases to radiate for any reason while the aircraft is in the final approach phase.

Note: Table for 200 kHz channel separation(which is included in Annex 10) is not shown

Application of these separation distances as per Annex 10 is as follows:

(i) Co-frequency localizer:
The protection distance in Table 3 – 2 should be secured on each point of the limit of the key-hole coverage of the ILS localizer coverage. As in most cases the bearing of the ILS facility is not known, the protection distance (in all azimuths) from the localizer is 80NM +25 NM = 105 NM.
Note: In Europe a different method is applied in case the bearing of the ILS facility is known

(ii) Adjacent frequency localizer:
100/50 kHz channel spacing:
The protection distance in Table 3 – 2 should be secured on each point of the limit of the key-hole coverage of the ILS localizer coverage. As in most cases the bearing of the ILS facility is not known, the protection distance (in all azimuths) from the localizer is 20NM +25

[1] Refers to the use of localizer receivers designed for 100 kHz channel spacing coupled with glide path receivers designed for 300 kHz channel spacing.
[2] Refers to the use of localizer receivers designed for 50 kHz channel spacing coupled with glide path receivers designed for 150 kHz channel spacing.

NM = 62 NM for localizer systems that operate on the first (50 kHz separated) adjacent frequency and 25+ 5 = 30 NM for localizer systems that operate on the second adjacent (100 kHz separated) frequency to protect localizer receivers operating with 100 kHz channel spacing.

50 kHz channel spacing:

To protect localizer receivers operating with 50 kHz channel spacing, the protection distance is 25 + 5 NM on the first adjacent (50 kHz separated) frequency

Note 1: In Europe a different method is applied in case the bearing of the ILS facility is known
Note 2: The provisions in Annex 10 require further clarification. For ILS frequencies operating on 100 kHz frequencies, the first adjacent 100 kHz channel is always a VOR frequency and the nearest ILS frequency is 200 kHz away. In areas where 50 kHz frequency assignments are used for ILS, the nearest ILS frequencies are either 50 kHz, 150 kHz or 200 kHz separated.
Note 3: It is assumed that the channel spacing used in the AFI Region is based on 100 kHz (i.e. ILS localizer receivers designated for 100 kHz channel spacing)

(iii) Co-frequency glide path:

When the co-frequency localizer is protected from harmful interference, the glide path frequency is also protected.

(iv) Adjacent frequency glide path:

300/150 kHz channel spacing: The protection distance in Table 3 – 2 should be secured on each point of the limit of the key-hole coverage of the ILS glide path coverage. As in most cases the bearing of the ILS facility is not known, the protection distance (in all azimuths) from the localizer is 10NM +11 NM = 21 NM for glide path systems that operate on the first (150 kHz separated) adjacent frequency and 10+ 1 = 11 NM for glide path systems that operate on the second adjacent (300 kHz separated) adjacent frequency to protect glide path receivers operating with 300 kHz channel spacing.

150 kHz channel spacing: To protect glide path receivers operating with 50 kHz channel spacing, the protection distance is 10 + 1 NM = 11 on the first adjacent (150 kHz separated) frequency

Note: In Europe a different method is applied in case the bearing of the ILS facility is known

3.2.2.2. Separation distance for ILS / VOR compatibility .

3.2.2.2.1 Co-frequency planning criteria for ILS and VOR.

Annex 10 requires that ILS and VOR cannot operate on the same frequency (see the channeling plan in Appendix E). It may occur that, temporarily an ILS and a VOR share the same frequency. Annex 10, Volume 1, Attachment C, paragraph 3.5.3 gives guidance for the separation distances to be secured in this case.

3.2.2.2.2. Adjacent frequency planning criteria for VOR and ILS

When operating on 100 kHz channels only, each ILS frequency is adjacent to a VOR frequency at 100 kHz frequency separation and to an ILS frequency at 200 kHz separation. For ILS receivers operating designed for 100 kHz channels spacing, the nearest (200 kHz) ILS frequency does not need to be taken into account for

frequency assignment planning. In principle, ILS frequencies separated with 200 kHz could be used on the same airport (Figure 3-4).

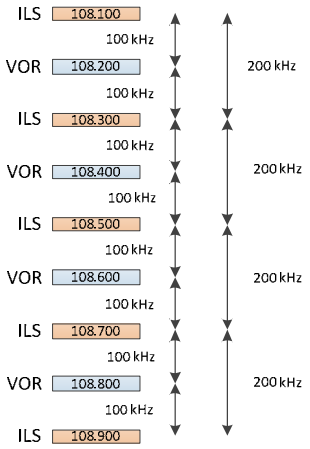


Figure 3-4 Adjacent channels for ILS frequencies with 100 kHz channel spacing.

When operating on 100 kHz and 50 kHz channels, each ILS Localizer frequency is adjacent to a VOR frequency and a Localizer frequency separated with 50 kHz (first adjacent channel).

The second adjacent frequency to an ILS frequency is always a VOR frequency, separated at 100 kHz. (Fig. 3-5).

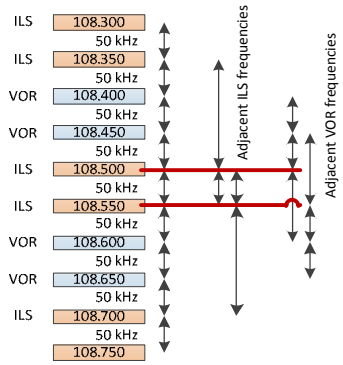


Figure 3-5 Adjacent channels for ILS frequencies with 50 kHz channel spacing

3.2.2.2.2 The separation criteria to protect both the VOR and the ILS localizer are:

a. Protection of the VOR is effectively obtained without geographical separation of the facilities.
b. Protection of the ILS system requires that a VOR spaced at 100 kHz from the ILS frequency (and for a VOR having an e.i.r.p. of 17 dBW (50W)) is located at least 5 NM from the ILS protection point. The minimum separation between an ILS and a VOR facility would be 25 + 5 = 30 NM. (For VOR with an e.i.r.p. of more than 50W, a larger separation distance would be required)

c. Protection of the ILS system requires that a VOR spaced at 50 kHz from the ILS frequency (and for a VOR having an e.i.r.p. of 17 dBW (50W)) is located at least 43 NM from the ILS protection point. The minimum separation between an ILS and a VOR facility would be 25 + 43 = 68 NM. (For VOR with an e.i.r.p. of more than 50W, a larger separation distance would be required).

Note: These separation distances apply in case the localizer receiver is designed for 100 kHz channel spacing. Where localizer receivers designed for 50 kHz channel spacing are used, the separation distance between the ILS and the VOR facility (e.i.r.p is 17 dBW (50W)) is 30 NM.

3.2.2.2.3 Adjacent frequency assignment planning constraints for the ILS glide path.

In paragraph 3.2.2.1 (iv) separation distances to protect the ILS glide path from interference are provided. As shown in Figure 3 – 5, not in all cases the adjacent channel to a localizer frequency is also adjacent to a glide path frequency and vice versa.

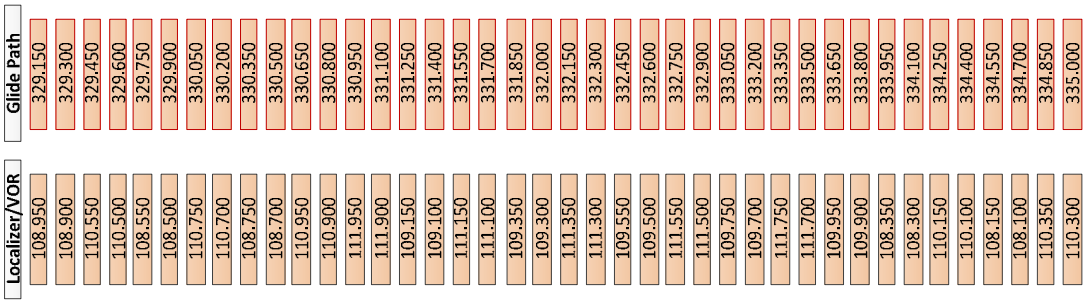


Figure 3 – 5 Overview of adjacent glide path frequencies in relation to the localizer frequency

As an example, when a frequency assignment is being made to the localizer frequency 110.900 MHz, the paired glide path frequency is 330.800 MHz. The adjacent glide path frequencies are as in Table 3 – 3.

To secure protection of the glide path frequencies it is necessary ensure that the adjacent channel protection criteria are met for the glide path frequencies of the ILS facilities with the frequency assignments for the localizer as in Table 3 – 3, even when the localizer frequencies are not adjacent.

Frequency separation (UHF)	Glide path	localizer
- 300 kHz	330.500 MHz	108.700 MHz
- 150 kHz	330.650 MHz	110.950 MHz
0	333.800 MHz	110.900 MHz
+ 150 kHz	330.950 MHz	111.950 MHz
+ 300 kHz	331.100 MHz	111.900 MHz

Table 3 – 3 Adjacent glide path frequencies and not-adjacent localizer frequencies.

3.2.2.2.3.1 In the AFI Region, to date frequency assignments for ILS have only been made on 100 kHz frequencies. In these cases, when the ILS Localizer is protected, the Glide Path is also protected since the adjacent separation distance to protect ILS Localizer is larger than the protection distance necessary to protect the Glide Path.

Only in cases where frequency assignments to ILS are made on 50 kHz frequencies, the protection of (adjacent) Glide Path frequencies needs to be tested. The program **SEARCH FREQUENCY** has not yet incorporated tests of adjacent Glide Path frequencies.

3.2.2.4 Frequency planning criteria FOR ILS used in some Regions.

Current frequency planning criteria for ILS are more conservative. As long as these Regions do not experience or expect congestion on the available frequencies for ILS, these criteria may continue to be used.

Typical values for the protection of ILS facilities are as follows:

ILS Co-frequency separation distance 175 NM

~~ILS Adjacent frequency separation (100 kHz): 45 NM~~

For frequency assignment planning, the frequencies for ILS facilities shall be selected in the following order (*Re. Annex X, Volume V, Chapter 4, paragraph 4.2.2*):

i. localizer frequencies on 100 kHz points and associated glide path frequencies
ii. localizer frequencies on 50 kHz points and associated glide path frequencies

In Regions where the requirements for runway localizer and glide path transmitter frequencies of an ILS does not justify more than 20 pairs, they shall be selected sequentially, as required, in the following order (*Re. Annex 10, Volume I, Chapter 3, paragraph 3.1.6.1.1*):

	Localizer (MHz)	Glide path (MHz)
1	110.3	335.0
2	109.9	333.8
3	109.5	332.6
4	110.1	334.4
5	109.7	333.2
6	109.3	332.0
7	109.1	331.4
8	110.9	330.8
9	110.7	330.2
10	110.5	329.6
11	108.1	334.7
12	108.3	334.1
13	108.5	329.9
14	108.7	330.5
15	108.9	329.3
16	111.1	331.7
17	111.3	332.3
18	111.5	332.9
19	111.7	333.5
20	111.9	333.1

Table 3 -3 Sequence of ILS frequency selection.

Note: the application of this provision in the Regions needs to be confirmed.

In the band 108 – 111.950 MHz, the assignable localizer frequencies are interleaved with VOR frequencies.

The following planning criteria for ILS have been interested in the program **SEARCH FREQUENCY:**

Co-frequency: 175 NM
Adjacent frequency (50 kHz): 43 NM beyond ILS coverage (25 NM +43 NM = 68 NM)
Adjacent frequency (100 kHz): 5 NM beyond ILS coverage (25 NM + 5 NM = 30 NM)

Note: the 1st or 2nd adjacent frequency can be either an ILS of a VOR; the separation distances are as contained in Annex 10, Volume I, Attachment C, 3.5). This material assumes a VOR having an e.i.r.p of 17 dBW (50 W).

3.3 Frequency assignment planning criteria for the VHF Omnidirectional Range (VOR).

3.3.1 Frequencies and channeling.

3.3.1.1 The channeling for VOR is either 50 kHz or 100 kHz. Channeling arrangements for VOR in the band 108 – 112 MHz, which is shared with the ILS Localizer, is shown in paragraph 3.2. In the band 112-117.975 VOR frequencies can be selected on 100 kHz or 50 kHz frequency assignments. Frequencies for VOR are paired with DME as shown in Appendix F.

3.3.1.2 The frequency band 112 – 117.975 MHz is shared with the data link systems GBAS and VDL Mode 4. Compatibility criteria between VOR and these data link systems are contained in paragraphs 3.4 and 3.5 below.

3.3.1.3 Coverage of VOR is specified based on the operational requirements. Normally combinations of a designated operational range and a designated operational height varies from 40 NM / 10.000 ft for a terminal VOR (TVOR) to 200 NM / 45.000 ft for an en-route VOR.

3.3.2 Frequency assignment planning criteria.

3.3.2.1 Detailed considerations of the planning criteria as contained in Annex 10.
(To be added)

3.3.2.2 Planning criteria as agreed in the APAC Region (these criteria are also applicable to the xxx Regions)

For VOR/DME the following criteria have been adopted:

(i) For VORs required to serve en-route flight operations, the geographical separation is:

Co-channel: 550 NM between VOR facilities with a designated operational coverage of 200 NM / 45000 ft
720 NM between VOR facilities with an extended range designated operational coverage of 300 NM / 45000 ft.

For VORs providing a service up to 60000 ft, a minimum geographical separation of 705 NM is appropriate

Adjacent channel (100 kHz): A geographical separation between the facilities of 220 NM is required.

(ii) For VORs required for use in terminal areas, the geographical separation is:

Co-channel: 200 NM for VOR facilities with a designated operational coverage of 40 NM / 25000 ft

Adjacent channel (100 kHz): a geographical separation of between the facilities of 60 NM is required.

(iii) For VORs required for use in final approach and landing, the geographical separation is:

Co-channel: 130 NM NM for VOR facilities with a designated operational coverage of 25 NM / 10000 ft

Adjacent channel (100 kHz): a geographical separation of between the facilities of 30 NM is required.

3.2.2.2.1 These criteria do not provide separation distances in case VORs with a designated operational coverage different from those specified are to be considered. On a provisional basis, subject to further studies, the program **SEARCH FREQUENCY** has implemented the following separation criteria:

Range		Height	Separation distance
≤ 25 NM	**OR**	≤ 10000 ft	130 NM
≤ 40 NM	**OR**	≤ 25000 ft	200 NM
≤ 200 NM	**OR**	≤ 45000 ft	550 NM
≤ 300 NM	**AND**	≤ 45000 ft	720 NM
> 200	**OR**	> 45000 ft	705 NM

Appendix A Aeronautical propagation curves for 125 MHz, 300 MHz, 1200 MHz and 5100 MHz (Source: Recommendation ITU-R P.528)

Appendix B Provisions concerning the deployment of VHF frequencies and the avoidance of harmful interference (Annex 10, Volume V, Chapter 4, paragraph 4.1.5)

Appendix C Utilization of frequencies above 30 MHz (Annex 10, Volume V, Chapter 4, paragraph 4.1; 4.1.1 – General allotment of frequency band 117.975 – 137 MHz)

Appendix D Terms and definitions

Appendix E Regional frequency allotment plans

Appendix F Frequency/channel pairing between VHF frequencies (localizer and VOR) and UHF frequencies (Glide Path and DME).

Appendix A

Code for antenna heights

Code	H_1 (m)	H_2 (m)
A	15	1000
B	1000	1000
C	15	10000
D	1000	10000
E	15	20000
F	1000	20000
G	10000	10000
H	10000	20000
I	20000	20000

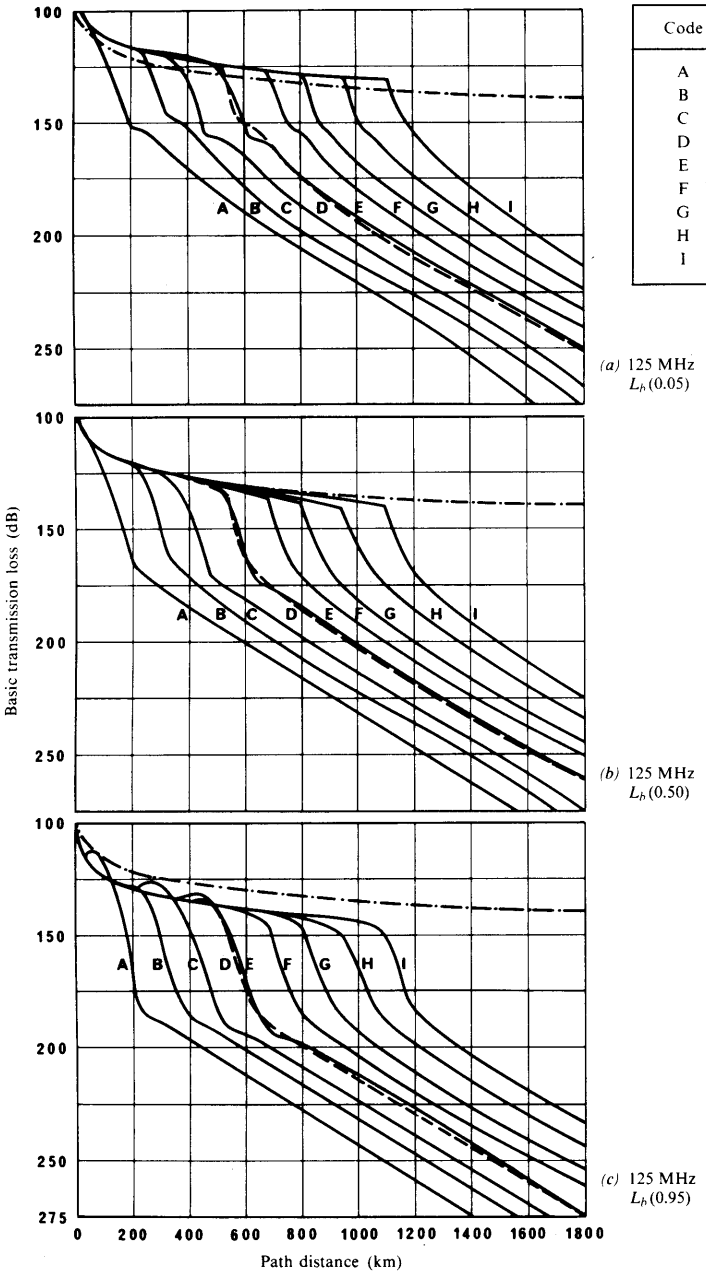


FIGURE 1 – *Basic transmission loss at 125 MHz for 5%, 50% and 95% of the time*

The dotted-line curve is that for free space

D01-sc

Code for antenna heights

Code	H_1 (m)	H_2 (m)
A	15	1000
B	1000	1000
C	15	10000
D	1000	10000
E	15	20000
F	1000	20000
G	10000	10000
H	10000	20000
I	20000	20000

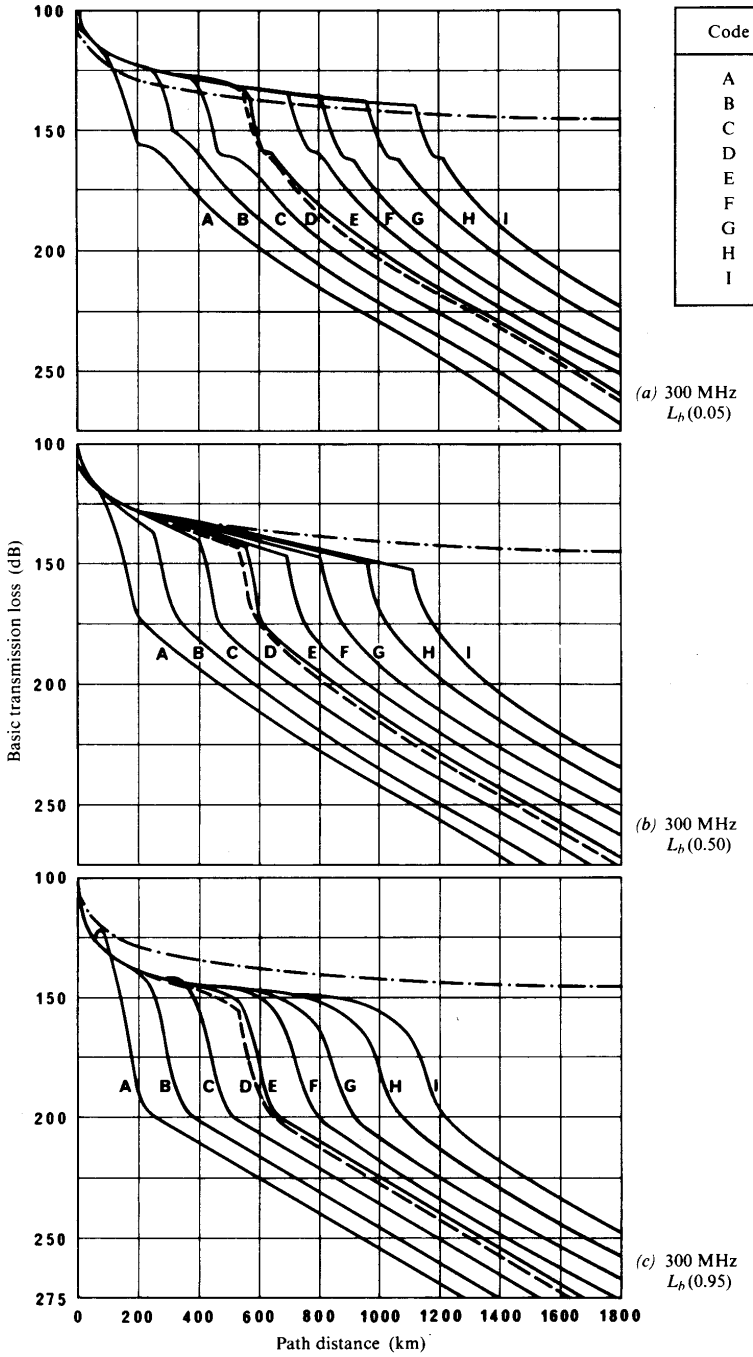
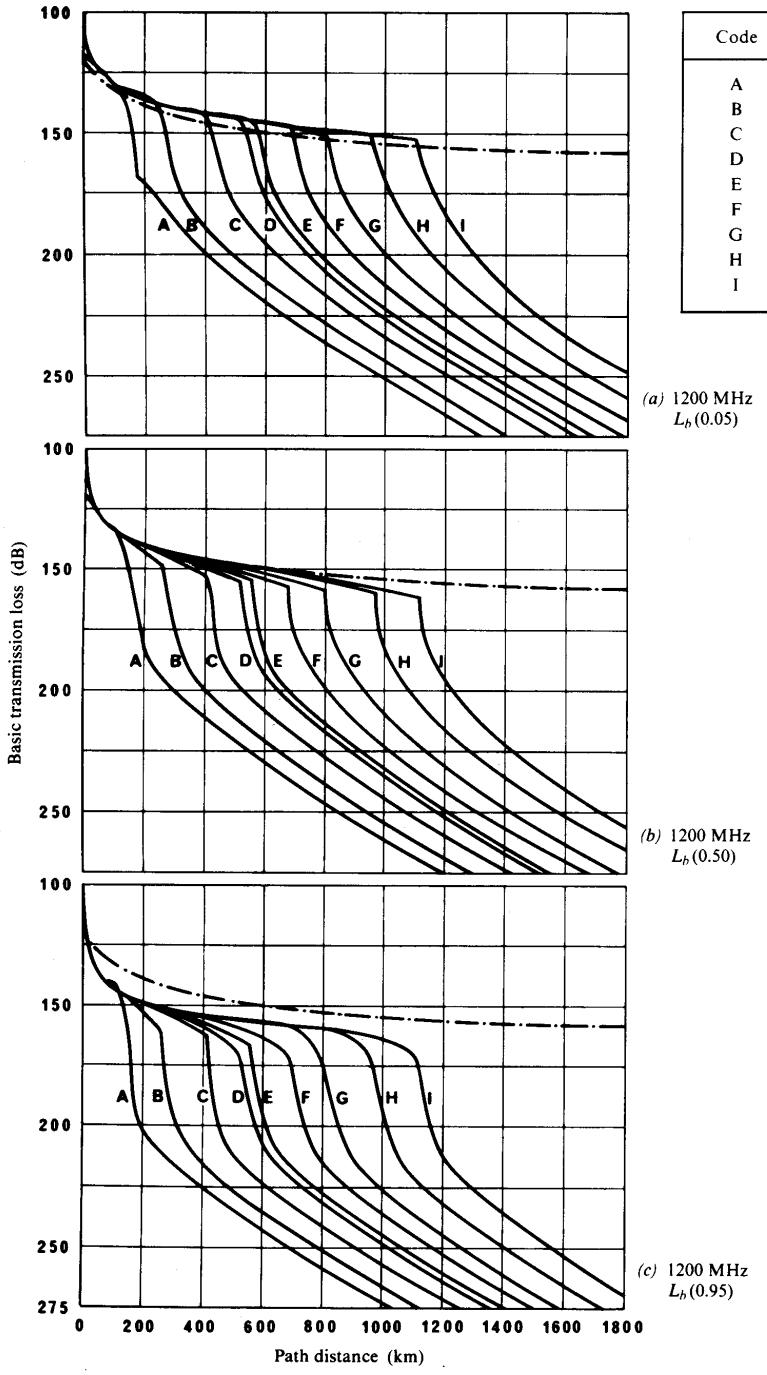


FIGURE 2 – *Basic transmission loss at 300 MHz for 5%, 50% and 95% of the time*

The dotted-line curve is that for free space

D02-sc

Appendix A



Code for antenna heights

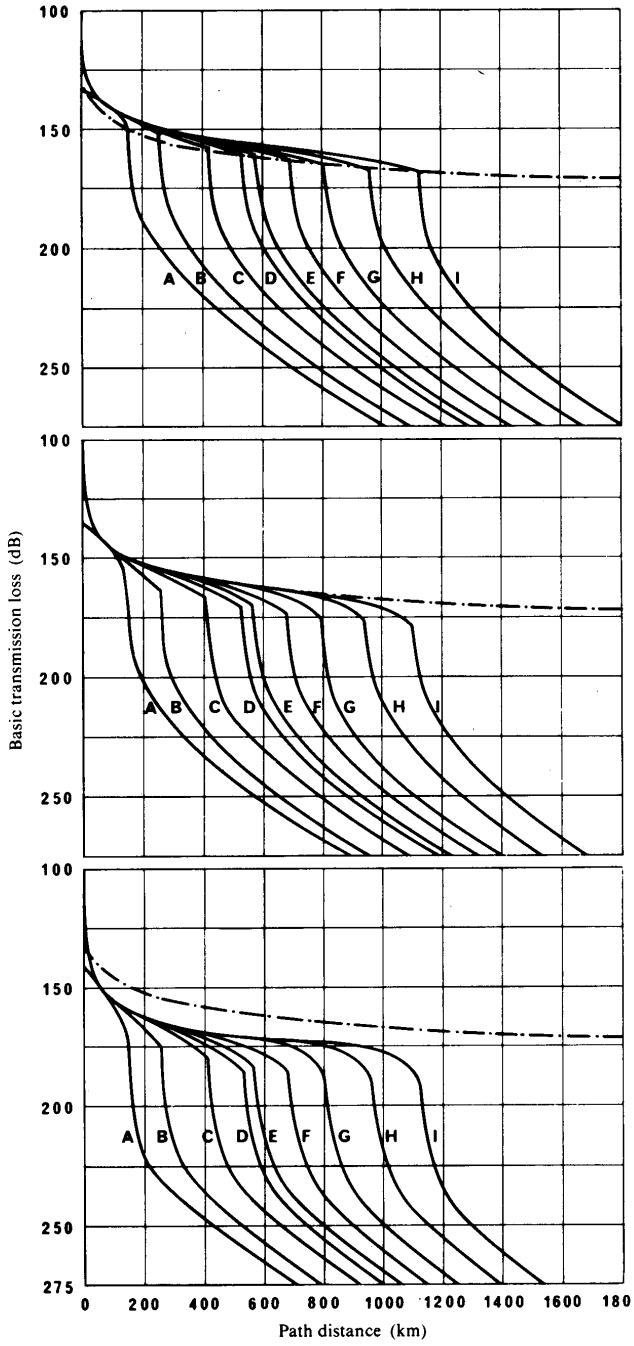
Code	H_1 (m)	H_2 (m)
A	15	1000
B	1000	1000
C	15	10000
D	1000	10000
E	15	20000
F	1000	20000
G	10000	10000
H	10000	20000
I	20000	20000

FIGURE 3 – *Basic transmission loss at 1200 MHz for 5%, 50% and 95% of the time*

The dotted-line curve is that for free space

D03-sc

Appendix A



Code for antenna heights

Code	H_1 (m)	H_2 (m)
A	15	1000
B	1000	1000
C	15	10000
D	1000	10000
E	15	20000
F	1000	20000
G	10000	10000
H	10000	20000
I	20000	20000

FIGURE 4 – *Basic transmission loss at 5100 MHz for 5%, 50% and 95% of the time*

The dotted-line curve is that for free space

D04-sc

Appendix B

CHAPTER 4. UTILIZATION OF FREQUENCIES ABOVE 30 MHz

4.1 Utilization in the band 117.975 – 137 MHz

Introduction

The band 118 – 132 MHz was allocated in 1947 by the Atlantic City ITU Radio Conference, and again in 1959 by the Geneva Conference, but with extension downwards to 117.975 MHz, for the exclusive use by the aeronautical mobile (R) service.

ITU Radio Conferences subsequent to 1947 also made provisions for the use of the band 132 – 136 MHz for the aeronautical mobile (R) service under conditions which vary for the different ITU Regions, countries or combination of countries. The utilization of this band has been included in the Allotment Table in this chapter. The ITU World Administrative Radio Conference (1979) made provisions for the use of the band 136 – 137 MHz by the aeronautical mobile (R) service, subject to conditions of Nos. S5.203, S5.203A and S5.203B of the Radio Regulations. The use of frequencies in the 136 – 137 MHz part of the band must take account of the conditions contained in these notes. In the utilization of these bands, States' attention is drawn to the possibility of harmful radio interference from non-aeronautical sources of radio frequency energy and the need to take appropriate measures to minimize its effects.

This chapter deals with Standards and Recommended Practices relating to this band and includes matters pertaining to the selection of particular frequencies for various aeronautical purposes. These Standards are introduced by the following preface, which sets out the principles upon which the utilization of VHF on a worldwide basis with due regard to economy has been planned.

Preface

The utilization of VHF on a worldwide basis with due regard to economy and practicability requires a plan that will take into account:

a) the need for an orderly evolution towards improved operation and the required degree of worldwide standardization;

b) the desirability of providing for an economic transition from present utilization to optimum utilization of the frequencies available, taking into account the maximum possible utilization of existing equipment;

c) the need to provide for coordination between international and national utilization so as to ensure mutual protection from interference;

d) the need for providing a framework for the integrated development of Regional Plans;

e) the desirability of incorporating in any group of frequencies to be used those now in use for international air services;

f) the need for keeping the total number of frequencies and their grouping in appropriate relation to the airborne equipment known to be widely used by international air services;

g) a requirement for the provision of a single frequency that may be used for emergency purposes on a worldwide basis and, also, in certain regions, for another frequency that may be used as a common frequency for special purposes; and

h) the need for providing sufficient flexibility to allow for the differences in application necessitated by regional conditions.

4.1.1 General allotment of frequency band 117.975 – 137 MHz

Note.— The plan includes a general Allotment Table that subdivides the complete band 117.975 – 137 MHz, the chief subdivisions being the bands of frequencies allocated to both national and international services, and the bands allocated to national services. Observance of this general subdivision should keep to a minimum the problem of coordinating national and international application.

4.1.1.1 The block allotment of the frequency band 117.975 – 137 MHz shall be as shown in Table 4-1.

4.1.1.2 **Recommendation.—** *In the case of the band 136 – 137 MHz, international applications have not yet been agreed, and these frequencies should be brought into use on a regional basis where and in the manner required.*

4.1.2 Frequency separation and limits of assignable frequencies

Note.— In the following text the channel spacing for 8.33 kHz channel assignments is defined as 25 kHz divided by 3 which is 8.333 ... kHz.

4.1.2.1 The minimum separation between assignable frequencies in the aeronautical mobile (R) service shall be 8.33 kHz.

Note.— It is recognized that in some regions or areas, 100 kHz, 50 kHz or 25 kHz channel spacing provides an adequate number of frequencies suitably related to international and national air services and that equipment designed specifically for 100 kHz, 50 kHz or 25 kHz channel spacing will remain adequate for services operating within such regions or areas. It is further recognized that assignments based on 25 kHz channel spacing as well as 8.33 kHz channel spacing may continue to co-exist within one region or area.

4.1.2.2 Until at least 1 January 2005, DSB-AM equipment specifically designed for 25 kHz channel spacing shall be safeguarded with respect to its suitability for the aeronautical mobile (R) service (AM(R)S) except in those regions or areas where regional agreement permits the use of equipment specifically designed for 8.33 kHz channel spacing or for VDL Mode 3 when used for air-ground voice communications.

Table 4-1 Allotment table

Block allotment of frequencies (MHz)	*Worldwide utilization*	*Remarks*
a) 118 – 121.4 inclusive	International and National Aeronautical Mobile Services	International and National Aeronautical Mobile Services Specific international allotments will be determined in the light of regional agreement. National assignments are covered by the provisions in 4.1.5.9.
b) 121.5	Emergency frequency	In order to provide a guard band for the protection of the aeronautical emergency frequency, the nearest assignable frequencies on either side of 121.5 MHz are emergency frequency, the nearest assignable frequencies on either side of 121.5 MHz are 121.4 MHz and 121.6 MHz, except that by regional agreement it may be decided that the nearest assignable frequencies are 121.3 MHz and 121.7 MHz
c) 121.6 – 121.9917 inclusive	International and National Aerodrome Surface Communications	Reserved for ground movement, pre-flight checking, air traffic services clearances, and associated operations.
d) 122 – 123.05 inclusive	National Aeronautical Mobile Services	Reserved for national allotments.
e) 123.1	Auxiliary frequency SAR	See 4.1.4.1.
f)123.15 – 123.6917 inclusive	National Aeronautical Mobile Services	Reserved for national allotments, with the exception of 123.45 MHz which is also used as the worldwide air-to-air communications channel (see g)).

g) 123.45	Air-to-air communications	Designated for use as provided for in 4.1.3.2.1.
h) 123.7 – 129.6917 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in light of regional agreement. National assignments are covered by the provisions in 4.1.5.9.
i) 129.7 – 130.8917 inclusive	National Aeronautical Mobile Services	Reserved for national allotments but may be used in whole or in part, subject to regional agreement, to meet the requirements mentioned in 4.1.8.1.3.
j) 130.9 – 136.875 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in light of regional agreement. National assignments are covered by the provisions in 4.1.5.9. (See the Introduction to 4.1 regarding the band 132 – 137 MHz.)
k) 136.9 – 136.975 inclusive	International and National Aeronautical Mobile Services	Reserved for VHF air-ground data link communications.

4.1.2.2.1 Requirements for mandatory carriage of equipment specifically designed for 8.33 kHz channel spacing shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment, including the appropriate lead time.

Note.— No changes will be required to aircraft systems or ground systems operating solely in regions not using 8.33 kHz channel spacing.

4.1.2.2.2 Until at least 1 January 2005, equipment specifically designed for 8.33 kHz channel spacing shall be safeguarded with respect to its suitability for the AM(R)S.

4.1.2.2.3 Requirements for mandatory carriage of equipment specifically designed for VDL Mode 3 and VDL Mode 4 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment, including the appropriate lead time.

4.1.2.2.3.1 The agreement indicated in 4.1.2.2.3 shall provide at least two years' notice of mandatory carriage of airborne systems.

4.1.2.2.4 Until at least 1 January 2010, equipment specifically designed to the VDL Mode 3 and VDL Mode 4 SARPs shall be safeguarded with respect to its suitability for the AM(R)S.

4.1.2.3 In the band 117.975 – 137 MHz, the lowest assignable frequency shall be 118 MHz and the highest 136.975 MHz.

4.1.2.4 In regions where 25 kHz channel spacing (DSBAM and VHF digital link (VDL)) and 8.33 kHz DSB-AM channel spacing are in operation, the publication of the assigned frequency or channel of operation shall conform to the channel contained in Table 4-1 (*bis*).

Note.— Table 4-1 (bis) *provides the frequency channel pairing plan which retains the numerical designator of the 25 kHz DSB-AM environment and allows unique identification of a 25 kHz VDL and 8.33 kHz channel.*

Table 4-1 *(bis)*. Channelling/frequency pairing

Frequency MHz)	*Time slot**	*Channel spacing (kHz)*	*Channel*
118.0000		25	118.000
118.0000	A	25	118.001
118.0000	B	25	118.002
118.0000	C	25	118.003

118.0000	D	25	118.004
118.0000		8.33	118.005
118.0083		8.33	118.010
118.0167		8.33	118.015
118.0250	A	25	118.021
118.0250	B	25	118.022
118.0250	C	25	118.023
118.0250	D	25	118.024
118.0250		25	118.025
118.0250		8.33	118.030
118.0333		8.33	118.035
118.0417		8.33	118.040
118.0500		25	118.050
118.0500	A	25	118.051
118.0500	B	25	118.052
118.0500	C	25	118.053
118.0500	D	25	118.054
118.0500		8.33	118.055
118.0583		8.33	118.060
118.0667		8.33	118.065
118.0750	A	25	118.071
118.0750	B	25	118.072
118.0750	C	25	118.073
118.0750	D	25	118.074
118.0750		25	118.075
118.0750		8.33	118.080
118.0833		8.33	118.085
118.0917		8.33	118.090
118.1000		25	118.100
etc.			

* Time slot indication is for VDL Mode 3 channels. (Ref. Annex 10, Volume III, Part I, Chapter 6 for characteristics of VDL Mode 3 operation)

4.1.3 Frequencies used for particular functions

4.1.3.1 *Emergency channel*

4.1.3.1.1 The emergency channel (121.5 MHz) shall be used only for genuine emergency purposes, as broadly outlined in the following:

a) to provide a clear channel between aircraft in distress or emergency and a ground station when the normal channels are being utilized for other aircraft;

b) to provide a VHF communication channel between aircraft and aerodromes, not normally used by international air services, in case of an emergency condition arising;

c) to provide a common VHF communication channel between aircraft, either civil or military, and between such aircraft, and surface services, involved in common search and rescue operations, prior to changing when necessary to the appropriate frequency;

d) to provide air-ground communication with aircraft when airborne equipment failure prevents the use of the regular channels;

e) to provide a channel for the operation of emergency locator transmitters (ELTs), and for communication between survival craft and aircraft engaged in search and rescue operations;

f) to provide a common VHF channel for communication between civil aircraft and intercepting aircraft or intercept control units and between civil or intercepting aircraft and air traffic services units in the event of interception of the civil aircraft.

Note 1.— The use of the frequency 121.5 MHz for the purpose outlined in c) is to be avoided if it interferes in any way with the efficient handling of distress traffic.

Note 2.— The current Radio Regulations make provisions that the aeronautical emergency frequency 121.5 MHz may also be used by mobile stations of the maritime mobile service, using A3E emission to communicate on this frequency for safety purposes with stations of the aeronautical mobile service (RR S5.200 and Appendix S13, Part A2).

4.1.3.1.2 The frequency 121.5 MHz shall be provided at:

a) all area control centres and flight information centres;

b) aerodrome control towers and approach control offices serving international aerodromes and international alternate aerodromes; and

c) any additional location designated by the appropriate ATS authority,

where the provision of that frequency is considered necessary to ensure immediate reception of distress calls or to serve the purposes specified in 4.1.3.1.1.

Note.— Where two or more of the above facilities are collocated, provision of 121.5 MHz at one would meet the requirement.

4.1.3.1.3 The frequency 121.5 MHz shall be available to intercept control units where considered necessary for the purpose specified in 4.1.3.1.1 f).

4.1.3.1.4 The emergency channel shall be guarded continuously during the hours of service of the units at which it is installed.

4.1.3.1.5 The emergency channel shall be guarded on a single channel simplex operation basis.

4.1.3.1.6 The emergency channel (121.5 MHz) shall be available only with the characteristics as contained in Annex 10, Volume III, Part II, Chapter 2.

4.1.3.2 *Air-to-air communications channel*

4.1.3.2.1 An air-to-air VHF communications channel on the frequency of 123.45 MHz shall be designated to enable aircraft engaged in flights over remote and oceanic areas out of range of VHF ground stations to exchange necessary operational information and to facilitate the resolution of operational problems.

Note.— Use of the air-to-air channel can cause interference to and from aircraft using the same frequency for air-ground communications.

4.1.3.2.2 In remote and oceanic areas out of range of VHF ground stations, the air-to-air VHF communications channel on the frequency 123.45 MHz shall be available only with the characteristics as contained in Annex 10, Volume III, Part II, Chapter 2.

4.1.3.3 *Common signalling channel.* The frequency 136.975 MHz is reserved on a worldwide basis to provide a common signalling channel (CSC) to the VHF digital link (VDL). This CSC uses the Mode 2 VDL modulation scheme and carrier sense multiple access (CSMA).

4.1.4 Auxiliary frequencies for search and rescue operations

4.1.4.1 Where a requirement is established for the use of a frequency auxiliary to 121.5 MHz, as described in 4.1.3.1.1 c), the frequency 123.1 MHz shall be used.

4.1.4.2 The auxiliary search and rescue channel (123.1 MHz) shall be available only with the characteristics as contained in Annex 10, Volume III, Part II, Chapter 2.

4.1.5 Provisions concerning the deployment of VHF frequencies and the avoidance of harmful interference

4.1.5.1 In the case of those VHF facilities providing service up to the radio horizon, the geographical separation between facilities working on the same frequency shall, except where there is an operational requirement for the use of common frequencies for groups of facilities, be such that points at the protection heights and at the limit of the functional service range of each facility are separated by distances not less than that required to provide a desired to undesired signal ratio of 14 dB. This provision shall be implemented on the

basis of a regional air navigation agreement. For areas where frequency assignment congestion is not severe or is not anticipated to become severe, a 20 dB (10 to 1 distance ratio) separation criteria or radio line-of-sight (RLOS) separation criteria (whichever is smaller) may be used.

Note.— Guidance material relating to the establishment of the minimum separation distance based on the desired to undesired signal protection ratio of 14 dB is contained in Attachment A.

4.1.5.2 In the case of those VHF facilities providing service beyond the radio horizon, except where there is an operational requirement for the use of common frequencies for groups of facilities, planning for co-channel operations shall be such that points at the protection heights and at the limits of the functional service area of each facility are separated by distances not less than the sum of distances from each point to its associated radio horizon.

Note 1.— The distance to the radio horizon from a station in an aircraft is normally given by the formula:

$$D = K \sqrt{h}$$

where D = *distance in nautical miles;*
h = *height of the aircraft station above earth;*
K = *(corresponding to an effective earth's radius of 4/3 of the actual radius);*
= *2.22 when* h *is expressed in metres; and*
= *1.23 when* h *is expressed in feet.*

Note 2.— In calculating the radio line-of-sight distance between a ground station and an aircraft station, the distance from the radio horizon of the aircraft station computed from Note 1 must be added to the distance from the radio horizon of the ground station. In calculating the latter the same formula is employed, taking for h *the height of the ground station transmitting antenna.*

Note 3.— The criterion contained in 4.1.5.2 is applicable in establishing minimum geographical separation between VHF facilities, with the object of avoiding co-channel air-to-air interference. Guidance material relating to the establishment of separation distances between ground stations and between aircraft and ground stations for co-channel operations is contained in Section 3 of Attachment A. Guidance material relating to adjacent channel frequency deployment is contained in Section 2 of Attachment A.

Note 4.— Guidance material on the interpretation of 4.1.5.1 and 4.1.5.2 is contained in Attachment A.

4.1.5.3 The geographical separation between facilities working on adjacent channels shall be such that points at the protection heights and at the limit of the functional service range of each facility are separated by a distance sufficient to ensure operations free from harmful interference.
Note.— Guidance material covering separation distances and related system characteristics is contained in Attachment A.

4.1.5.4 The protection height shall be a height above a specified datum associated with a particular facility, such that below it harmful interference is improbable.

4.1.5.5 The protection height to be applied to functions or to specific facilities shall be determined regionally, taking into consideration the following factors:

a) the nature of the service to be provided;

b) the air traffic pattern involved;

c) the distribution of communication traffic;

d) the availability of frequency channels in airborne equipment;

e) probable future developments.

4.1.5.6 **Recommendation.—** *Where the protection heights determined are less than those operationally desirable, separation between facilities operating on the same frequency should not be less than that necessary to ensure that an aircraft at the limit of the functional service range and the operationally desirable protection height of one facility does not come above the radio horizon with respect to*

adjacent facilities.

Note.— The effect of this recommendation is to establish a geographical separation distance below which harmful interference is probable.

4.1.5.7 The geographical separation between VHF VOLMET stations shall be determined regionally and, generally, shall be such that operations free from harmful interference are secured at the highest altitude flown by aircraft in the area concerned.

Note.— Guidance material on the interpretation of 4.1.5.7 is contained in Attachment A.

4.1.5.8 Frequencies in the aeronautical mobile VHF band used for national services, unless worldwide or regionally allotted to this specific purpose, shall be so deployed that minimum interference is caused to facilities for the international air services in this band.

4.1.5.9 **Recommendation.—** *The problem of inter-State interference on frequencies allotted worldwide or on a regional basis to national services, should be resolved by consultation between the administrations concerned.*

4.1.5.10 The communication coverage provided by a VHF ground transmitter shall, in order to avoid harmful interference to other stations, be kept to the minimum consistent with the operational requirement for the function.

4.1.5.11 **Recommendation.—** *For ground VHF facilities which provide service beyond the radio horizon, any spurious or harmonic radiation outside the band ±250 kHz from the assigned carrier frequency should not exceed an effective radiated power of 1 mW in any azimuth.*

4.1.6 Equipment requirements

Note 1.— Frequency tolerances to which stations operating in the aeronautical mobile band (117.975 – 137 MHz) must conform are contained in Appendix 3 to the Radio Regulations. Tolerances for transmitters used for aeronautical services are not mentioned in this Annex, except in those cases where tighter tolerances than those contained in the Radio Regulations are required (e.g. the equipment specifications in Volume III contain several such instances).

Note 2.— The frequency tolerance applicable to individual components of a multi-carrier or similar system will be determined by the characteristics of the specific system.

4.1.6.1 **Recommendation.—** *The antenna gain of an extended range VHF facility should preferably be such as to ensure that, beyond the limits of ±2 Φ about the centre line of the angular width Φ of the area to be served, it does not exceed 3 dB above that of a dipole. But, in any case, it should be such as to ensure freedom from harmful interference with other radio services.*

Note 1.— The actual azimuth, the angular width of the service area, and the effective radiated power would have to be taken into account in each individual case.

Note 2.— Guidance material on the interpretation of 4.1.6.1 is contained in Attachment A.

4.1.7 Method of operation

4.1.7.1 Single channel simplex operation shall be used in the VHF band 117.975 – 137 MHz at all stations providing for aircraft engaged in international air navigation.

4.1.7.2 In addition to the above, the ground-to-air voice channel associated with an ICAO standard radio navigational aid may be used, subject to regional agreement, for broadcast or communication purposes or both.

4.1.8 Plan of assignable VHF radio frequencies for use in the international aeronautical mobile service

Introduction

This plan designates the list of frequencies available for assignment, together with provision for the use by the aeronautical mobile (R) service of all frequencies with a channel spacing of 25 kHz, and of all frequencies with a channel width and spacing of 8.33 kHz, with the frequencies in Group A continuing to be used wherever they provide a sufficient number to meet the operational requirements.

The plan provides that the total number of frequencies required in any region would be determined regionally. The effect of this will be that frequencies assignable in any particular region may be restricted to a limited number of the frequencies in the list, the actual number being selected as outlined herein.

In order that the assignable frequencies may be coordinated between regions as far as practicable, the plan requires that, whenever the number of frequencies contained in Group A of 4.1.8.1.2 is sufficient to meet the requirements of a region, the frequencies of this Group be used in a sequence commencing with 118 MHz. This ensures that all regions will have in common the frequencies used in the region requiring the least number of frequencies and, in respect to any two regions, the region with the greater number will have in use all the frequencies used by the other.

Group A provides for frequency planning based on 100 kHz channel spacing.

Group B of the list at 4.1.8.1.2 contains the frequencies in the band 117.975 – 132 MHz ending in 50 kHz. Together with the frequencies in Group A, they provide for frequency planning based on 50 kHz channel spacing. In Group C are listed the frequency channels in the band 132 – 137 MHz based upon 50 kHz channel spacing. Group D contains the frequency channels in the band 132 – 137 MHz ending in 25 kHz, and Group E similarly lists the frequency channels in the band 117.975 – 132 MHz. The utilization of channels in Groups B, C, D and E is explained below.

Group F of the list at 4.1.8.1.2 contains the frequencies in the band 117.975 – 137 MHz when 8.33 kHz channel width is used. The utilization of the channels in this Group is explained below.

Whenever the number of frequencies required in a particular region exceeds the number in Group A, frequencies may be selected from the other Groups taking into account the provisions of 4.1.8.1 with respect to the use of channels based on 25 kHz channel spacing and, with regard to the band 132 – 137 MHz, the provisions of the Radio Regulations (see Introduction to 4.1). Although for Groups B, C, D and E a preferred order of selection is not indicated, regional planning may require a particular selection of frequencies from these Groups in order to cater for specific regional circumstances. This may apply particularly to the utilization of frequencies from the band 132 – 137 MHz for reasons of available airborne equipment and/or availability of particular frequency channels for the aeronautical mobile (R) service. It may also be found that, in a particular region, it is desirable to select frequencies from Group B first, before selecting frequencies from Groups C, D or E.

Where all the channels of Groups A, B, C, D and E of the list at 4.1.8.1.2 are insufficient to meet the requirements of a region, a part or parts of the band may be designated as containing 8.33 kHz width channels or designated as supporting VDL Mode 3. For parts of the band containing 8.33 kHz width channels, the appropriate frequencies from Group F should be used in accordance with 4.1.8.1.1.1 and 4.1.8.1.2. It should be noted that the designation of frequencies in Group F differs from that of the corresponding frequencies in Groups A to E to emphasize the difference in channel width. For part of the bands supporting VDL Mode 3, frequencies from Groups A, B, C, D and E are utilized on a time-division basis. A single frequency supports multiple channels, each utilizing the frequency in periodic time frames or time slots. Specific time slots for VDL Mode 3 are identified using the numeric designators of Table 4-1 (bis).

Although for Group F a preferred order of selection is not indicated, regional planning may require a particular selection of frequencies from this group in order to cater for specific regional circumstances.

In many regions particular frequencies have already been assigned for particular functions as, for instance, aerodrome or approach control. The plan does not make such assignments (except in respect to the emergency channel and ground service frequencies), such action being taken regionally if considered desirable.

4.1.8.1 The frequencies in the band 117.975 – 137 MHz for use in the aeronautical mobile (R) service shall be selected from the list in 4.1.8.1.2.

4.1.8.1.1 When the number of frequencies required in a particular region does not exceed the number of frequencies contained in Group A of 4.1.8.1.2, the frequencies to be used shall be selected in sequence, in so far as practicable, from those in Group A of 4.1.8.1.2.

4.1.8.1.1.1 When the number of frequencies required in a particular region exceeds those available in Groups A to E of 4.1.8.1.2, parts of the band shall be designated as containing 8.33 kHz width channels (voice) or as containing VDL Mode 3. Appropriate frequencies shall be selected from Group F of 4.1.8.1.2 for 8.33 kHz channel assignments or from Groups A to E in accordance with the time-slot

assignments in accordance with Table 4-1 *(bis)* for VDL Mode 3. The remainder of the band shall continue to be used for 25 kHz width channels selected from the appropriate parts of Groups A to E.

Note 1.— The frequencies 121.425 – 121.575 MHz inclusive, 123.075 – 123.125 MHz inclusive and 136.500 – 136.975 MHz inclusive are not available for assignment to channels of less than 25 kHz width.

Note 2.— Services that continue operation using 25 kHz assignments will be protected in regions implementing 8.33 kHz channel spacing.

4.1.8.1.2 *List of assignable frequencies*

The list of assignable frequencies is shown in the Appendix to this chapter.

4.1.8.1.3 **Recommendation.—** *Frequencies for operational control communications may be required to enable aircraft operating agencies to meet the obligations prescribed in Annex 6, Part I, in which case they should be selected from the bands 128.825 – 132.025 MHz. These frequencies should be chosen, in so far as practicable, from the upper end of the band and in sequential order.*

Note.— It is recognized that the assignment of such frequencies and the licensing of the operation of the related facilities are matters for national determination. However, in regions where a problem exists with respect to the provision of frequencies for operational control purposes, it may be advantageous if States endeavour to coordinate the requirements of aircraft operating agencies for such channels prior to regional meetings.

4.1.8.2 The frequencies that may be allotted for use in the aeronautical mobile (R) service in a particular region shall be limited to the number determined as being necessary for operational needs in the region.

Note.— The number of frequencies required in a particular region is normally determined by the Council on the recommendations of Regional Air Navigation Meetings. The capabilities of VHF airborne equipment known to be widely used in the region will be taken into account in this determination.

APPENDIX TO CHAPTER 4. LIST OF ASSIGNABLE FREQUENCIES

Frequency (MHz)	Annotations	Frequency (MHz)	Annotations
121.5	Emergency frequency		
123.1	Auxiliary frequency SAR		
121.60	Reserved for aerodrome surface communications [see Table 4-1, Item c)]	121.625	Reserved for aerodrome surface communications [see Table 4-1, Item c)]
121.65		121.675	
121.70		121.725	
121.75		121.775	
121.80		121.825	
121.85		121.875	
121.90		121.925	
121.95		121.975	

GROUP A Frequencies (MHz)

118.00	119.00	120.00	121.00	124.00	125.00	126.00	127.00	128.00	129.00	131.00
118.10	119.10	120.10	121.10	124.10	125.10	126.10	127.10	128.10	129.10	131.10
118.20	119.20	120.20	121.20	124.20	125.20	126.20	127.20	128.20	129.20	131.20
118.30	119.30	120.30	121.30	124.30	125.30	126.30	127.30	128.30	129.30	131.30
118.40	119.40	120.40	121.40	124.40	125.40	126.40	127.40	128.40	129.40	131.40
118.50	119.50	120.50	--	124.50	125.50	126.50	127.50	128.50	129.50	131.50
118.60	119.60	120.60	--	124.60	125.60	126.60	127.60	128.60	129.60	131.60
118.70	119.70	120.70	123.70	124.70	125.70	126.70	127.70	128.70	130.90	131.70
118.80	119.80	120.80	123.80	124.80	125.80	126.80	127.80	128.80	129.00	131.80
118.90	119.90	120.90	123.90	124.90	125.90	126.90	127.90	128.90	129.10	131.90

GROUP B Frequencies (MHz)

118.05	119.05	120.05	121.05	124.05	125.05	126.05	127.05	128.05	129.05	131.05
118.15	119.15	120.15	121.15	124.15	125.15	126.15	127.15	128.15	129.15	131.15
118.25	119.25	120.25	121.25	124.25	125.25	126.25	127.25	128.25	129.25	131.25
118.35	119.35	120.35	121.35	124.35	125.35	126.35	127.35	128.35	129.35	131.35
118.45	119.45	120.45	--	124.45	125.45	126.45	127.45	128.45	129.45	131.45
118.55	119.55	120.55	--	124.55	125.55	126.55	127.55	128.55	129.55	131.55
118.65	119.65	120.65	--	124.65	125.65	126.65	127.65	128.65	129.65	131.65
118.75	119.75	120.75	123.75	124.75	125.75	126.75	127.75	128.75	--	131.75
118.85	119.85	120.85	123.85	124.85	125.85	126.85	127.85	128.85	--	131.85
118.95	119.95	120.95	123.95	124.95	125.95	126.95	127.95	128.95	130.95	131.95

GROUP C Frequencies (MHz)

132.00	132.50	133.00	133.50	134.00	134.50	135.00	135.50
132.05	132.55	133.05	133.55	134.05	134.55	135.05	135.55
132.10	132.60	133.10	133.60	134.10	134.60	135.10	135.60
132.15	132.65	133.15	133.65	134.15	134.65	135.15	135.65
132.20	132.70	133.20	133.70	134.20	134.70	135.20	135.70
132.25	132.75	133.25	133.75	134.25	134.75	135.25	135.75
132.30	132.80	133.30	133.80	134.30	134.80	135.30	135.80
132.35	132.85	133.35	133.85	134.35	134.85	135.35	135.85
132.40	132.90	133.40	133.90	134.40	134.90	135.40	135.90
132.45	132.95	133.45	133.95	134.45	134.95	135.45	135.95

GROUP D Frequencies (MHz)

132.025	132.525	133.025	133.525	134.025	134.525	135.025	135.525	136.000	136.250	136.500	136.750
132.075	132.575	133.075	133.575	134.075	134.575	135.075	135.575	136.025	136.275	136.525	136.775
132.125	132.625	133.125	133.625	134.125	134.625	135.125	135.625	136.050	136.300	136.550	136.800
132.175	132.675	133.175	133.675	134.175	134.675	135.175	135.675	136.075	136.325	136.575	136.825
132.225	132.725	133.225	133.725	134.225	134.725	135.225	135.725	136.100	136.350	136.600	136.850
132.275	132.775	133.275	133.775	134.275	134.775	135.275	135.775	136.125	136.375	136.625	136.875
132.325	132.825	133.325	133.825	134.325	134.825	135.325	135.825	136.150	136.400	136.650	136.900
132.375	132.875	133.375	133.875	134.375	134.875	135.375	135.875	136.175	136.425	136.675	136.925
132.425	132.925	133.425	133.925	134.425	134.925	135.425	135.925	136.200	136.450	136.700	136.950
132.475	132.975	133.475	133.975	134.475	134.975	135.475	135.975	136.225	136.475	136.725	136.975

GROUP E Frequencies (MHz)

118.025	119.025	120.025	121.025	124.025	125.025	126.025	127.025	128.025	129.025	131.025
118.075	119.075	120.075	121.075	124.075	125.075	126.075	127.075	128.075	129.075	131.075
118.125	119.125	120.125	121.125	124.125	125.125	126.125	127.125	128.125	129.125	131.125
118.175	119.175	120.175	121.175	124.175	125.175	126.175	127.175	128.175	129.175	131.175
118.225	119.225	120.225	121.225	124.225	125.225	126.225	127.225	128.225	129.225	131.225
118.275	119.275	120.275	121.275	124.275	125.275	126.275	127.275	128.275	129.275	131.275
118.325	119.325	120.325	121.325	124.325	125.325	126.325	127.325	128.325	129.325	131.325
118.375	119.375	120.375	121.375	124.375	125.375	126.375	127.375	128.375	129.375	131.375
118.425	119.425	120.425	--	124.425	125.425	126.425	127.425	128.425	129.425	131.425
118.475	119.475	120.475	--	124.475	125.475	126.475	127.475	128.475	129.475	131.475
118.525	119.525	120.525	--	124.525	125.525	126.525	127.525	128.525	129.525	131.525
118.575	119.575	120.575	--	124.575	125.575	126.575	127.575	128.575	129.575	131.575
118.625	119.625	120.625	--	124.625	125.625	126.625	127.625	128.625	129.625	131.625
118.675	119.675	120.675	--	124.675	125.675	126.675	127.675	128.675	129.675	131.675

118.725	119.725	120.725	123.725	124.725	125.725	126.725	127.725	128.725	--	131.725
118.775	119.775	120.775	123.775	124.775	125.775	126.775	127.775	128.775	--	131.775
118.825	119.825	120.825	123.825	124.825	125.825	126.825	127.825	128.825	--	131.825
118.875	119.875	120.875	123.875	124.875	125.875	126.875	127.875	128.875	--	131.875
118.925	119.925	120.925	123.925	124.925	125.925	126.925	127.925	128.925	130.925	131.925
118.975	119.975	120.975	123.975	124.975	125.975	126.975	127.975	128.975	130.975	131.975

GROUP F (see also Table 4-1 *(bis)*)

118.000 – 121.400 in 8.33 kHz steps	121.600 – 123.050 in 8.33 kHz steps	123.150 – 136.475 in 8.33 kHz steps

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ATTACHMENT A. CONSIDERATIONS AFFECTING THE DEPLOYMENT OF VHF COMMUNICATION FREQUENCIES

Introduction

Paragraphs 4.1.5.2 and 4.1.5.3 specify the geographical separation required for co-channel operation of VHF facilities in the aeronautical mobile service. in Figure A-1 the distance AB indicates the separation required between facilities in order that aircraft a *and* b *operating at the protection heights and at the limits of the functional service range of stations A and B respectively, will not experience harmful interference.*

Paragraph 4.1.6.1 recommends the maximum antenna gain outside the main beam of facilities which provide service beyond the radio horizon. Figure A-2 illustrates the azimuthal angle to be protected and the method of derivation. Smaller beamwidths than 30 degrees are not considered practical at present.

Note.— The term "main beam" includes all azimuths where antenna gain exceeds 3 dB above that of a dipole.

1. Criteria employed in establishing geographical separation between ground stations for co-channel operation of VHF facilities that have a service area up to the radio horizon

1.1 To provide co-channel interference protection of 14 dB (5 to 1 distance ratio, as shown below) desired signal to undesired signal (D/U), the free-space loss (FSL) formula is used to calculate both the free-space loss of the desired signal (FSL_D) and the free-space loss of the undesired signal (FSL_U):

FSL (in dB) = 32.4 + 20 log f + 20 log d ; where f = frequency in MHz and d = distance in km.

In comparing the FSL_D versus the FSL_U, the subtraction of the formula results in:

$FSL_U - FSL_D = 20 \log dU - 20 \log dD = 20 \log dU/dD$

If $FSL_U - FSL_D = 14$ dB, then $\log dU/dD = 14/20 = 0.7$; then $dU/dD = 5.01$.

Note.— It is necessary to take into account that the effective radiated powers of transmitting stations may not be equal.

1.2 The desired distance (dD) is the distance between the desired ground facility and the limit of the functional service range of that ground facility (see Figure A-3).

Note.— When making assignments using a 14 dB D/U signal ratio, the potential effects of interference caused by mute lifts due to high communications loading on co-channel assignments should be considered.

1.3 The undesired distance (dU) is the distance between the limit of the functional service ranges of the desired facility and that of the undesired facility (i.e. the distance between the aircraft at the edges of the respective service ranges). See Figure A-1.

1.4 The required geographical separation between the desired and the undesired facility is therefore dD + dU plus the service range of the undesired facility (see Figure A-1).

1.5 If the calculated dU exceeds the RLOS between the aircraft, then a distance as small as the RLOS can be used as the distance between the edges of the service volumes.

2. Criteria employed in establishing adjacent channel frequency deployment with respect to receiver rejection and other system characteristics

2.1 For aircraft receivers designed for operation in a 50 kHz channel spacing environment and a ground station frequency tolerance of 50 parts in 10^6 (±0.005 per cent), an effective adjacent channel rejection characteristic of 60 dB or better is assumed. This assumption will result in a geographical separation distance between the nearest limits of the functional service ranges of the two facilities of at least 5.6 km (3 NM).

2.2 For aircraft receivers designed for operation in a 25 kHz channel spacing environment and a ground station frequency tolerance of ±0.002 per cent, and for aircraft receivers designed for operation in a 8.33 kHz spacing environment, and a ground station frequency tolerance of ±.0001 per cent, an effective adjacent channel rejection characteristic of 60 dB or better is assumed. This assumption will result in a geographical separation distance between the nearest limits of the functional service ranges between two facilities using 25 kHz spacing or between two facilities using 8.33 kHz spacing of at least 5.6 km (3 NM).

2.3 The above criteria are based on the concept of protection by receiver muting, except in the case of area control and FIR channels where a minimum field strength is specified in order to secure the desired wanted-to-unwanted signal ratio.

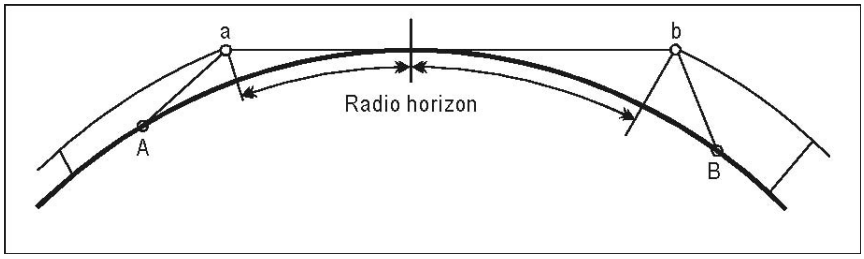


Figure A-1. Geographical separation required for co-channel operation of VHF facilities

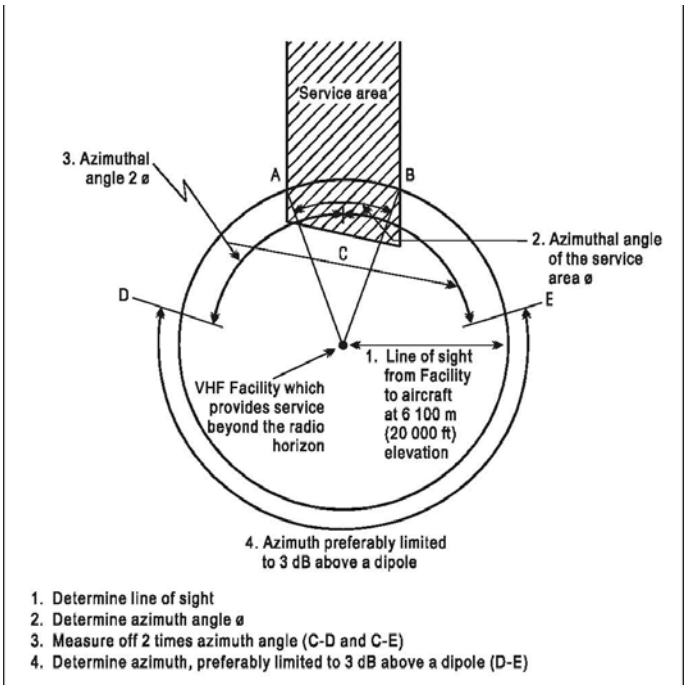


Figure A-2. Limit of azimuth protection for VHF facilities which provide a service beyond the radio horizon

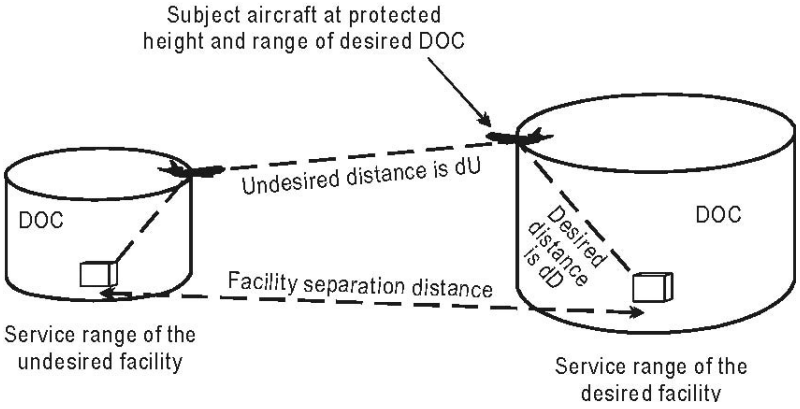


Figure A-3. Co-channel configuration for undesired/desired distance ratio

2.4 The following additional assumptions were made in establishing the criteria:

1) *Propagation*: free space propagation between aircraft. The ITU-R curves for 100 MHz vertical polarization over land in conjunction with an assumed ground antenna height of 20 m (65 ft) were used in computing ground-air field strengths.

2) *Minimum field strength at limit of functional service range*: 45 dB above 1 microvolt per metre at 3 000 m (10 000 ft) in the case of area control and FIR channels.

Note.— To meet this requirement, a station radiating 100 W from an antenna 20 m (65 ft) high should be not more than 185 km (100 NM) from the limit of its functional service range.

3) *Effective radiated power (ERP)*: a maximum ERP of 20 W from ground and airborne stations with the exception that, in case of ground stations providing flight information or area control service communications, it was necessary to assume a minimum ERP of 100 W.

4) *Airborne antenna polar patterns*: total variations not exceeding 10 dB. Since a maximum ERP was assumed (and therefore all variations are downwards from this figure), no allowance was necessary in respect of airborne transmitter polar diagrams.

5) *Wanted-to-unwanted signal ratio*: 20 dB at the receiver output.

6) *Receiver muting characteristics*: a muting threshold corresponding to a received field strength of 5 microvolts per metre.

2.5 The following criteria were based on all relevant assumptions made in 2.4. Two cases related to adjacent channel interference are considered separately:

a) receiver mute lift; and

b) desired-to-undesired signal ratio.

These cases might cause different planning criteria to be observed

2.5.1 Where it is necessary to take account on a regional basis of receivers not specifically designed for an 8.33 kHz environment, the following characteristics should be assumed:

a) an 8.33 kHz channel, which is assigned 8.33 kHz away from the assigned frequency of a 25 kHz channel, is assumed to be co-channel with that 25 kHz channel;

b) an 8.33 kHz channel, spaced ±16.67 kHz from the assigned frequency of a 25 kHz channel is assumed under all operating conditions (including all instabilities and doppler shifts), to have an adjacent channel rejection ratio of:

i) 23 dB aircraft against ground offset carrier systems;

ii) 30 dB aircraft against ground non-offset carrier systems; and

iii) 27 dB aircraft against aircraft systems.

Worst case conditions for planning purposes are used here for a mixed environment of 8.33 kHz and 25 kHz systems.

c) an 8.33 kHz channel which is assigned 25 kHz away from the assigned frequency of a 25 kHz channel is assumed to have an effective adjacent channel characteristic of at least 60 dB.

2.5.2 Where it is necessary to take account of the implementation of VHF stations which use 8.33 kHz channel spacing, in a region where 25 kHz assignments occur, the assumptions of 2.5.1 a) to c) result in the following:

a) where 8.33 kHz services are spaced ±8.33 kHz away from the assigned frequency of a 25 kHz channel, the regionally agreed planning criteria for co-channel assignments should be used, applying either the radio horizon method (assumed to give at least 20 dB D/U) or a desired-to-undesired signal ratio of 14 dB;

b) where 8.33 kHz services are spaced ±16.67 kHz away from the assigned frequency of a 25 kHz channel, the following criteria should be applied:

i) Receiver mute lift criteria.

The minimum separation distance required for the prevention of receiver mute lifts is:

187 NM aircraft against ground offset carrier systems;

84 NM aircraft against ground non-offset carrier systems; and

118 NM aircraft against aircraft systems.

ii) Desired-to-undesired signal ratio.

The minimum distance required to provide sufficient adjacent channel protection based upon a D/U ratio (assuming equal ERP from the wanted and unwanted signals) can be calculated given the maximum service range of the wanted signal by:

Dadj = service range/(10 (*ACR – D/U*)/20)

Dadj = distance required between the edges of the two service ranges operating on adjacent channels

ACR = adjacent channel rejection

Dadj and service range expressed in the same units.

The D/U ratio used will depend on regionally agreed planning criteria.

Note.— The application of the 14 dB planning criteria assumes that it is highly unlikely that two aircraft will be at the maximum edge of their respective service volumes and at the closest point between these two volumes.

c) 8.33 kHz channels spaced 25 kHz away from an assigned frequency of a 25 kHz channel should be planned in accordance with 2.2.

3. Criteria to be employed in establishing adjacent channel frequency deployment of VHF facilities that have a service range beyond the radio horizon

For the most economical use of frequencies and to ensure freedom from interference, planning must be based on an accurate knowledge of equipment used. When the equipment characteristics and field strength (or attenuation) curves are on hand for the troposcatter regions, it is relatively easy to determine the required geographical separation. When these are not known, the maximum permitted antenna gain stipulated in 4.1.6.1 will be assumed. There are several conditions that must be calculated and compared to determine the appropriate separation to be used. The conditions to be compared are:

1) ground facility-to-aircraft;

2) aircraft-to-ground facility;

3) aircraft-to-aircraft; and

4) ground facility-to-ground facility.

Case 1.— For the case of protection of aircraft A from a ground facility (see Figure A-4):

A. Determine the signal level *S* (dB rel. 1 µV/m) received from the desired station at the limit of the service radius at the protection altitude.

B. Assign the desired protection ratio *P* (dB) required at the aircraft receiver.

C. Let receiver adjacent channel rejection be represented by *A* (dB). Then the level *L* (dB rel. 1 µV/m) that can be tolerated at the receiver antenna can be determined by:

$L = S - P + A$

D. Distance *d* (km) from protection point to undesired facility to provide protection established by "C", is found by application of *L* to the appropriate curves.

Note 1.— Figures A-8 to A-15 are field strength curves appropriate for the average temperate climate over land or sea, which may be used to determine geographical separation for situations where these field strengths will not normally be exceeded more than 5 per cent of the time. These curves were established by the Institute for Telecommunications Sciences and Aeronomy of the Environmental Science Services Administration of the United States.

Note 2.— For power levels other than 1 kW the necessary corrections under "C" would have to be made. For example, 5 kW ERP requires a minus 7 dB correction.

E. The facility-to-facility separation D is d (km) plus service radius (km).

Case 2.— Aircraft (A)-to-ground facility (see Figure A-4):

A. Determine signal level *Sg* at the ground facility receiving antenna for proper system operation.

B. Proceed as in Case 1, where

$L = Sg - P + A$

C. Ground facility-to-ground facility separation will also be determined as in Case 1 (D = d + service radius (km)).

Note.— Where ground facility receivers have sensitivities of less than 1 microvolt across 50 ohms, Case 2 is most likely to yield the separation to be used.

Case 3.— Aircraft (A)-to-aircraft (B) (see Figure A-5):

A. Establish service radius and protection altitude for facility to be protected (see aircraft A in Figure A-5).

B. Determine closest point to aircraft A that aircraft B will be transmitting to the ground facility site and the altitude where this will take place.

C. Proceed as in Case 1, using the aircraft (B) contacting ground facilities as the undesired signal.

D. Then $L = S - P + A$

E. The distance *d* to aircraft B (undesired) obtained from the curves, plus the service radius of the facility to be protected, will determine the separation between aircraft B and the ground facility protected.

F. Facility-to-facility separation may then be determined graphically or by trigonometric means.

Case 4.— Ground facility-to-ground facility (see Figure A-5).

A. Determine signal level that can be tolerated at the receiver antenna at one facility by $L = Sg - P + A$ (see Case 1).

B. Then facility-to-facility separation for these conditions is read directly from the curves (after correcting for transmitter power of other facilities if different from 1kW).

C. Should equipment at the two facilities have different characteristics, repeat procedure in "A" and "B" for the other combinations of equipment.

D. Of the two distances derived, use the greater to compare with other cases (see below).

Note.— In most instances, it will be found that the facility-to-facility consideration will not be the controlling factor in determining geographical separation.

Facility separation will then be the greatest distance derived for Cases 1 to 4.

4. Criteria to be employed in establishing geographical separation between ground stations and between aircraft and ground stations for co-channel operation of VHF facilities that have a service area beyond the radio horizon

Geographical separation of co-channel facilities can be calculated by using the method given in 2 above except that the adjacent channel rejection *A* is omitted from consideration.

5. Criteria employed in establishing co-channel frequency deployment of VHF VOLMET facilities

In the case of VHF VOLMET services, the geographical separation between co-channel stations should be 55.6 km (30

NM) plus twice the distance to the radio horizon from an aircraft at the highest altitude flown by aircraft in the area concerned. (See Figure A-6.)

Note.— At 27.8 km (15 NM) beyond the radio horizon, the field strength at 13 500 m (45 000 ft), from a transmitter of 100 W ERP, will be approximately at the receiver muting level of 5 microvolts per metre.

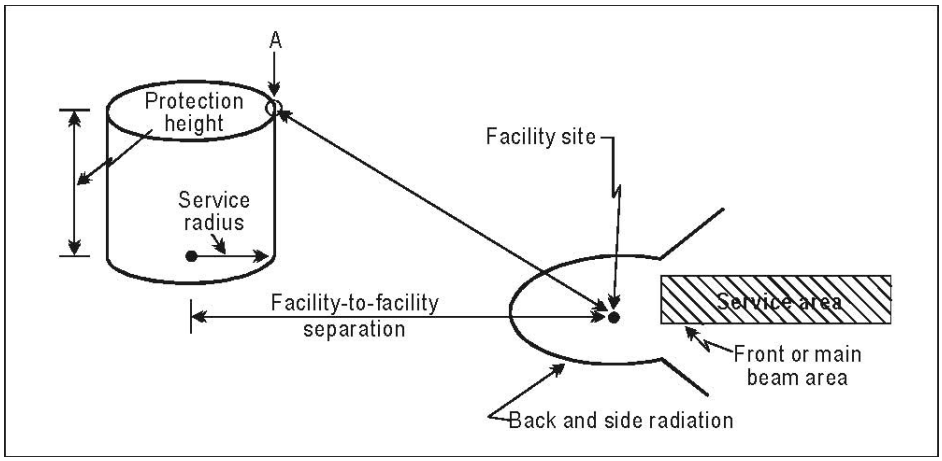


Figure A-4. Air-to-ground (facility from A) and ground-to-air (A from facility)

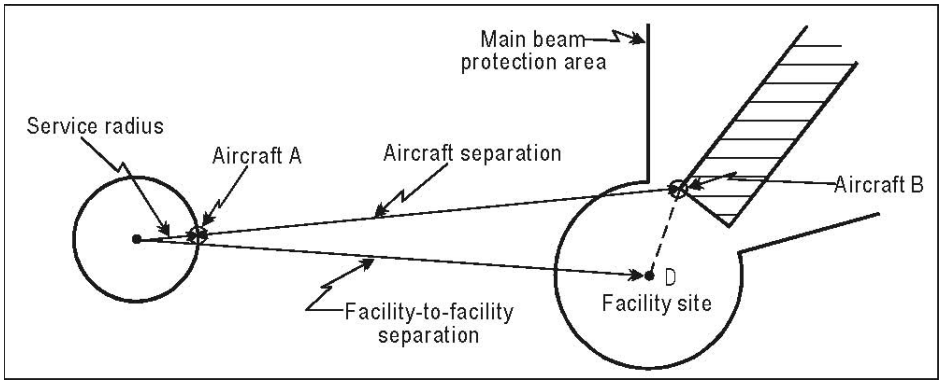


Figure A-5. Facility-to-facility separation based on air-to-air (A from B) and ground-to-ground (C and D)

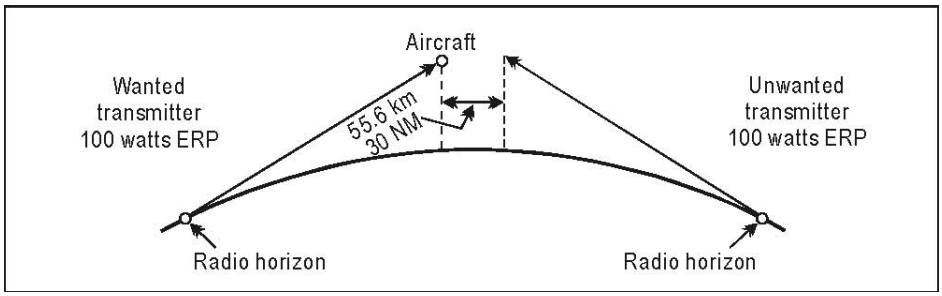


Figure A-6. VOLMET planning (illustrating co-channel protection)

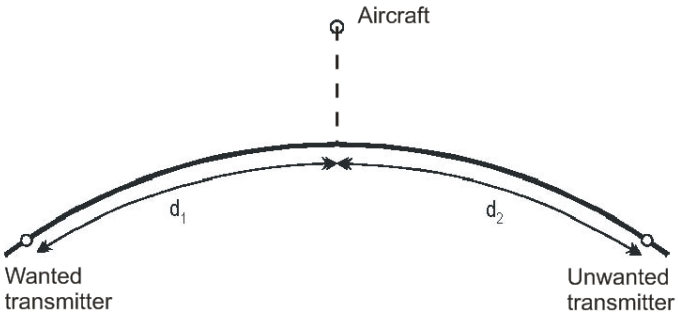


Figure A-7. VOLMET planning (illustrating adjacent-channel protection)

6. Criteria employed in establishing adjacent channel frequency deployment of VHF VOLMET facilities

6.1 For aircraft receivers designed for operation in a 25 kHz channel spacing environment, an effective adjacent channel rejection characteristic of 60 dB or better is assumed. This assumption will result in a geographical separation distance *D* between VHF VOLMET ground transmitters derived as follows (nautical miles may be substituted for kilometres):

Altitude	*Receiver rejection characteristic*	*d1 km (NM)*	*d2 km (NM)*	*D km (NM)*
13 500 m (45 000 ft)	60 dB	491 (265)	24.1 (13)	515 (278)
13 500 m (45 000 ft)	40 dB	491 (265)	241 (130)	732 (395)
20 000 m (66 000 ft)	60 dB	619 (334)	24.1 (13)	643 (347)
20 000 m (66 000 ft)	40 dB	619 (334)	241 (130)	860 (464)

$D = (d_1 + d_2)$ km where d_1 = distance between aircraft and wanted ground station = radio horizon + 27.8 km (15 NM) and d_2 = distance between aircraft and unwanted ground station = 24.1 km (13 NM).

(See Figure A-7.)

6.2 Where it is necessary to take account, on a regional basis, of receivers not specifically designed for 25 kHz channel spacing and used in a 25 kHz channel spacing environment, an effective adjacent channel rejection characteristic of the receiver of the order of 40 dB is assumed. This assumption will result in a minimum geographical separation distance *D* between VHF VOLMET ground transmitters derived as follows:

$D = (d_1 + d_2)$ km where d_1 = distance between aircraft and wanted ground station = radio horizon + 27.8 km (15 NM) d_2 = distance between aircraft and unwanted ground station = 240.9 km (130 NM).

6.3 Application of the above criteria in the case of aircraft altitudes of 13 500 m (45 000 ft) and 20 000 m (66 000 ft) results in the following separation distances:

6.4 The above criteria are based on the following additional assumptions:

1) *Effective radiated power*: an ERP of 100 W for the ground stations.

Note.— If an ERP of 20 W is assumed, this would result in separation distances for 13 500 m (45 000 ft) of 472 km (255 NM) for 60 dB receiver adjacent channel rejection and 572 km (309 NM) for 40 dB receiver adjacent channel rejection.

2) *Interfering signal strength*: if the received signal strength is in excess of the free space propagation value, then the maximum value will not exceed the free space value by more than 5 dB over average earth. This condition is satisfied when transmitters of 20 W ERP or more are used in conjunction with a receiver adjacent channel rejection of not less than 35 dB. Thus, the minimum distance for d_2 can be derived from a consideration of receiver muting level, receiver adjacent channel rejection and transmitter ERP.

7. RF — Characteristics for digital VHF systems, interference immunity performance

7.1 *Receiving function — interference immunity performance*. The standard measurement technique for digital systems provides that the desired signal field strength be doubled, and that the undesired signal be applied in increasing levels until the channel performance, that is the specified error rate, degrades to a value equal to the value found at the specified receiver sensitivity.

For the VDL, the effect of the measurement technique is that the desired signal strength is increased from 20 microvolts per metre to 40 microvolts per metre. Then the undesired signal on the adjacent or any other assignable channel is raised to the specified level higher than the desired signal until the specified error rate is exceeded.

Care should be taken to ensure that on-channel noise power is not included in the measurement of the undesired signal.

7.2 *Assignment criteria.* Assignment of frequencies for VHF digital link should take into account the VDL RF system characteristics in order to avoid harmful interference to or from co-channel and adjacent channel assignments, in keeping with regionally and nationally agreed spectrum management policies

Note: Propagation curves not included

.

Appendix D

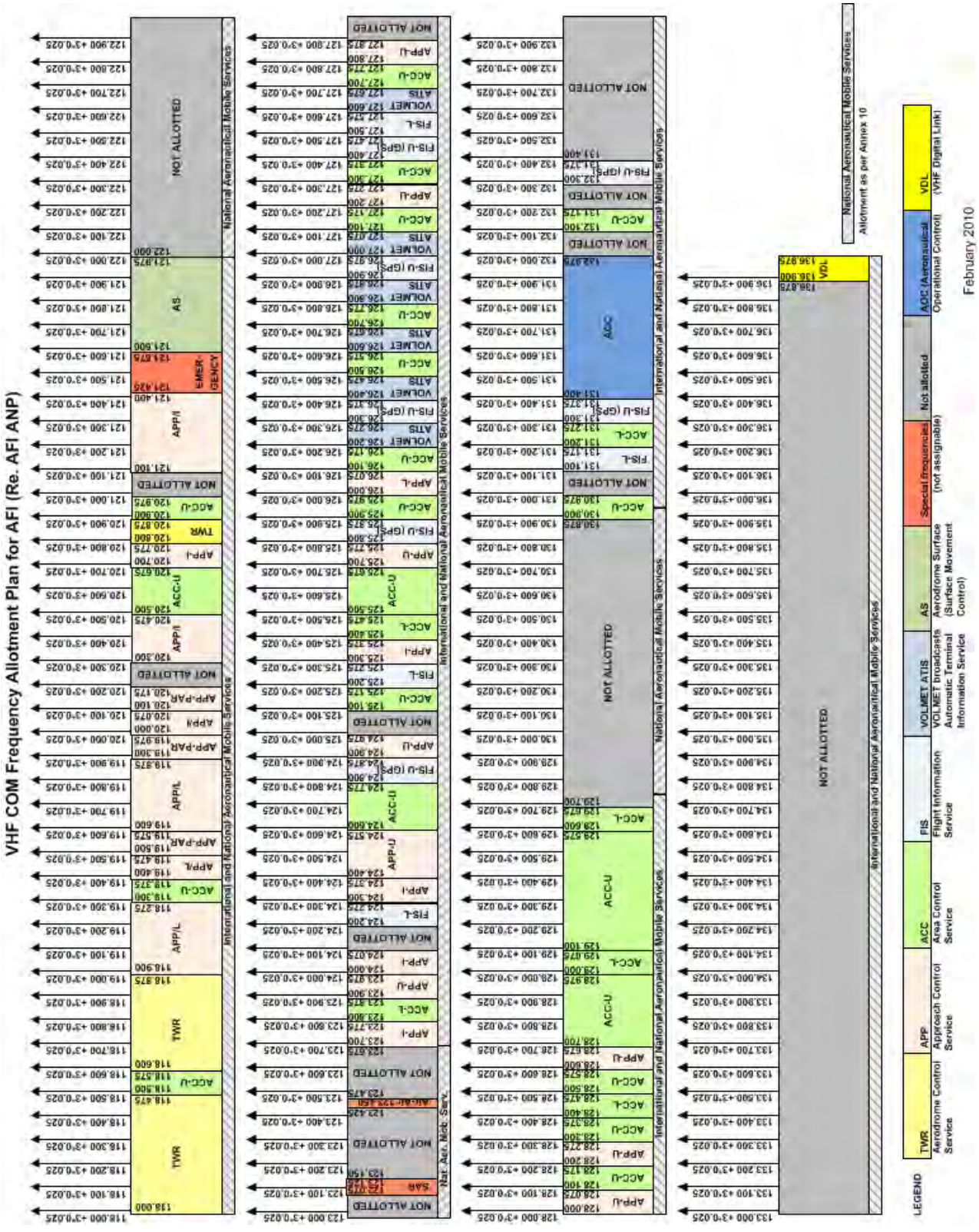
Terms and definitions

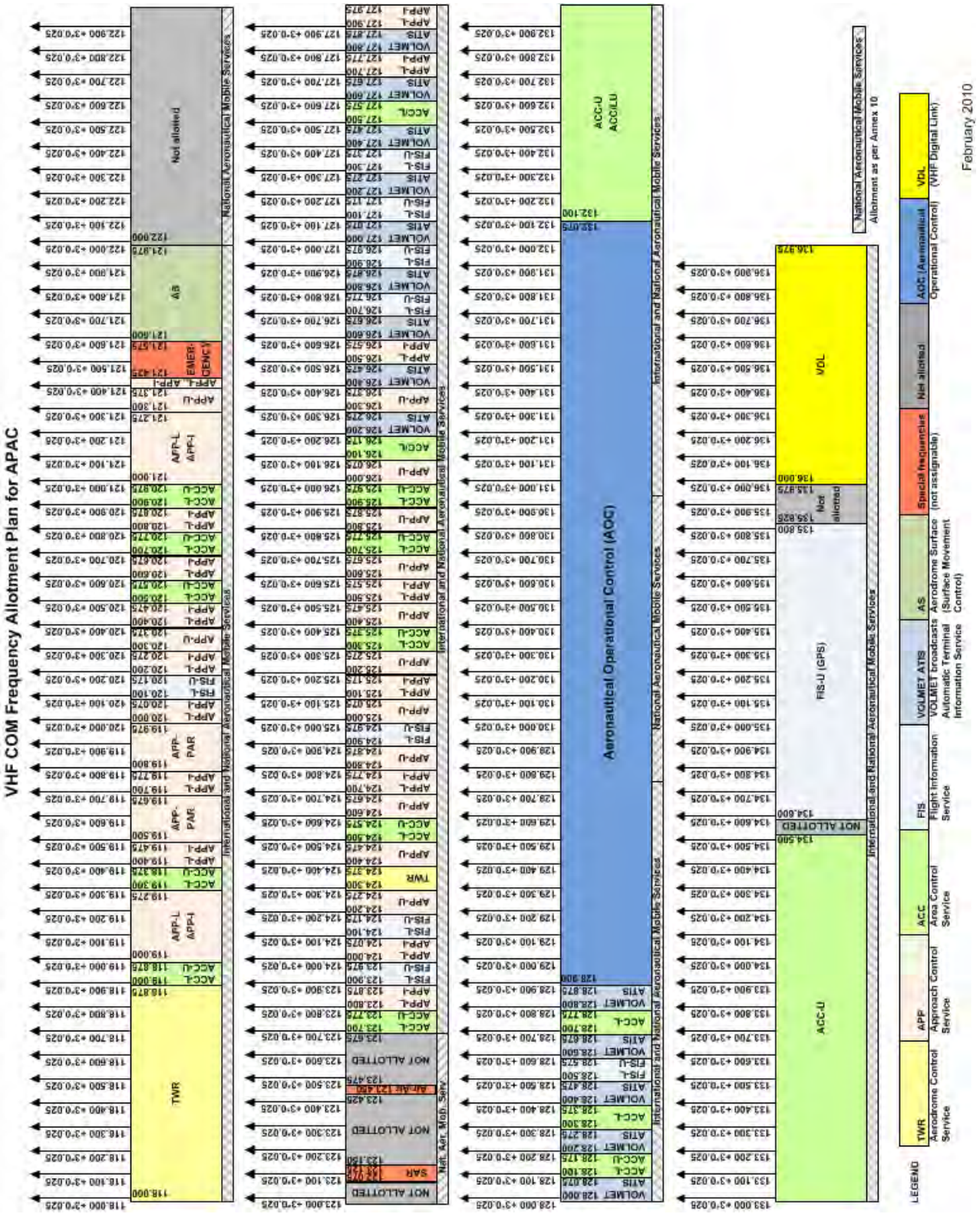
Designated operational range or height (DOR or DOH) – The range or height to which an aid is needed operationally in order to provide a particular service and within which the facility is afforded frequency protection.

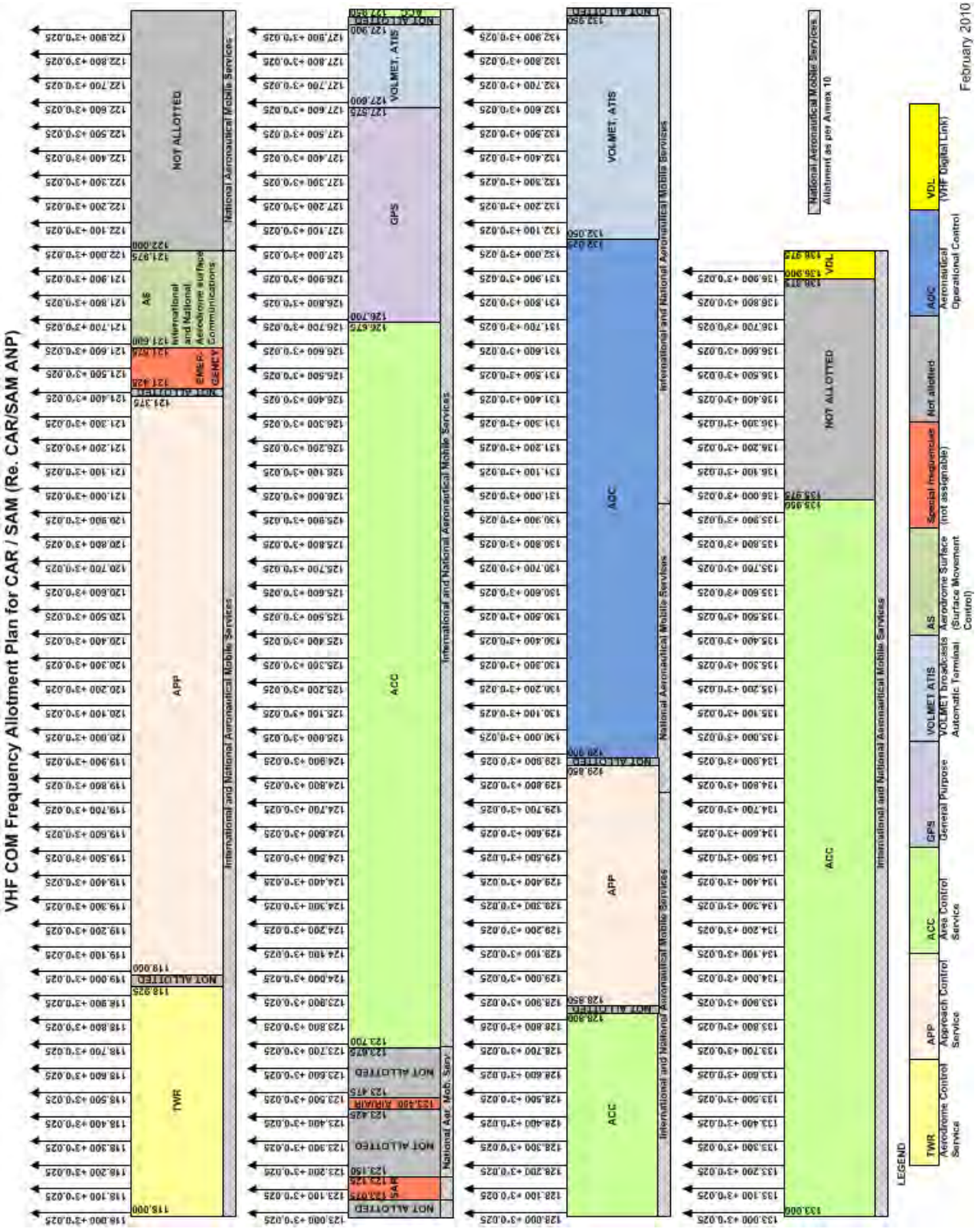
Note 1 – The designated value for range or height is determined in accordance with the criteria for the deployment of the aid in question.

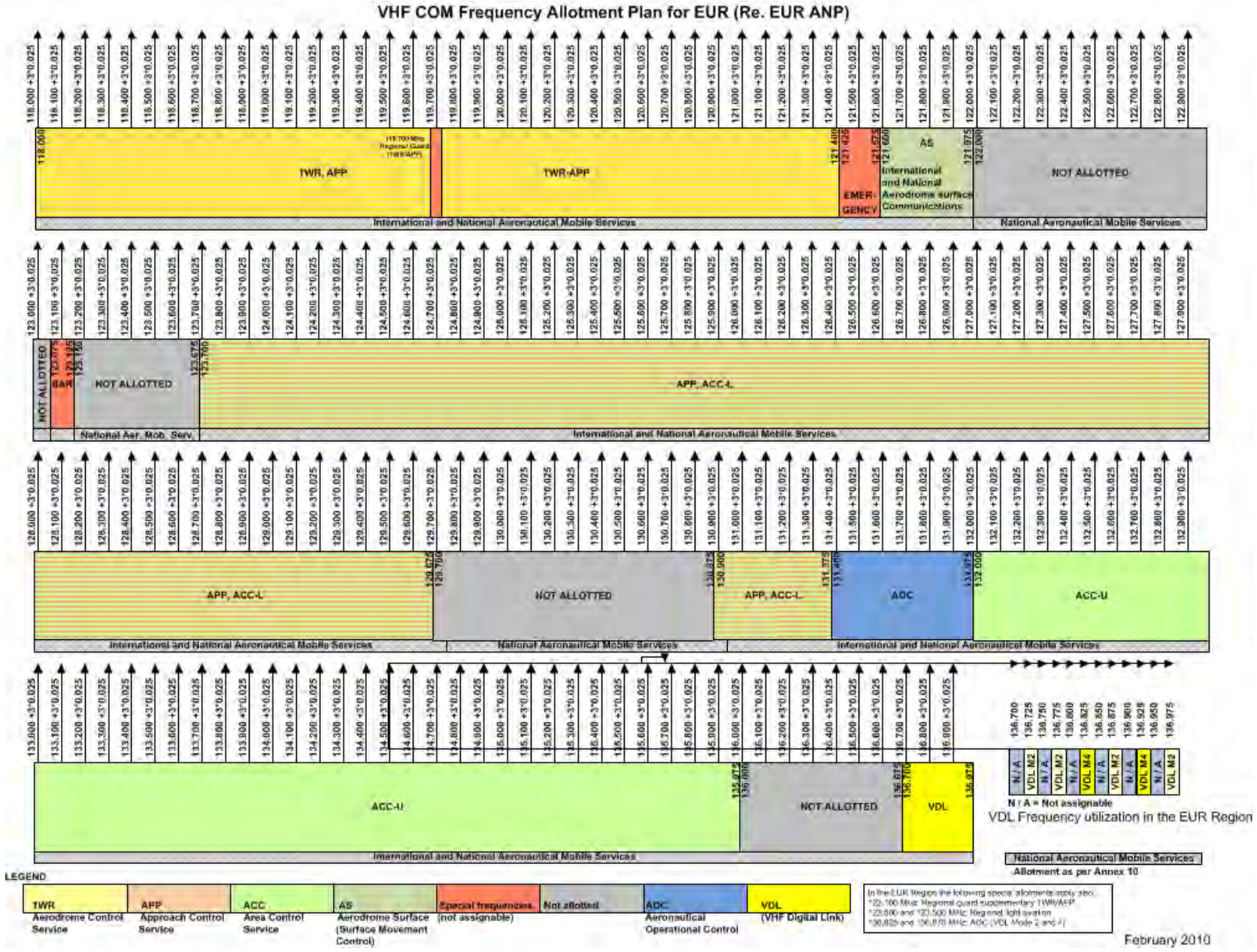
Note 2 – The designated value for range or height forms the basis for the technical planning of aids.

Designated operational coverage (DOC) – The combination of the designated operational range and the designated operational height (e.g. 200NM/FL500 is the designated operational coverage for an aid with a designated operational range of 500 NM and a designated operational height of 50.000 ft (Flight Level 500).

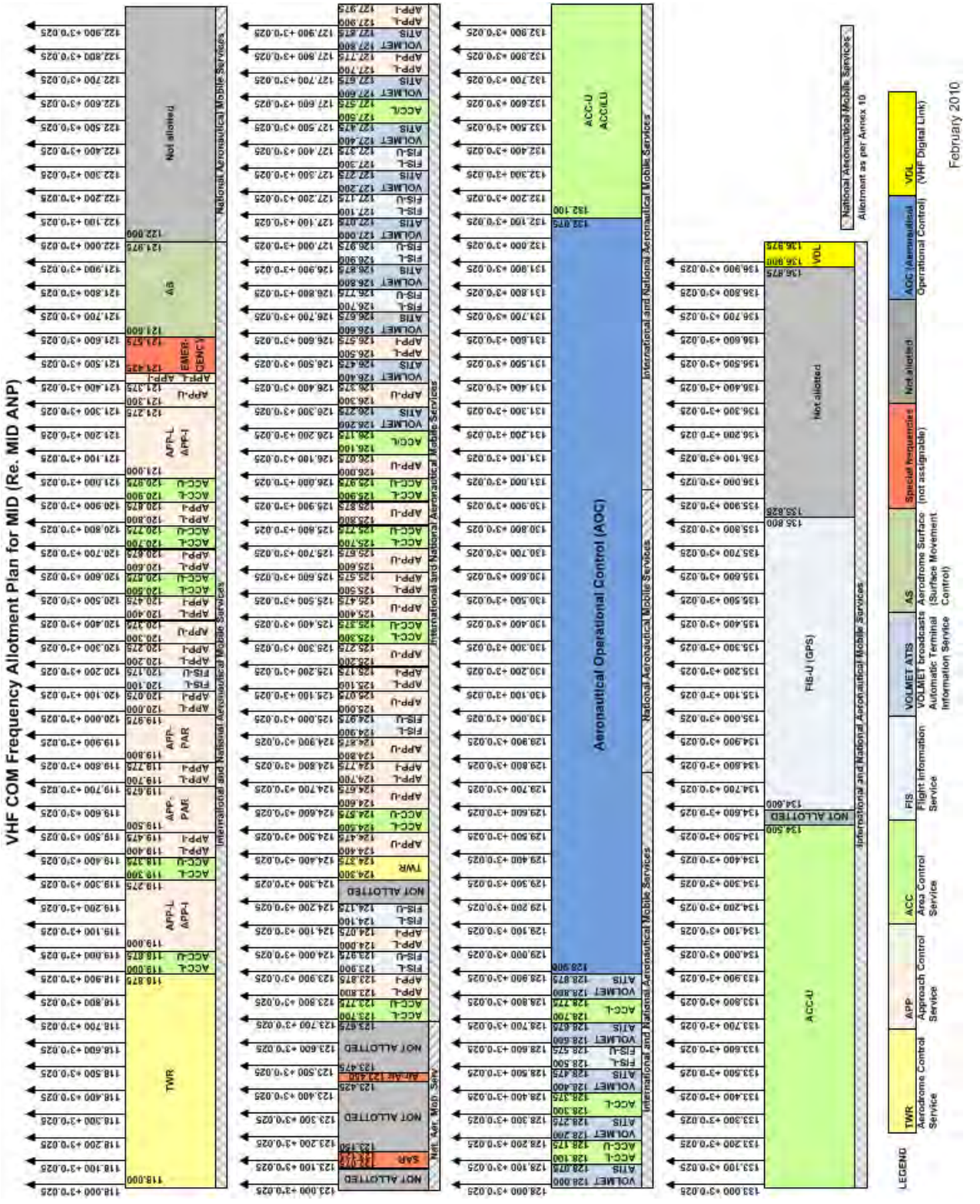

VHF COM Frequency Allotment Plan for AFI (Re. AFI ANP)
LEGEND
TWR Aerodrome Control Service
APP Approach Control Service
ACC Area Control Service
FIS Flight Information Service
VOLMET ATIS VOLMET broadcasts Automatic Terminal Information Service
AS Aerodrome Surface (Surface Movement Control)
Special frequencies (not assignable)
Not allotted
AOC (Aeronautical Operational Control)
VDL (VHF Digital Link)
National Aeronautical Mobile Services
Allotment as per Annex 10
NOT ALLOTTED
International and National Aeronautical Mobile Services
February 2010


VHF COM Frequency Allotment Plan for APAC
February 2010
LEGEND
TWR
Aerodrome Control Service
APP
Approach Control Service
ACC
Area Control Service
FIS
Flight Information Service
VOLMET ATIS
VOLMET broadcasts
Automatic Terminal Information Service
AS
Aerodrome Surface (Surface Movement Control)
Special frequencies (not assignable)
Not allotted
AOC (Aeronautical Operational Control)
VDL
(VHF Digital Link)
National Aeronautical Mobile Services
Allotment as per Annex 10
International and National Aeronautical Mobile Services
Aeronautical Operational Control (AOC)
ACC-U
ACC-L
VOL
FIS-U (GPS)
NOT ALLOTTED
Not allotted
Not allotted
Not allotted


VHF COM Frequency Allotment Plan for CAR / SAM (Re. CAR/SAM ANP)
February 2010
LEGEND
TWR
Aerodrome Control Service
APP
Approach Control Service
ACC
Area Control Service
GPS
General Purpose
VOLMET ATIS
VOLMET broadcasts Automatic Terminal
AS
Aerodrome Surface (Surface Movement Control)
Special frequencies (not assignable)
Not allotted
AOC
Aeronautical Operational Control
VDL
(VHF Digital Link)
National Aeronautical Mobile Services
Allotment as per Annex 10
International and National Aeronautical Mobile Services
National Aeronautical Mobile Services
International and National Aeronautical Mobile Services
National Aer. Mob. Serv.
International and National Aeronautical Mobile Services
International and National Aeronautical Mobile Services
NOT ALLOTTED
TWR
APP
ACC
GPS
VOLMET, ATIS
AS
EMERG. GENEV
International and National Aerodrome surface Communications
VDL
NOT ALLOTTED
AIR/AIR
123.475
123.450 AIR/AIR
123.150
AIR/AIR
123.075
AIR/AIR
122.850
NOT ALLOTTED
122.900
127.900
127.675
126.700
121.975
121.600
121.575
121.425
121.375
118.000
118.825
136.975
136.900
135.975
135.950
133.000
132.950
132.050
129.025
128.950
128.850
128.800
123.675
123.600
123.425
123.400
123.375
123.300
123.200
123.150
123.100
123.075
123.000


VHF COM Frequency Allotment Plan for EUR (Re. EUR ANP)
TWR, APP
TWR-APP
EMER-GENCY
AS
International and National Aerodrome surface Communications
NOT ALLOTTED
International and National Aeronautical Mobile Services
National Aeronautical Mobile Services
NOT ALLOTTED
BAR
NOT ALLOTTED
APP, ACC-L
National Aer. Mob. Serv.
International and National Aeronautical Mobile Services
APP, ACC-L
NOT ALLOTTED
APP, ACC-L
ADC
ACC-U
International and National Aeronautical Mobile Services
National Aeronautical Mobile Services
International and National Aeronautical Mobile Services
ACC-U
NOT ALLOTTED
VDL
International and National Aeronautical Mobile Services
N / A
VDL M2
N / A
VDL M2
N / A
VDL M4
N / A
VDL M2
N / A
VDL M4
N / A
VDL M2
N / A = Not assignable
VDL Frequency utilization in the EUR Region
National Aeronautical Mobile Services
Allotment as per Annex 10
LEGEND
TWR
Aerodrome Control Service
APP
Approach Control Service
ACC
Area Control Service
AS
Aerodrome Surface (Surface Movement Control)
Special frequencies (not assignable)
Not allotted
ADC
Aeronautical Operational Control
VDL
(VHF Digital Link)
In the EUR Region the following special allotments apply also:
*123.100 MHz: Regional guard supplementary TWR/APP
*123.500 and *123.500 MHz: Regional light aviation
*136.825 and 136.875 MHz: ADC (VDL Mode 2 and 4)
February 2010

Appendix E


VHF COM Frequency Allotment Plan for MID (Re. MID ANP)
February 2010
LEGEND
TWR
Aerodrome Control Service
APP
Approach Control Service
ACC
Area Control Service
FIS
Flight Information Service
VOLMET ATIS
VOLMET broadcasts Automatic Terminal Information Service
AS
Aerodrome Surface (Surface Movement Control)
Special frequencies (not assignable)
Not allotted
AOG (Aeronautical Operational Control)
VDL
(VHF Digital Link)
Aeronautical Operational Control (AOC)
ACC-U
ACC/LU
FIS-U (GPS)
Not allotted
ACC-U
NOT ALLOTTED
TWR
APP-L
APP-I
APP-PAR
APP-U
EMER-GENCY
Air
Not allotted
SAR
NOT ALLOTTED
TWR
NOT ALLOTTED
National Aeronautical Mobile Services
International and National Aeronautical Mobile Services
National Aeronautical Mobile Services
International and National Aeronautical Mobile Services
National Aeronautical Mobile Services
International and National Aeronautical Mobile Services
National Aeronautical Mobile Services
International and National Aeronautical Mobile Services
Allotment as per Annex 10

Appendix F

Channel pairing between ILS localizer, ILS-glide path and DME and between VOR and DME.

Localizer/VOR	Glide Path	DME channel
108.000		17X
108.050		17Y
108.100	334.700	18X
108.150	334.550	18Y
108.200		19X
108.250		19Y
108.300	334.100	20X
108.350	333.950	20Y
108.400		21X
108.450		21Y
108.500	329.900	22X
108.550	329.750	22Y
108.600		23X
108.650		23Y
108.700	330.500	24X
108.750	330.350	24Y
108.800		25X
108.850		25Y
108.900	329.300	26X
108.950	329.150	26Y
109.000		27X
109.050		27Y
109.100	331.400	28X
109.150	331.250	28Y
109.200		29X
109.250		29Y
109.300	332.000	30X
109.350	331.850	30Y
109.400		31X
109.450		31Y
109.500	332.600	32X
109.550	332.450	32Y
109.600		33X
109.650		33Y
109.700	333.200	34X
109.750	333.050	34Y
109.800		35X
109.850		35Y
109.900	333.800	36X
109.950	333.650	36Y
110.000		37X
110.050		37Y
110.100	334.400	38X
110.150	334.250	38Y
110.200		39X
110.250		39Y
110.300	335.000	40X
110.350	334.850	40Y
110.400		41X
110.450		41Y
110.500	329.600	42X
110.550	329.450	42Y
110.600		43X
110.650		43Y
110.700	330.200	44X
110.750	330.050	44Y
110.800		45X
110.850		45Y
110.900	330.800	46X
110.950	330.650	46Y
111.000		47X
111.050		47Y
111.100	331.700	48X
111.150	331.550	48Y
111.200		49X
111.250		49Y
111.300	332.300	50X
111.350	332.150	50Y
111.400		51X
111.450		51Y

Localizer/VOR	Glide Path	DME channel
111.500	332.900	52X
111.550	332.750	52Y
111.600		53X
111.650		53Y
111.700	333.500	54X
111.750	333.350	54Y
111.800		55X
111.850		55Y
111.900	331.100	56X
111.950	330.950	56Y
112.000		57X
112.050		57Y
112.100		58X
112.150		58Y
112.200		59X
112.250		59Y
112.300		70X
112.350		70Y
112.400		71X
112.450		71Y
112.500		72X
112.550		72Y
112.600		73X
112.650		73Y
112.700		74X
112.750		74Y
112.800		75X
112.850		75Y
112.900		76X
112.950		76Y
113.000		77X
113.050		77Y
113.100		78X
113.150		78Y
113.200		79X
113.250		79Y
113.300		80X
113.350		80Y
113.400		81X
113.450		81Y
113.500		82X
113.550		82Y
113.600		83X
113.650		83Y
113.700		84X
113.750		84Y
113.800		85X
113.850		85Y
113.900		86X
113.950		86Y
114.000		87X
114.050		87Y
114.100		88X
114.150		88Y
114.200		89X
114.250		89Y
114.300		90X
114.350		90Y
114.400		91X
114.450		91Y
114.500		92X
114.550		92Y
114.600		93X
114.650		93Y
114.700		94X
114.750		94Y
114.800		95X
114.850		95Y
114.900		96X
114.950		96Y

Localizer/VOR	DME channel
115.000	97X
115.050	97Y
115.100	98X
115.150	98Y
115.200	99X
115.250	99Y
115.300	100X
115.350	100Y
115.400	101X
115.450	101Y
115.500	102X
115.550	102Y
115.600	103X
115.650	103Y
115.700	104X
115.750	104Y
115.800	105X
115.850	105Y
115.900	106X
115.950	106Y
116.000	107X
116.050	107Y
116.100	108X
116.150	108Y
116.200	109X
116.250	109Y
116.300	110X
116.350	110Y
116.400	111X
116.450	111Y
116.500	112X
116.550	112Y
116.600	113X
116.650	113Y
116.700	114X
116.750	114Y
116.800	115X
116.850	115Y
116.900	116X
116.950	116Y
117.000	117X
117.050	117Y
117.100	118X
117.150	118Y
117.200	119X
117.250	119Y
117.300	120X
117.350	120Y
117.400	121X
117.450	121Y
117.500	122X
117.550	122Y
117.600	123X
117.650	123Y
117.700	124X
117.750	124Y
117.800	125X
117.850	125Y
117.900	126X
117.950	125Y

Regional frequency utilization table

Appendix G

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
118.0000	118.005	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0000	118.000	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.0083	118.010	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0167	118.015	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0250	118.025	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.0250	118.030	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0333	118.035	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0417	118.040	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0500	118.055	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0500	118.050	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.0583	118.060	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0667	118.065	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0750	118.080	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0750	118.075	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.0833	118.085	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.0917	118.090	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1000	118.100	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.1000	118.105	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1083	118.110	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1167	118.115	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1250	118.125	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.1250	118.130	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1333	118.135	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1417	118.140	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1500	118.150	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.1500	118.155	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1583	118.160	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1667	118.165	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1750	118.175	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.1750	118.180	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1833	118.185	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.1917	118.190	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2000	118.200	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.2000	118.205	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2083	118.210	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2167	118.215	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2250	118.230	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2250	118.225	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.2333	118.235	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2417	118.240	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2500	118.250	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.2500	118.255	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2583	118.260	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2667	118.265	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2750	118.275	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.2750	118.280	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.2833	118.285	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
118.2917	118.290	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3000	118.300	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.3000	118.305	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3083	118.310	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3167	118.315	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3250	118.330	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3250	118.325	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.3333	118.335	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3417	118.340	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3500	118.355	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3500	118.350	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.3583	118.360	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3667	118.365	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3750	118.380	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3750	118.375	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.3833	118.385	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.3917	118.390	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4000	118.400	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.4000	118.405	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4083	118.410	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4167	118.415	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4250	118.425	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.4250	118.430	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4333	118.435	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4417	118.440	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4500	118.450	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.4500	118.455	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4583	118.460	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4667	118.465	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4750	118.475	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.4750	118.480	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4833	118.485	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.4917	118.490	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5000	118.500	ACC-U	TWR	TWR	TWR, APP	TWR	TWR
118.5000	118.505	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5083	118.510	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5167	118.515	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5250	118.525	ACC-U	TWR	TWR	TWR, APP	TWR	TWR
118.5250	118.530	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5333	118.535	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5417	118.540	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5500	118.550	ACC-U	TWR	TWR	TWR, APP	TWR	TWR
118.5500	118.555	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5583	118.560	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5667	118.565	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5750	118.575	ACC-U	TWR	TWR	TWR, APP	TWR	TWR
118.5750	118.580	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5833	118.585	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.5917	118.590	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
118.6000	118.600	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.6000	118.605	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6083	118.610	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6167	118.615	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6250	118.625	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.6250	118.630	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6333	118.635	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6417	118.640	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6500	118.650	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.6500	118.655	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6583	118.660	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6667	118.665	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6750	118.675	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.6750	118.680	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6833	118.685	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.6917	118.690	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7000	118.700	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.7000	118.705	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7083	118.710	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7167	118.715	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7250	118.725	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.7250	118.730	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7333	118.735	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7417	118.740	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7500	118.750	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.7500	118.755	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7583	118.760	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7667	118.765	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7750	118.775	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.7750	118.780	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7833	118.785	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.7917	118.790	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8000	118.800	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.8000	118.805	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8083	118.810	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8167	118.815	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8250	118.825	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.8250	118.830	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8333	118.835	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8417	118.840	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8500	118.850	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.8500	118.855	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8583	118.860	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8667	118.865	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8750	118.875	TWR	TWR	TWR	TWR, APP	TWR	TWR
118.8750	118.880	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8833	118.885	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.8917	118.890	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9000	118.900	TWR	ACC-L, ACC-U	TWR	TWR, APP	ACC-L, ACC-U	TWR

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
118.9000	118.905	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9083	118.910	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9167	118.915	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9250	118.925	TWR	ACC-L, ACC-U	TWR	TWR, APP	ACC-L, ACC-U	TWR
118.9250	118.930	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9333	118.935	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9417	118.940	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9500	118.950	TWR	ACC-L, ACC-U	Not allotted	TWR, APP	ACC-L, ACC-U	Not allotted
118.9500	118.955	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9583	118.960	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9667	118.965	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9750	118.975	TWR	ACC-L, ACC-U	Not allotted	TWR, APP	ACC-L, ACC-U	Not allotted
118.9750	118.980	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9833	118.985	Not used	Not used	Not used	TWR, APP	Not used	Not used
118.9917	118.990	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0000	119.000	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.0000	119.005	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0083	119.010	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0167	119.015	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0250	119.025	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.0250	119.030	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0333	119.035	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0417	119.040	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0500	119.050	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.0500	119.055	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0583	119.060	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0667	119.065	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0750	119.075	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.0750	119.080	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0833	119.085	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.0917	119.090	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1000	119.100	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.1000	119.105	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1083	119.110	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1167	119.115	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1250	119.125	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.1250	119.130	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1333	119.135	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1417	119.140	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1500	119.150	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.1500	119.155	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1583	119.160	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1667	119.165	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1750	119.175	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.1750	119.180	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1833	119.185	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.1917	119.190	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2000	119.200	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.2000	119.205	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
119.2083	119.210	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2167	119.215	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2250	119.225	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.2250	119.230	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2333	119.235	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2417	119.240	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2500	119.250	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.2500	119.255	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2583	119.260	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2667	119.265	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2750	119.275	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.2750	119.280	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2833	119.285	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.2917	119.290	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3000	119.300	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
119.3000	119.305	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3083	119.310	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3167	119.315	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3250	119.325	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
119.3250	119.330	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3333	119.335	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3417	119.340	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3500	119.350	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
119.3500	119.355	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3583	119.360	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3667	119.365	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3750	119.375	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
119.3750	119.380	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3833	119.385	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.3917	119.390	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4000	119.400	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.4000	119.405	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4083	119.410	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4167	119.415	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4250	119.425	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.4250	119.430	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4333	119.435	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4417	119.440	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4500	119.450	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.4500	119.455	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4583	119.460	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4667	119.465	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4750	119.475	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.4750	119.480	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4833	119.485	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.4917	119.490	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5000	119.505	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5000	119.500	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.5083	119.510	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
119.5167	119.515	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5250	119.525	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.5250	119.530	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5333	119.535	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5417	119.540	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5500	119.550	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.5500	119.555	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5583	119.560	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5667	119.565	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5750	119.575	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.5750	119.580	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5833	119.585	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.5917	119.590	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6000	119.600	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.6000	119.605	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6083	119.610	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6167	119.615	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6250	119.625	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.6250	119.630	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6333	119.635	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6417	119.640	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6500	119.650	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.6500	119.655	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6583	119.660	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6667	119.665	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6750	119.675	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.6750	119.680	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6833	119.685	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.6917	119.690	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7000	119.700	APP-L	APP-L, APP-I	APP	RGA (TWR, APP)	APP-L, APP-I	APP
119.7000	119.705	Not used	Not used	Not used	RGA (TWR, APP)	Not used	Not used
119.7083	119.710	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7167	119.715	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7250	119.725	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.7250	119.730	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7333	119.735	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7417	119.740	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7500	119.750	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.7500	119.755	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7583	119.760	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7667	119.765	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7750	119.775	APP-L	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
119.7750	119.780	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7833	119.785	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.7917	119.790	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8000	119.800	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.8000	119.805	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8083	119.810	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8167	119.815	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
119.8250	119.825	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.8250	119.830	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8333	119.835	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8417	119.840	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8500	119.850	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.8500	119.855	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8583	119.860	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8667	119.865	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8750	119.875	APP-L	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.8750	119.880	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8833	119.885	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.8917	119.890	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9000	119.900	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.9000	119.905	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9083	119.910	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9167	119.915	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9250	119.930	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9250	119.925	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.9333	119.935	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9417	119.940	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9500	119.950	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.9500	119.955	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9583	119.960	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9667	119.965	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9750	119.975	APP-PAR	APP-PAR	APP	TWR, APP	APP-PAR	APP
119.9750	119.980	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9833	119.985	Not used	Not used	Not used	TWR, APP	Not used	Not used
119.9917	119.990	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0000	120.000	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.0000	120.005	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0083	120.010	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0167	120.015	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0250	120.025	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.0250	120.030	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0333	120.035	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0417	120.040	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0500	120.055	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0500	120.050	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.0583	120.060	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0667	120.065	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0750	120.075	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.0750	120.080	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0833	120.085	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.0917	120.090	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1000	120.100	APP-PAR	FIS-L, FIS-U	APP	TWR, APP	FIS-L, FIS-U	APP
120.1000	120.105	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1083	120.110	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1167	120.115	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1250	120.125	APP-PAR	FIS-L, FIS-U	APP	TWR, APP	FIS-L, FIS-U	APP

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
120.1250	120.130	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1333	120.135	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1417	120.140	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1500	120.150	APP-PAR	FIS-L, FIS-U	APP	TWR, APP	FIS-L, FIS-U	APP
120.1500	120.155	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1583	120.160	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1667	120.165	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1750	120.175	APP-PAR	FIS-L, FIS-U	APP	TWR, APP	FIS-L, FIS-U	APP
120.1750	120.180	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1833	120.185	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.1917	120.190	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2000	120.200	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.2000	120.205	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2083	120.210	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2167	120.215	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2250	120.225	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.2250	120.230	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2333	120.235	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2417	120.240	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2500	120.250	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.2500	120.255	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2583	120.260	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2667	120.265	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2750	120.275	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.2750	120.280	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2833	120.285	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.2917	120.290	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3000	120.300	APP-I	APP-U	APP	TWR, APP	APP-U	APP
120.3000	120.305	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3083	120.310	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3167	120.315	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3250	120.325	APP-I	APP-U	APP	TWR, APP	APP-U	APP
120.3250	120.330	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3333	120.335	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3417	120.340	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3500	120.350	APP-I	APP-U	APP	TWR, APP	APP-U	APP
120.3500	120.355	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3583	120.360	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3667	120.365	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3750	120.375	APP-I	APP-U	APP	TWR, APP	APP-U	APP
120.3750	120.380	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3833	120.385	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.3917	120.390	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4000	120.400	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.4000	120.405	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4083	120.410	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4167	120.415	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4250	120.425	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.4250	120.430	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
120.4333	120.435	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4417	120.440	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4500	120.450	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.4500	120.455	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4583	120.460	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4667	120.465	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4750	120.475	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.4750	120.480	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4833	120.485	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.4917	120.490	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5000	120.500	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.5000	120.505	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5083	120.510	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5167	120.515	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5250	120.525	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.5250	120.530	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5333	120.535	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5417	120.540	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5500	120.550	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.5500	120.555	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5583	120.560	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5667	120.565	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5750	120.575	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.5750	120.580	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5833	120.585	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.5917	120.590	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6000	120.600	ACC-U	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.6000	120.605	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6083	120.610	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6167	120.615	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6250	120.625	ACC-U	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.6250	120.630	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6333	120.635	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6417	120.640	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6500	120.650	ACC-U	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.6500	120.655	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6583	120.660	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6667	120.665	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6750	120.675	ACC-U	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.6750	120.680	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6833	120.685	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.6917	120.690	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7000	120.700	APP-I	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.7000	120.705	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7083	120.710	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7167	120.715	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7250	120.725	APP-I	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.7250	120.730	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7333	120.735	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
120.7417	120.740	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7500	120.750	APP-I	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.7500	120.755	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7583	120.760	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7667	120.765	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7750	120.775	APP-I	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.7750	120.780	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7833	120.785	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.7917	120.790	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8000	120.800	TWR	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.8000	120.805	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8083	120.810	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8167	120.815	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8250	120.825	TWR	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.8250	120.830	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8333	120.835	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8417	120.840	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8500	120.850	TWR	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.8500	120.855	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8583	120.860	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8667	120.865	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8750	120.875	TWR	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
120.8750	120.880	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8833	120.885	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.8917	120.890	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9000	120.900	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.9000	120.905	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9083	120.910	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9167	120.915	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9250	120.925	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.9250	120.930	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9333	120.935	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9417	120.940	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9500	120.950	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.9500	120.955	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9583	120.960	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9667	120.965	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9750	120.980	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9750	120.975	ACC-U	ACC-L, ACC-U	APP	TWR, APP	ACC-L, ACC-U	APP
120.9833	120.985	Not used	Not used	Not used	TWR, APP	Not used	Not used
120.9917	120.990	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0000	121.000	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.0000	121.005	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0083	121.010	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0167	121.015	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0250	121.025	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.0250	121.030	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0333	121.035	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0417	121.040	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
121.0500	121.050	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.0500	121.055	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0583	121.060	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0667	121.065	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0750	121.075	Not allotted	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.0750	121.080	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0833	121.085	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.0917	121.090	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1000	121.100	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.1000	121.105	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1083	121.110	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1167	121.115	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1250	121.125	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.1250	121.130	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1333	121.135	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1417	121.140	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1500	121.150	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.1500	121.155	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1583	121.160	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1667	121.165	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1750	121.175	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.1750	121.180	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1833	121.185	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.1917	121.190	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2000	121.200	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.2000	121.205	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2083	121.210	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2167	121.215	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2250	121.225	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.2250	121.230	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2333	121.235	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2417	121.240	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2500	121.250	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.2500	121.255	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2583	121.260	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2667	121.265	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2750	121.275	APP-I	APP-L, APP-I	APP	TWR, APP	APP-L, APP-I	APP
121.2750	121.280	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2833	121.285	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.2917	121.290	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3000	121.300	APP-I	APP-U	APP	TWR, APP	APP-U	APP
121.3000	121.305	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3083	121.310	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3167	121.315	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3250	121.325	APP-I	APP-U	APP	TWR, APP	APP-U	APP
121.3250	121.330	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3333	121.335	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3417	121.340	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3500	121.350	APP-I	APP-U	APP	TWR, APP	APP-U	APP

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
121.3500	121.355	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3583	121.360	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3667	121.365	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3750	121.375	APP-I	APP-U	APP	TWR, APP	APP-U	APP
121.3750	121.380	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3833	121.385	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.3917	121.390	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.4000	121.405	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.4000	121.400	APP-I	APP-L, APP-I	Not allotted	TWR, APP	APP-L, APP-I	Not allotted
121.4083	121.410	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.4167	121.415	Not used	Not used	Not used	TWR, APP	Not used	Not used
121.4250	121.425	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4250	121.430	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4333	121.435	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4417	121.440	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4500	121.450	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4500	121.455	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4583	121.460	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4667	121.465	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4750	121.475	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4750	121.480	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4833	121.485	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.4917	121.490	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5000	121.500	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5000	121.505	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5083	121.510	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5167	121.515	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5250	121.525	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5250	121.530	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5333	121.535	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5417	121.540	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5500	121.550	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5500	121.555	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5583	121.560	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5667	121.565	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5750	121.575	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
121.5750	121.580	Not used	Not used	Not used	AS	Not used	Not used
121.5833	121.585	Not used	Not used	Not used	AS	Not used	Not used
121.5917	121.590	Not used	Not used	Not used	AS	Not used	Not used
121.6000	121.600	AS	AS	AS	AS	AS	AS
121.6000	121.605	Not used	Not used	Not used	AS	Not used	Not used
121.6083	121.610	Not used	Not used	Not used	AS	Not used	Not used
121.6167	121.615	Not used	Not used	Not used	AS	Not used	Not used
121.6250	121.630	Not used	Not used	Not used	AS	Not used	Not used
121.6250	121.625	AS	AS	AS	AS	AS	AS
121.6333	121.635	Not used	Not used	Not used	AS	Not used	Not used
121.6417	121.640	Not used	Not used	Not used	AS	Not used	Not used
121.6500	121.650	AS	AS	AS	AS	AS	AS
121.6500	121.655	Not used	Not used	Not used	AS	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
121.6583	121.660	Not used	Not used	Not used	AS	Not used	Not used
121.6667	121.665	Not used	Not used	Not used	AS	Not used	Not used
121.6750	121.675	AS	AS	AS	AS	AS	AS
121.6750	121.680	Not used	Not used	Not used	AS	Not used	Not used
121.6833	121.685	Not used	Not used	Not used	AS	Not used	Not used
121.6917	121.690	Not used	Not used	Not used	AS	Not used	Not used
121.7000	121.700	AS	AS	AS	AS	AS	AS
121.7000	121.705	Not used	Not used	Not used	AS	Not used	Not used
121.7083	121.710	Not used	Not used	Not used	AS	Not used	Not used
121.7167	121.715	Not used	Not used	Not used	AS	Not used	Not used
121.7250	121.725	AS	AS	AS	AS	AS	AS
121.7250	121.730	Not used	Not used	Not used	AS	Not used	Not used
121.7333	121.735	Not used	Not used	Not used	AS	Not used	Not used
121.7417	121.740	Not used	Not used	Not used	AS	Not used	Not used
121.7500	121.750	AS	AS	AS	AS	AS	AS
121.7500	121.755	Not used	Not used	Not used	AS	Not used	Not used
121.7583	121.760	Not used	Not used	Not used	AS	Not used	Not used
121.7667	121.765	Not used	Not used	Not used	AS	Not used	Not used
121.7750	121.775	AS	AS	AS	AS	AS	AS
121.7750	121.780	Not used	Not used	Not used	AS	Not used	Not used
121.7833	121.785	Not used	Not used	Not used	AS	Not used	Not used
121.7917	121.790	Not used	Not used	Not used	AS	Not used	Not used
121.8000	121.800	AS	AS	AS	AS	AS	AS
121.8000	121.805	Not used	Not used	Not used	AS	Not used	Not used
121.8083	121.810	Not used	Not used	Not used	AS	Not used	Not used
121.8167	121.815	Not used	Not used	Not used	AS	Not used	Not used
121.8250	121.825	AS	AS	AS	AS	AS	AS
121.8250	121.830	Not used	Not used	Not used	AS	Not used	Not used
121.8333	121.835	Not used	Not used	Not used	AS	Not used	Not used
121.8417	121.840	Not used	Not used	Not used	AS	Not used	Not used
121.8500	121.850	AS	AS	AS	AS	AS	AS
121.8500	121.855	Not used	Not used	Not used	AS	Not used	Not used
121.8583	121.860	Not used	Not used	Not used	AS	Not used	Not used
121.8667	121.865	Not used	Not used	Not used	AS	Not used	Not used
121.8750	121.875	AS	AS	AS	AS	AS	AS
121.8750	121.880	Not used	Not used	Not used	AS	Not used	Not used
121.8833	121.885	Not used	Not used	Not used	AS	Not used	Not used
121.8917	121.890	Not used	Not used	Not used	AS	Not used	Not used
121.9000	121.900	AS	AS	AS	AS	AS	AS
121.9000	121.905	Not used	Not used	Not used	AS	Not used	Not used
121.9083	121.910	Not used	Not used	Not used	AS	Not used	Not used
121.9167	121.915	Not used	Not used	Not used	AS	Not used	Not used
121.9250	121.925	AS	AS	AS	AS	AS	AS
121.9250	121.930	Not used	Not used	Not used	AS	Not used	Not used
121.9333	121.935	Not used	Not used	Not used	AS	Not used	Not used
121.9417	121.940	Not used	Not used	Not used	AS	Not used	Not used
121.9500	121.950	AS	AS	AS	AS	AS	AS
121.9500	121.955	Not used	Not used	Not used	AS	Not used	Not used
121.9583	121.960	Not used	Not used	Not used	AS	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
121.9667	121.965	Not used	Not used	Not used	AS	Not used	Not used
121.9750	121.975	AS	AS	AS	AS	AS	AS
121.9750	121.980	Not used	Not used	Not used	AS	Not used	Not used
121.9833	121.985	Not used	Not used	Not used	AS	Not used	Not used
121.9917	121.990	Not used	Not used	Not used	AS	Not used	Not used
122.0000	122.000	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.0000	122.005	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0083	122.010	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0167	122.015	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0250	122.025	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.0250	122.030	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0333	122.035	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0417	122.040	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0500	122.050	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.0500	122.055	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0583	122.060	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0667	122.065	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0750	122.075	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.0750	122.080	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0833	122.085	Not used	Not used	Not used	Not allotted	Not used	Not used
122.0917	122.090	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1000	122.100	Not allotted	Not allotted	Not allotted	RGA TWR, APP	Not allotted	Not allotted
122.1000	122.105	Not used	Not used	Not used	RGA TWR, APP	Not used	Not used
122.1083	122.110	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1167	122.115	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1250	122.125	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.1250	122.130	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1333	122.135	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1417	122.140	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1500	122.150	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.1500	122.155	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1583	122.160	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1667	122.165	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1750	122.175	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.1750	122.180	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1833	122.185	Not used	Not used	Not used	Not allotted	Not used	Not used
122.1917	122.190	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2000	122.200	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.2000	122.205	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2083	122.210	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2167	122.215	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2250	122.225	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.2250	122.230	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2333	122.235	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2417	122.240	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2500	122.250	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.2500	122.255	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2583	122.260	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2667	122.265	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
122.2750	122.275	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.2750	122.280	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2833	122.285	Not used	Not used	Not used	Not allotted	Not used	Not used
122.2917	122.290	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3000	122.300	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.3000	122.305	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3083	122.310	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3167	122.315	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3250	122.325	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.3250	122.330	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3333	122.335	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3417	122.340	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3500	122.350	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.3500	122.355	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3583	122.360	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3667	122.365	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3750	122.375	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.3750	122.380	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3833	122.385	Not used	Not used	Not used	Not allotted	Not used	Not used
122.3917	122.390	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4000	122.400	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.4000	122.405	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4083	122.410	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4167	122.415	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4250	122.425	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.4250	122.430	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4333	122.435	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4417	122.440	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4500	122.450	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.4500	122.455	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4583	122.460	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4667	122.465	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4750	122.475	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.4750	122.480	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4833	122.485	Not used	Not used	Not used	Not allotted	Not used	Not used
122.4917	122.490	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5000	122.500	Not allotted	Not allotted	Not allotted	RLA	Not allotted	Not allotted
122.5000	122.505	Not used	Not used	Not used	RLA	Not used	Not used
122.5083	122.510	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5167	122.515	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5250	122.525	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.5250	122.530	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5333	122.535	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5417	122.540	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5500	122.550	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.5500	122.555	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5583	122.560	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5667	122.565	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5750	122.575	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
122.5750	122.580	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5833	122.585	Not used	Not used	Not used	Not allotted	Not used	Not used
122.5917	122.590	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6000	122.600	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.6000	122.605	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6083	122.610	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6167	122.615	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6250	122.625	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.6250	122.630	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6333	122.635	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6417	122.640	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6500	122.650	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.6500	122.655	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6583	122.660	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6667	122.665	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6750	122.675	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.6750	122.680	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6833	122.685	Not used	Not used	Not used	Not allotted	Not used	Not used
122.6917	122.690	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7000	122.700	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.7000	122.705	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7083	122.710	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7167	122.715	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7250	122.725	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.7250	122.730	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7333	122.735	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7417	122.740	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7500	122.750	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.7500	122.755	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7583	122.760	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7667	122.765	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7750	122.775	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.7750	122.780	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7833	122.785	Not used	Not used	Not used	Not allotted	Not used	Not used
122.7917	122.790	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8000	122.800	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.8000	122.805	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8083	122.810	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8167	122.815	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8250	122.825	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.8250	122.830	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8333	122.835	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8417	122.840	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8500	122.850	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.8500	122.855	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8583	122.860	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8667	122.865	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8750	122.875	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.8750	122.880	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
122.8833	122.885	Not used	Not used	Not used	Not allotted	Not used	Not used
122.8917	122.890	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9000	122.900	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.9000	122.905	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9083	122.910	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9167	122.915	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9250	122.925	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.9250	122.930	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9333	122.935	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9417	122.940	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9500	122.950	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.9500	122.955	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9583	122.960	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9667	122.965	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9750	122.975	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
122.9750	122.980	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9833	122.985	Not used	Not used	Not used	Not allotted	Not used	Not used
122.9917	122.990	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0000	123.000	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.0000	123.005	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0083	123.010	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0167	123.015	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0250	123.025	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.0250	123.030	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0333	123.035	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0417	123.040	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0500	123.050	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.0500	123.055	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0583	123.060	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0667	123.065	Not used	Not used	Not used	Not allotted	Not used	Not used
123.0750	123.075	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.0750	123.080	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.0833	123.085	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.0917	123.090	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.1000	123.100	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.1000	123.105	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.1083	123.110	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.1167	123.115	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.1250	123.125	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
123.1250	123.130	Not used	Not used	Not used	Not allotted	Not used	Not used
123.1333	123.135	Not used	Not used	Not used	Not allotted	Not used	Not used
123.1417	123.140	Not used	Not used	Not used	Not allotted	Not used	Not used
123.1500	123.150	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.1500	123.155	Not used	Not used	Not used	Not allotted	Not used	Not used
123.1583	123.160	Not used	Not used	Not used	Not allotted	Not used	Not used
123.1667	123.165	Not used	Not used	Not used	Not allotted	Not used	Not used
123.1750	123.175	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.1750	123.180	Not used	Not used	Not used	Not allotted	Not used	Not used
123.1833	123.185	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
123.1917	123.190	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2000	123.200	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.2000	123.205	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2083	123.210	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2167	123.215	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2250	123.225	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.2250	123.230	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2333	123.235	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2417	123.240	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2500	123.255	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2500	123.250	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.2583	123.260	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2667	123.265	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2750	123.275	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.2750	123.280	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2833	123.285	Not used	Not used	Not used	Not allotted	Not used	Not used
123.2917	123.290	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3000	123.300	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.3000	123.305	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3083	123.310	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3167	123.315	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3250	123.325	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.3250	123.330	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3333	123.335	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3417	123.340	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3500	123.350	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.3500	123.355	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3583	123.360	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3667	123.365	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3750	123.375	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.3750	123.380	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3833	123.385	Not used	Not used	Not used	Not allotted	Not used	Not used
123.3917	123.390	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4000	123.400	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.4000	123.405	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4083	123.410	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4167	123.415	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4250	123.425	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.4250	123.430	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4333	123.435	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4417	123.440	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4500	123.450	Air-Air	Air-Air	Air-Air	Not allotted	Air-Air	Air-Air
123.4500	123.455	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4583	123.460	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4667	123.465	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4750	123.475	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.4750	123.480	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4833	123.485	Not used	Not used	Not used	Not allotted	Not used	Not used
123.4917	123.490	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
123.5000	123.500	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.5000	123.505	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5083	123.510	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5167	123.515	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5250	123.525	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.5250	123.530	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5333	123.535	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5417	123.540	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5500	123.550	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.5500	123.555	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5583	123.560	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5667	123.565	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5750	123.575	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.5750	123.580	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5833	123.585	Not used	Not used	Not used	Not allotted	Not used	Not used
123.5917	123.590	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6000	123.600	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.6000	123.605	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6083	123.610	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6167	123.615	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6250	123.625	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.6250	123.630	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6333	123.635	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6417	123.640	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6500	123.650	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.6500	123.655	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6583	123.660	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6667	123.665	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6750	123.675	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted	Not allotted
123.6750	123.680	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6833	123.685	Not used	Not used	Not used	Not allotted	Not used	Not used
123.6917	123.690	Not used	Not used	Not used	Not allotted	Not used	Not used
123.7000	123.700	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
123.7000	123.705	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7083	123.710	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7167	123.715	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7250	123.725	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
123.7250	123.730	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7333	123.735	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7417	123.740	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7500	123.750	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
123.7500	123.755	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7583	123.760	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7667	123.765	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7750	123.775	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
123.7750	123.780	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7833	123.785	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.7917	123.790	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8000	123.800	ACC-L	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
123.8000	123.805	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8083	123.810	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8167	123.815	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8250	123.825	ACC-L	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
123.8250	123.830	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8333	123.835	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8417	123.840	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8500	123.850	ACC-L	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
123.8500	123.855	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8583	123.860	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8667	123.865	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8750	123.875	ACC-L	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
123.8750	123.880	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8833	123.885	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.8917	123.890	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9000	123.900	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
123.9000	123.905	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9083	123.910	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9167	123.915	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9250	123.925	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
123.9250	123.930	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9333	123.935	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9417	123.940	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9500	123.950	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
123.9500	123.955	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9583	123.960	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9667	123.965	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9750	123.975	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
123.9750	123.980	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9833	123.985	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
123.9917	123.990	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0000	124.000	APP-I	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.0000	124.005	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0083	124.010	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0167	124.015	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0250	124.025	APP-I	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.0250	124.030	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0333	124.035	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0417	124.040	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0500	124.050	APP-I	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.0500	124.055	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0583	124.060	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0667	124.065	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0750	124.075	APP-I	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.0750	124.080	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0833	124.085	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.0917	124.090	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1000	124.100	Not allotted	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.1000	124.105	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
124.1083	124.110	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1167	124.115	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1250	124.125	Not allotted	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.1250	124.130	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1333	124.135	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1417	124.140	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1500	124.150	Not allotted	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.1500	124.155	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1583	124.160	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1667	124.165	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1750	124.175	Not allotted	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.1750	124.180	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1833	124.185	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.1917	124.190	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2000	124.200	FIS-L	APP-U	ACC	APP, ACC-L	Not allotted	ACC
124.2000	124.205	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2083	124.210	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2167	124.215	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2250	124.225	FIS-L	APP-U	ACC	APP, ACC-L	Not allotted	ACC
124.2250	124.230	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2333	124.235	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2417	124.240	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2500	124.250	FIS-L	APP-U	ACC	APP, ACC-L	Not allotted	ACC
124.2500	124.255	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2583	124.260	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2667	124.265	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2750	124.275	FIS-L	APP-U	ACC	APP, ACC-L	Not allotted	ACC
124.2750	124.280	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2833	124.285	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.2917	124.290	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3000	124.300	APP-I	TWR	ACC	APP, ACC-L	TWR	ACC
124.3000	124.305	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3083	124.310	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3167	124.315	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3250	124.325	APP-I	TWR	ACC	APP, ACC-L	TWR	ACC
124.3250	124.330	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3333	124.335	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3417	124.340	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3500	124.350	APP-I	TWR	ACC	APP, ACC-L	TWR	ACC
124.3500	124.355	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3583	124.360	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3667	124.365	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3750	124.375	APP-I	TWR	ACC	APP, ACC-L	TWR	ACC
124.3750	124.380	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3833	124.385	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.3917	124.390	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4000	124.400	APP-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.4000	124.405	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4083	124.410	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
124.4167	124.415	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4250	124.425	APP-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.4250	124.430	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4333	124.435	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4417	124.440	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4500	124.450	APP-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.4500	124.455	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4583	124.460	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4667	124.465	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4750	124.475	APP-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.4750	124.480	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4833	124.485	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.4917	124.490	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5000	124.500	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
124.5000	124.505	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5083	124.510	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5167	124.515	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5250	124.525	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
124.5250	124.530	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5333	124.535	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5417	124.540	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5500	124.550	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
124.5500	124.555	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5583	124.560	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5667	124.565	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5750	124.575	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
124.5750	124.580	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5833	124.585	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.5917	124.590	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6000	124.600	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.6000	124.605	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6083	124.610	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6167	124.615	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6250	124.625	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.6250	124.630	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6333	124.635	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6417	124.640	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6500	124.650	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.6500	124.655	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6583	124.660	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6667	124.665	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6750	124.675	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.6750	124.680	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6833	124.685	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.6917	124.690	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7000	124.700	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.7000	124.705	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7083	124.710	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7167	124.715	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
124.7250	124.725	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.7250	124.730	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7333	124.735	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7417	124.740	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7500	124.750	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.7500	124.755	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7583	124.760	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7667	124.765	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7750	124.775	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
124.7750	124.780	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7833	124.785	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.7917	124.790	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8000	124.800	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.8000	124.805	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8083	124.810	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8167	124.815	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8250	124.825	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.8250	124.830	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8333	124.835	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8417	124.840	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8500	124.850	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.8500	124.855	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8583	124.860	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8667	124.865	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8750	124.875	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
124.8750	124.880	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8833	124.885	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.8917	124.890	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9000	124.900	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.9000	124.905	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9083	124.910	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9167	124.915	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9250	124.925	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.9250	124.930	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9333	124.935	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9417	124.940	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9500	124.950	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.9500	124.955	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9583	124.960	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9667	124.965	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9750	124.975	APP-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
124.9750	124.980	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9833	124.985	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
124.9917	124.990	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0000	125.000	Not allotted	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.0000	125.005	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0083	125.010	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0167	125.015	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0250	125.025	Not allotted	APP-U	ACC	APP, ACC-L	APP-U	ACC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
125.0250	125.030	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0333	125.035	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0417	125.040	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0500	125.050	Not allotted	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.0500	125.055	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0583	125.060	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0667	125.065	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0750	125.075	Not allotted	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.0750	125.080	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0833	125.085	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.0917	125.090	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1000	125.100	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.1000	125.105	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1083	125.110	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1167	125.115	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1250	125.125	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.1250	125.130	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1333	125.135	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1417	125.140	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1500	125.150	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.1500	125.155	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1583	125.160	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1667	125.165	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1750	125.175	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.1750	125.180	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1833	125.185	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.1917	125.190	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2000	125.200	FIS-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.2000	125.205	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2083	125.210	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2167	125.215	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2250	125.225	FIS-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.2250	125.230	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2333	125.235	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2417	125.240	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2500	125.250	FIS-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.2500	125.255	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2583	125.260	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2667	125.265	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2750	125.275	FIS-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.2750	125.280	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2833	125.285	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.2917	125.290	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3000	125.300	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.3000	125.305	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3083	125.310	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3167	125.315	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3250	125.325	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.3250	125.330	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
125.3333	125.335	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3417	125.340	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3500	125.350	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.3500	125.355	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3583	125.360	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3667	125.365	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3750	125.375	APP-I	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.3750	125.380	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3833	125.385	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.3917	125.390	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4000	125.400	ACC-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.4000	125.405	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4083	125.410	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4167	125.415	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4250	125.425	ACC-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.4250	125.430	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4333	125.435	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4417	125.440	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4500	125.450	ACC-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.4500	125.455	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4583	125.460	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4667	125.465	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4750	125.475	ACC-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.4750	125.480	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4833	125.485	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.4917	125.490	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5000	125.500	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.5000	125.505	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5083	125.510	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5167	125.515	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5250	125.525	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.5250	125.530	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5333	125.535	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5417	125.540	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5500	125.550	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.5500	125.555	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5583	125.560	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5667	125.565	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5750	125.575	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
125.5750	125.580	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5833	125.585	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.5917	125.590	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6000	125.600	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.6000	125.605	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6083	125.610	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6167	125.615	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6250	125.625	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.6250	125.630	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6333	125.635	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
125.6417	125.640	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6500	125.650	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.6500	125.655	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6583	125.660	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6667	125.665	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6750	125.675	ACC-U	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.6750	125.680	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6833	125.685	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.6917	125.690	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7000	125.700	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.7000	125.705	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7083	125.710	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7167	125.715	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7250	125.725	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.7250	125.730	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7333	125.735	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7417	125.740	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7500	125.750	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.7500	125.755	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7583	125.760	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7667	125.765	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7750	125.775	APP-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.7750	125.780	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7833	125.785	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.7917	125.790	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8000	125.800	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.8000	125.805	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8083	125.810	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8167	125.815	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8250	125.825	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.8250	125.830	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8333	125.835	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8417	125.840	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8500	125.850	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.8500	125.855	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8583	125.860	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8667	125.865	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8750	125.875	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
125.8750	125.880	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8833	125.885	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.8917	125.890	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9000	125.900	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.9000	125.905	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9083	125.910	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9167	125.915	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9250	125.925	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.9250	125.930	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9333	125.935	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9417	125.940	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
125.9500	125.950	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.9500	125.955	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9583	125.960	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9667	125.965	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9750	125.975	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
125.9750	125.980	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9833	125.985	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
125.9917	125.990	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0000	126.000	APP-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.0000	126.005	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0083	126.010	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0167	126.015	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0250	126.025	APP-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.0250	126.030	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0333	126.035	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0417	126.040	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0500	126.050	APP-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.0500	126.055	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0583	126.060	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0667	126.065	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0750	126.075	APP-L	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.0750	126.080	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0833	126.085	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.0917	126.090	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1000	126.100	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
126.1000	126.105	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1083	126.110	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1167	126.115	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1250	126.125	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
126.1250	126.130	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1333	126.135	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1417	126.140	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1500	126.150	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
126.1500	126.155	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1583	126.160	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1667	126.165	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1750	126.175	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
126.1750	126.180	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1833	126.185	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.1917	126.190	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2000	126.200	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.2000	126.205	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2083	126.210	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2167	126.215	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2250	126.225	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.2250	126.230	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2333	126.235	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2417	126.240	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2500	126.250	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
126.2500	126.255	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2583	126.260	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2667	126.265	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2750	126.275	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.2750	126.280	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2833	126.285	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.2917	126.290	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3000	126.300	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.3000	126.305	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3083	126.310	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3167	126.315	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3250	126.325	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.3250	126.330	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3333	126.335	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3417	126.340	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3500	126.350	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.3500	126.355	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3583	126.360	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3667	126.365	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3750	126.375	FIS-U (GPS)	APP-U	ACC	APP, ACC-L	APP-U	ACC
126.3750	126.380	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3833	126.385	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.3917	126.390	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4000	126.400	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.4000	126.405	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4083	126.410	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4167	126.415	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4250	126.425	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.4250	126.430	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4333	126.435	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4417	126.440	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4500	126.450	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.4500	126.455	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4583	126.460	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4667	126.465	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4750	126.475	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.4750	126.480	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4833	126.485	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.4917	126.490	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5000	126.500	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
126.5000	126.505	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5083	126.510	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5167	126.515	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5250	126.525	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
126.5250	126.530	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5333	126.535	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5417	126.540	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5500	126.550	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
126.5500	126.555	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
126.5583	126.560	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5667	126.565	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5750	126.575	ACC-U	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
126.5750	126.580	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5833	126.585	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.5917	126.590	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6000	126.600	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.6000	126.605	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6083	126.610	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6167	126.615	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6250	126.625	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.6250	126.630	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6333	126.635	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6417	126.640	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6500	126.650	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.6500	126.655	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6583	126.660	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6667	126.665	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6750	126.675	VOLMET, ATIS	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
126.6750	126.680	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6833	126.685	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.6917	126.690	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7000	126.700	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.7000	126.705	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7083	126.710	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7167	126.715	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7250	126.725	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.7250	126.730	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7333	126.735	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7417	126.740	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7500	126.750	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.7500	126.755	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7583	126.760	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7667	126.765	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7750	126.775	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.7750	126.780	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7833	126.785	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.7917	126.790	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8000	126.800	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
126.8000	126.805	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8083	126.810	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8167	126.815	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8250	126.825	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
126.8250	126.830	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8333	126.835	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8417	126.840	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8500	126.850	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
126.8500	126.855	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8583	126.860	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
126.8667	126.865	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8750	126.875	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
126.8750	126.880	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8833	126.885	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.8917	126.890	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9000	126.900	FIS-U (GPS)	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.9000	126.905	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9083	126.910	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9167	126.915	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9250	126.925	FIS-U (GPS)	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.9250	126.930	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9333	126.935	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9417	126.940	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9500	126.950	FIS-U (GPS)	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.9500	126.955	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9583	126.960	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9667	126.965	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9750	126.975	FIS-U (GPS)	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
126.9750	126.980	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9833	126.985	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
126.9917	126.990	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0000	127.000	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.0000	127.005	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0083	127.010	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0167	127.015	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0250	127.025	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.0250	127.030	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0333	127.035	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0417	127.040	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0500	127.050	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.0500	127.055	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0583	127.060	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0667	127.065	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0750	127.075	VOLMET, ATIS	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.0750	127.080	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0833	127.085	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.0917	127.090	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1000	127.100	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.1000	127.105	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1083	127.110	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1167	127.115	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1250	127.125	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.1250	127.130	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1333	127.135	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1417	127.140	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1500	127.150	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.1500	127.155	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1583	127.160	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1667	127.165	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
127.1750	127.175	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.1750	127.180	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1833	127.185	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.1917	127.190	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2000	127.200	APP-U	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.2000	127.205	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2083	127.210	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2167	127.215	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2250	127.225	APP-U	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.2250	127.230	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2333	127.235	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2417	127.240	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2500	127.250	APP-U	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.2500	127.255	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2583	127.260	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2667	127.265	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2750	127.275	APP-U	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.2750	127.280	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2833	127.285	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.2917	127.290	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3000	127.300	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.3000	127.305	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3083	127.310	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3167	127.315	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3250	127.325	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.3250	127.330	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3333	127.335	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3417	127.340	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3500	127.350	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.3500	127.355	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3583	127.360	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3667	127.365	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3750	127.375	ACC-U	FIS-L, FIS-U	GPS	APP, ACC-L	FIS-L, FIS-U	GPS
127.3750	127.380	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3833	127.385	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.3917	127.390	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4000	127.400	FIS-U (GPS)	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.4000	127.405	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4083	127.410	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4167	127.415	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4250	127.425	FIS-U (GPS)	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.4250	127.430	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4333	127.435	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4417	127.440	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4500	127.450	FIS-U (GPS)	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS
127.4500	127.455	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4583	127.460	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4667	127.465	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4750	127.475	FIS-U (GPS)	VOLMET, ATIS	GPS	APP, ACC-L	VOLMET, ATIS	GPS

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
127.4750	127.480	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4833	127.485	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.4917	127.490	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5000	127.500	FIS-L	ACC-L	GPS	APP, ACC-L	ACC-L	GPS
127.5000	127.505	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5083	127.510	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5167	127.515	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5250	127.525	FIS-L	ACC-L	GPS	APP, ACC-L	ACC-L	GPS
127.5250	127.530	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5333	127.535	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5417	127.540	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5500	127.550	FIS-L	ACC-L	GPS	APP, ACC-L	ACC-L	GPS
127.5500	127.555	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5583	127.560	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5667	127.565	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5750	127.575	FIS-L	ACC-L	GPS	APP, ACC-L	ACC-L	GPS
127.5750	127.580	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5833	127.585	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.5917	127.590	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6000	127.600	VOLMET, ATIS	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.6000	127.605	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6083	127.610	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6167	127.615	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6250	127.625	VOLMET, ATIS	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.6250	127.630	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6333	127.635	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6417	127.640	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6500	127.650	VOLMET, ATIS	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.6500	127.655	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6583	127.660	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6667	127.665	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6750	127.675	VOLMET, ATIS	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.6750	127.680	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6833	127.685	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.6917	127.690	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7000	127.700	ACC-U	APP-L, APP-I	VOLMET, ATIS	APP, ACC-L	APP-L, APP-I	VOLMET, ATIS
127.7000	127.705	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7083	127.710	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7167	127.715	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7250	127.725	ACC-U	APP-L, APP-I	VOLMET, ATIS	APP, ACC-L	APP-L, APP-I	VOLMET, ATIS
127.7250	127.730	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7333	127.735	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7417	127.740	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7500	127.750	ACC-U	APP-L, APP-I	VOLMET, ATIS	APP, ACC-L	APP-L, APP-I	VOLMET, ATIS
127.7500	127.755	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7583	127.760	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7667	127.765	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7750	127.775	ACC-U	APP-L, APP-I	VOLMET, ATIS	APP, ACC-L	APP-L, APP-I	VOLMET, ATIS
127.7750	127.780	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
127.7833	127.785	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.7917	127.790	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8000	127.800	APP-U	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.8000	127.805	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8083	127.810	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8167	127.815	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8250	127.825	APP-U	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.8250	127.830	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8333	127.835	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8417	127.840	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8500	127.850	APP-U	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.8500	127.855	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8583	127.860	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8667	127.865	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8750	127.875	APP-U	VOLMET, ATIS	VOLMET, ATIS	APP, ACC-L	VOLMET, ATIS	VOLMET, ATIS
127.8750	127.880	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8833	127.885	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.8917	127.890	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9000	127.900	Not allotted	APP-L, APP-I	VOLMET, ATIS	APP, ACC-L	APP-L, APP-I	VOLMET, ATIS
127.9000	127.905	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9083	127.910	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9167	127.915	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9250	127.925	Not allotted	APP-L, APP-I	Not allotted	APP, ACC-L	APP-L, APP-I	Not allotted
127.9250	127.930	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9333	127.935	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9417	127.940	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9500	127.950	Not allotted	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
127.9500	127.955	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9583	127.960	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9667	127.965	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9750	127.975	Not allotted	APP-L, APP-I	ACC	APP, ACC-L	APP-L, APP-I	ACC
127.9750	127.980	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9833	127.985	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
127.9917	127.990	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0000	128.000	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.0000	128.005	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0083	128.010	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0167	128.015	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0250	128.025	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.0250	128.030	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0333	128.035	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0417	128.040	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0500	128.050	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.0500	128.055	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0583	128.060	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0667	128.065	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0750	128.075	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.0750	128.080	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.0833	128.085	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
128.0917	128.090	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1000	128.100	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
128.1000	128.105	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1083	128.110	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1167	128.115	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1250	128.125	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
128.1250	128.130	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1333	128.135	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1417	128.140	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1500	128.150	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
128.1500	128.155	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1583	128.160	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1667	128.165	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1750	128.175	ACC-U	ACC-L, ACC-U	ACC	APP, ACC-L	ACC-L, ACC-U	ACC
128.1750	128.180	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1833	128.185	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.1917	128.190	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2000	128.200	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.2000	128.205	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2083	128.210	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2167	128.215	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2250	128.225	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.2250	128.230	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2333	128.235	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2417	128.240	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2500	128.250	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.2500	128.255	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2583	128.260	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2667	128.265	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2750	128.275	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.2750	128.280	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2833	128.285	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.2917	128.290	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3000	128.300	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
128.3000	128.305	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3083	128.310	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3167	128.315	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3250	128.325	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
128.3250	128.330	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3333	128.335	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3417	128.340	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3500	128.350	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
128.3500	128.355	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3583	128.360	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3667	128.365	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3750	128.375	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
128.3750	128.380	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3833	128.385	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.3917	128.390	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
128.4000	128.400	ACC-L	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.4000	128.405	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4083	128.410	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4167	128.415	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4250	128.425	ACC-L	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.4250	128.430	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4333	128.435	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4417	128.440	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4500	128.450	ACC-L	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.4500	128.455	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4583	128.460	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4667	128.465	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4750	128.475	ACC-L	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.4750	128.480	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4833	128.485	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.4917	128.490	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5000	128.500	ACC-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
128.5000	128.505	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5083	128.510	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5167	128.515	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5250	128.525	ACC-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
128.5250	128.530	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5333	128.535	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5417	128.540	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5500	128.550	ACC-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
128.5500	128.555	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5583	128.560	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5667	128.565	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5750	128.575	ACC-U	FIS-L, FIS-U	ACC	APP, ACC-L	FIS-L, FIS-U	ACC
128.5750	128.580	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5833	128.585	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.5917	128.590	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6000	128.600	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.6000	128.605	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6083	128.610	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6167	128.615	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6250	128.625	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.6250	128.630	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6333	128.635	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6417	128.640	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6500	128.650	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.6500	128.655	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6583	128.660	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6667	128.665	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6750	128.675	APP-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.6750	128.680	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6833	128.685	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.6917	128.690	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7000	128.700	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
128.7000	128.705	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7083	128.710	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7167	128.715	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7250	128.725	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
128.7250	128.730	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7333	128.735	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7417	128.740	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7500	128.750	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
128.7500	128.755	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7583	128.760	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7667	128.765	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7750	128.775	ACC-U	ACC-L	ACC	APP, ACC-L	ACC-L	ACC
128.7750	128.780	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7833	128.785	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.7917	128.790	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8000	128.800	ACC-U	VOLMET, ATIS	ACC	APP, ACC-L	VOLMET, ATIS	ACC
128.8000	128.805	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8083	128.810	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8167	128.815	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8250	128.825	ACC-U	VOLMET, ATIS	Not allotted	APP, ACC-L	VOLMET, ATIS	Not allotted
128.8250	128.830	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8333	128.835	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8417	128.840	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8500	128.850	ACC-U	VOLMET, ATIS	APP	APP, ACC-L	VOLMET, ATIS	APP
128.8500	128.855	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8583	128.860	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8667	128.865	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8750	128.875	ACC-U	VOLMET, ATIS	APP	APP, ACC-L	VOLMET, ATIS	APP
128.8750	128.880	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8833	128.885	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.8917	128.890	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9000	128.900	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
128.9000	128.905	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9083	128.910	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9167	128.915	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9250	128.925	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
128.9250	128.930	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9333	128.935	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9417	128.940	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9500	128.950	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
128.9500	128.955	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9583	128.960	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9667	128.965	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9750	128.975	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
128.9750	128.980	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9833	128.985	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
128.9917	128.990	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0000	129.000	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.0000	129.005	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
129.0083	129.010	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0167	129.015	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0250	129.025	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.0250	129.030	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0333	129.035	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0417	129.040	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0500	129.050	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.0500	129.055	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0583	129.060	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0667	129.065	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0750	129.075	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.0750	129.080	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0833	129.085	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.0917	129.090	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1000	129.100	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.1000	129.105	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1083	129.110	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1167	129.115	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1250	129.125	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.1250	129.130	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1333	129.135	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1417	129.140	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1500	129.150	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.1500	129.155	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1583	129.160	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1667	129.165	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1750	129.175	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.1750	129.180	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1833	129.185	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.1917	129.190	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2000	129.200	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.2000	129.205	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2083	129.210	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2167	129.215	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2250	129.225	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.2250	129.230	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2333	129.235	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2417	129.240	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2500	129.250	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.2500	129.255	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2583	129.260	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2667	129.265	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2750	129.275	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.2750	129.280	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2833	129.285	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.2917	129.290	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3000	129.300	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.3000	129.305	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3083	129.310	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
129.3167	129.315	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3250	129.325	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.3250	129.330	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3333	129.335	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3417	129.340	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3500	129.350	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.3500	129.355	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3583	129.360	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3667	129.365	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3750	129.375	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.3750	129.380	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3833	129.385	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.3917	129.390	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4000	129.400	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.4000	129.405	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4083	129.410	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4167	129.415	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4250	129.425	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.4250	129.430	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4333	129.435	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4417	129.440	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4500	129.450	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.4500	129.455	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4583	129.460	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4667	129.465	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4750	129.475	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.4750	129.480	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4833	129.485	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.4917	129.490	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5000	129.500	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.5000	129.505	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5083	129.510	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5167	129.515	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5250	129.525	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.5250	129.530	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5333	129.535	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5417	129.540	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5500	129.550	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.5500	129.555	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5583	129.560	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5667	129.565	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5750	129.575	ACC-U	AOC	APP	APP, ACC-L	AOC	APP
129.5750	129.580	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5833	129.585	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.5917	129.590	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6000	129.600	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.6000	129.605	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6083	129.610	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6167	129.615	Not used	Not used	Not used	APP, ACC-L	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
129.6250	129.625	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.6250	129.630	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6333	129.635	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6417	129.640	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6500	129.650	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.6500	129.655	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6583	129.660	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6667	129.665	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6750	129.675	ACC-L	AOC	APP	APP, ACC-L	AOC	APP
129.6750	129.680	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6833	129.685	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.6917	129.690	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
129.7000	129.700	Not allotted	AOC	APP	Not allotted	AOC	APP
129.7000	129.705	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7083	129.710	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7167	129.715	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7250	129.725	Not allotted	AOC	APP	Not allotted	AOC	APP
129.7250	129.730	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7333	129.735	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7417	129.740	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7500	129.750	Not allotted	AOC	APP	Not allotted	AOC	APP
129.7500	129.755	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7583	129.760	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7667	129.765	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7750	129.775	Not allotted	AOC	APP	Not allotted	AOC	APP
129.7750	129.780	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7833	129.785	Not used	Not used	Not used	Not allotted	Not used	Not used
129.7917	129.790	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8000	129.800	Not allotted	AOC	APP	Not allotted	AOC	APP
129.8000	129.805	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8083	129.810	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8167	129.815	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8250	129.825	Not allotted	AOC	APP	Not allotted	AOC	APP
129.8250	129.830	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8333	129.835	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8417	129.840	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8500	129.850	Not allotted	AOC	APP	Not allotted	AOC	APP
129.8500	129.855	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8583	129.860	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8667	129.865	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8750	129.875	Not allotted	AOC	Not allotted	Not allotted	AOC	Not allotted
129.8750	129.880	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8833	129.885	Not used	Not used	Not used	Not allotted	Not used	Not used
129.8917	129.890	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9000	129.900	Not allotted	AOC	AOC	Not allotted	AOC	AOC
129.9000	129.905	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9083	129.910	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9167	129.915	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9250	129.925	Not allotted	AOC	AOC	Not allotted	AOC	AOC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
129.9250	129.930	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9333	129.935	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9417	129.940	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9500	129.950	Not allotted	AOC	AOC	Not allotted	AOC	AOC
129.9500	129.955	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9583	129.960	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9667	129.965	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9750	129.975	Not allotted	AOC	AOC	Not allotted	AOC	AOC
129.9750	129.980	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9833	129.985	Not used	Not used	Not used	Not allotted	Not used	Not used
129.9917	129.990	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0000	130.000	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.0000	130.005	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0083	130.010	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0167	130.015	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0250	130.025	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.0250	130.030	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0333	130.035	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0417	130.040	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0500	130.050	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.0500	130.055	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0583	130.060	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0667	130.065	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0750	130.075	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.0750	130.080	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0833	130.085	Not used	Not used	Not used	Not allotted	Not used	Not used
130.0917	130.090	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1000	130.100	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.1000	130.105	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1083	130.110	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1167	130.115	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1250	130.125	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.1250	130.130	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1333	130.135	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1417	130.140	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1500	130.150	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.1500	130.155	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1583	130.160	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1667	130.165	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1750	130.175	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.1750	130.180	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1833	130.185	Not used	Not used	Not used	Not allotted	Not used	Not used
130.1917	130.190	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2000	130.200	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.2000	130.205	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2083	130.210	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2167	130.215	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2250	130.225	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.2250	130.230	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
130.2333	130.235	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2417	130.240	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2500	130.250	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.2500	130.255	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2583	130.260	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2667	130.265	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2750	130.275	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.2750	130.280	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2833	130.285	Not used	Not used	Not used	Not allotted	Not used	Not used
130.2917	130.290	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3000	130.300	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.3000	130.305	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3083	130.310	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3167	130.315	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3250	130.325	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.3250	130.330	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3333	130.335	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3417	130.340	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3500	130.350	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.3500	130.355	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3583	130.360	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3667	130.365	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3750	130.375	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.3750	130.380	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3833	130.385	Not used	Not used	Not used	Not allotted	Not used	Not used
130.3917	130.390	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4000	130.400	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.4000	130.405	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4083	130.410	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4167	130.415	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4250	130.425	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.4250	130.430	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4333	130.435	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4417	130.440	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4500	130.450	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.4500	130.455	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4583	130.460	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4667	130.465	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4750	130.475	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.4750	130.480	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4833	130.485	Not used	Not used	Not used	Not allotted	Not used	Not used
130.4917	130.490	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5000	130.500	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.5000	130.505	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5083	130.510	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5167	130.515	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5250	130.525	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.5250	130.530	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5333	130.535	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
130.5417	130.540	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5500	130.550	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.5500	130.555	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5583	130.560	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5667	130.565	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5750	130.575	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.5750	130.580	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5833	130.585	Not used	Not used	Not used	Not allotted	Not used	Not used
130.5917	130.590	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6000	130.600	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.6000	130.605	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6083	130.610	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6167	130.615	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6250	130.625	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.6250	130.630	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6333	130.635	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6417	130.640	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6500	130.650	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.6500	130.655	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6583	130.660	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6667	130.665	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6750	130.675	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.6750	130.680	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6833	130.685	Not used	Not used	Not used	Not allotted	Not used	Not used
130.6917	130.690	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7000	130.700	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.7000	130.705	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7083	130.710	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7167	130.715	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7250	130.725	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.7250	130.730	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7333	130.735	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7417	130.740	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7500	130.750	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.7500	130.755	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7583	130.760	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7667	130.765	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7750	130.775	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.7750	130.780	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7833	130.785	Not used	Not used	Not used	Not allotted	Not used	Not used
130.7917	130.790	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8000	130.800	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.8000	130.805	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8083	130.810	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8167	130.815	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8250	130.825	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.8250	130.830	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8333	130.835	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8417	130.840	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
130.8500	130.850	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.8500	130.855	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8583	130.860	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8667	130.865	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8750	130.875	Not allotted	AOC	AOC	Not allotted	AOC	AOC
130.8750	130.880	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8833	130.885	Not used	Not used	Not used	Not allotted	Not used	Not used
130.8917	130.890	Not used	Not used	Not used	Not allotted	Not used	Not used
130.9000	130.900	ACC-U	AOC	AOC	APP, ACC-L	AOC	AOC
130.9000	130.905	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9083	130.910	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9167	130.915	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9250	130.925	ACC-U	AOC	AOC	APP, ACC-L	AOC	AOC
130.9250	130.930	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9333	130.935	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9417	130.940	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9500	130.950	ACC-U	AOC	AOC	APP, ACC-L	AOC	AOC
130.9500	130.955	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9583	130.960	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9667	130.965	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9750	130.975	ACC-U	AOC	AOC	APP, ACC-L	AOC	AOC
130.9750	130.980	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9833	130.985	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
130.9917	130.990	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0000	131.000	Not allotted	AOC	AOC	APP, ACC-L	AOC	AOC
131.0000	131.005	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0083	131.010	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0167	131.015	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0250	131.025	Not allotted	AOC	AOC	APP, ACC-L	AOC	AOC
131.0250	131.030	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0333	131.035	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0417	131.040	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0500	131.050	Not allotted	AOC	AOC	APP, ACC-L	AOC	AOC
131.0500	131.055	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0583	131.060	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0667	131.065	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0750	131.075	Not allotted	AOC	AOC	APP, ACC-L	AOC	AOC
131.0750	131.080	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0833	131.085	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.0917	131.090	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1000	131.100	FIS-L	AOC	AOC	APP, ACC-L	AOC	AOC
131.1000	131.105	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1083	131.110	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1167	131.115	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1250	131.125	FIS-L	AOC	AOC	APP, ACC-L	AOC	AOC
131.1250	131.130	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1333	131.135	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1417	131.140	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1500	131.150	FIS-L	AOC	AOC	APP, ACC-L	AOC	AOC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
131.1500	131.155	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1583	131.160	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1667	131.165	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1750	131.175	FIS-L	AOC	AOC	APP, ACC-L	AOC	AOC
131.1750	131.180	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1833	131.185	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.1917	131.190	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2000	131.200	ACC-L	AOC	AOC	APP, ACC-L	AOC	AOC
131.2000	131.205	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2083	131.210	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2167	131.215	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2250	131.225	ACC-L	AOC	AOC	APP, ACC-L	AOC	AOC
131.2250	131.230	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2333	131.235	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2417	131.240	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2500	131.250	ACC-L	AOC	AOC	APP, ACC-L	AOC	AOC
131.2500	131.255	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2583	131.260	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2667	131.265	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2750	131.275	ACC-L	AOC	AOC	APP, ACC-L	AOC	AOC
131.2750	131.280	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2833	131.285	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.2917	131.290	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3000	131.300	FIS-U (GPS)	AOC	AOC	APP, ACC-L	AOC	AOC
131.3000	131.305	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3083	131.310	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3167	131.315	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3250	131.325	FIS-U (GPS)	AOC	AOC	APP, ACC-L	AOC	AOC
131.3250	131.330	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3333	131.335	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3417	131.340	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3500	131.350	FIS-U (GPS)	AOC	AOC	APP, ACC-L	AOC	AOC
131.3500	131.355	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3583	131.360	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3667	131.365	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3750	131.375	FIS-U (GPS)	AOC	AOC	APP, ACC-L	AOC	AOC
131.3750	131.380	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3833	131.385	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.3917	131.390	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
131.4000	131.400	AOC	AOC	AOC	AOC	AOC	AOC
131.4000	131.405	Not used	Not used	Not used	AOC	Not used	Not used
131.4083	131.410	Not used	Not used	Not used	AOC	Not used	Not used
131.4167	131.415	Not used	Not used	Not used	AOC	Not used	Not used
131.4250	131.425	AOC	AOC	AOC	AOC	AOC	AOC
131.4250	131.430	Not used	Not used	Not used	AOC	Not used	Not used
131.4333	131.435	Not used	Not used	Not used	AOC	Not used	Not used
131.4417	131.440	Not used	Not used	Not used	AOC	Not used	Not used
131.4500	131.450	AOC	AOC	AOC	AOC	AOC	AOC
131.4500	131.455	Not used	Not used	Not used	AOC	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
131.4583	131.460	Not used	Not used	Not used	AOC	Not used	Not used
131.4667	131.465	Not used	Not used	Not used	AOC	Not used	Not used
131.4750	131.475	AOC	AOC	AOC	AOC	AOC	AOC
131.4750	131.480	Not used	Not used	Not used	AOC	Not used	Not used
131.4833	131.485	Not used	Not used	Not used	AOC	Not used	Not used
131.4917	131.490	Not used	Not used	Not used	AOC	Not used	Not used
131.5000	131.500	AOC	AOC	AOC	AOC	AOC	AOC
131.5000	131.505	Not used	Not used	Not used	Blocked	Not used	Not used
131.5083	131.510	Not used	Not used	Not used	Blocked	Not used	Not used
131.5167	131.515	Not used	Not used	Not used	Blocked	Not used	Not used
131.5250	131.525	AOC	AOC	AOC	AOC	AOC	AOC
131.5250	131.530	Not used	Not used	Not used	Blocked	Not used	Not used
131.5333	131.535	Not used	Not used	Not used	Blocked	Not used	Not used
131.5417	131.540	Not used	Not used	Not used	Blocked	Not used	Not used
131.5500	131.550	AOC	AOC	AOC	AOC	AOC	AOC
131.5500	131.555	Not used	Not used	Not used	AOC	Not used	Not used
131.5583	131.560	Not used	Not used	Not used	AOC	Not used	Not used
131.5667	131.565	Not used	Not used	Not used	AOC	Not used	Not used
131.5750	131.575	AOC	AOC	AOC	AOC	AOC	AOC
131.5750	131.580	Not used	Not used	Not used	AOC	Not used	Not used
131.5833	131.585	Not used	Not used	Not used	AOC	Not used	Not used
131.5917	131.590	Not used	Not used	Not used	AOC	Not used	Not used
131.6000	131.600	AOC	AOC	AOC	AOC	AOC	AOC
131.6000	131.605	Not used	Not used	Not used	AOC	Not used	Not used
131.6083	131.610	Not used	Not used	Not used	AOC	Not used	Not used
131.6167	131.615	Not used	Not used	Not used	AOC	Not used	Not used
131.6250	131.625	AOC	AOC	AOC	AOC	AOC	AOC
131.6250	131.630	Not used	Not used	Not used	AOC	Not used	Not used
131.6333	131.635	Not used	Not used	Not used	AOC	Not used	Not used
131.6417	131.640	Not used	Not used	Not used	AOC	Not used	Not used
131.6500	131.650	AOC	AOC	AOC	AOC	AOC	AOC
131.6500	131.655	Not used	Not used	Not used	AOC	Not used	Not used
131.6583	131.660	Not used	Not used	Not used	AOC	Not used	Not used
131.6667	131.665	Not used	Not used	Not used	AOC	Not used	Not used
131.6750	131.675	AOC	AOC	AOC	AOC	AOC	AOC
131.6750	131.680	Not used	Not used	Not used	AOC	Not used	Not used
131.6833	131.685	Not used	Not used	Not used	AOC	Not used	Not used
131.6917	131.690	Not used	Not used	Not used	AOC	Not used	Not used
131.7000	131.700	AOC	AOC	AOC	AOC	AOC	AOC
131.7000	131.705	Not used	Not used	Not used	Blocked	Not used	Not used
131.7083	131.710	Not used	Not used	Not used	Blocked	Not used	Not used
131.7167	131.715	Not used	Not used	Not used	Blocked	Not used	Not used
131.7250	131.725	AOC	AOC	AOC	AOC	AOC	AOC
131.7250	131.730	Not used	Not used	Not used	Blocked	Not used	Not used
131.7333	131.735	Not used	Not used	Not used	Blocked	Not used	Not used
131.7417	131.740	Not used	Not used	Not used	Blocked	Not used	Not used
131.7500	131.750	AOC	AOC	AOC	AOC	AOC	AOC
131.7500	131.755	Not used	Not used	Not used	Blocked	Not used	Not used
131.7583	131.760	Not used	Not used	Not used	Blocked	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
131.7667	131.765	Not used	Not used	Not used	Blocked	Not used	Not used
131.7750	131.775	AOC	AOC	AOC	AOC	AOC	AOC
131.7750	131.780	Not used	Not used	Not used	Blocked	Not used	Not used
131.7833	131.785	Not used	Not used	Not used	Blocked	Not used	Not used
131.7917	131.790	Not used	Not used	Not used	Blocked	Not used	Not used
131.8000	131.800	AOC	AOC	AOC	AOC	AOC	AOC
131.8000	131.805	Not used	Not used	Not used	Blocked	Not used	Not used
131.8083	131.810	Not used	Not used	Not used	Blocked	Not used	Not used
131.8167	131.815	Not used	Not used	Not used	Blocked	Not used	Not used
131.8250	131.825	AOC	AOC	AOC	AOC	AOC	AOC
131.8250	131.830	Not used	Not used	Not used	Blocked	Not used	Not used
131.8333	131.835	Not used	Not used	Not used	Blocked	Not used	Not used
131.8417	131.840	Not used	Not used	Not used	Blocked	Not used	Not used
131.8500	131.850	AOC	AOC	AOC	AOC	AOC	AOC
131.8500	131.855	Not used	Not used	Not used	AOC	Not used	Not used
131.8583	131.860	Not used	Not used	Not used	AOC	Not used	Not used
131.8667	131.865	Not used	Not used	Not used	AOC	Not used	Not used
131.8750	131.875	AOC	AOC	AOC	AOC	AOC	AOC
131.8750	131.880	Not used	Not used	Not used	AOC	Not used	Not used
131.8833	131.885	Not used	Not used	Not used	AOC	Not used	Not used
131.8917	131.890	Not used	Not used	Not used	AOC	Not used	Not used
131.9000	131.900	AOC	AOC	AOC	AOC	AOC	AOC
131.9000	131.905	Not used	Not used	Not used	AOC	Not used	Not used
131.9083	131.910	Not used	Not used	Not used	AOC	Not used	Not used
131.9167	131.915	Not used	Not used	Not used	AOC	Not used	Not used
131.9250	131.925	AOC	AOC	AOC	AOC	AOC	AOC
131.9250	131.930	Not used	Not used	Not used	AOC	Not used	Not used
131.9333	131.935	Not used	Not used	Not used	AOC	Not used	Not used
131.9417	131.940	Not used	Not used	Not used	AOC	Not used	Not used
131.9500	131.950	AOC	AOC	AOC	AOC	AOC	AOC
131.9500	131.955	Not used	Not used	Not used	AOC	Not used	Not used
131.9583	131.960	Not used	Not used	Not used	AOC	Not used	Not used
131.9667	131.965	Not used	Not used	Not used	AOC	Not used	Not used
131.9750	131.975	AOC	AOC	AOC	AOC	AOC	AOC
131.9750	131.980	Not used	Not used	Not used	AOC	Not used	Not used
131.9833	131.985	Not used	Not used	Not used	AOC	Not used	Not used
131.9917	131.990	Not used	Not used	Not used	AOC	Not used	Not used
132.0000	132.000	Not allotted	AOC	AOC	ACC-U	AOC	AOC
132.0000	132.005	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0083	132.010	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0167	132.015	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0250	132.025	Not allotted	AOC	AOC	ACC-U	AOC	AOC
132.0250	132.030	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0333	132.035	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0417	132.040	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0500	132.050	Not allotted	Not allotted	VOLMET, ATIS	ACC-U	Not allotted	VOLMET, ATIS
132.0500	132.055	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0583	132.060	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0667	132.065	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
132.0750	132.075	Not allotted	Not allotted	VOLMET, ATIS	ACC-U	Not allotted	VOLMET, ATIS
132.0750	132.080	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0833	132.085	Not used	Not used	Not used	ACC-U	Not used	Not used
132.0917	132.090	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1000	132.100	ACC-U	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.1000	132.105	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1083	132.110	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1167	132.115	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1250	132.125	ACC-U	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.1250	132.130	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1333	132.135	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1417	132.140	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1500	132.150	ACC-U	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.1500	132.155	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1583	132.160	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1667	132.165	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1750	132.175	ACC-U	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.1750	132.180	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1833	132.185	Not used	Not used	Not used	ACC-U	Not used	Not used
132.1917	132.190	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2000	132.200	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.2000	132.205	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2083	132.210	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2167	132.215	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2250	132.225	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.2250	132.230	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2333	132.235	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2417	132.240	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2500	132.250	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.2500	132.255	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2583	132.260	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2667	132.265	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2750	132.275	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.2750	132.280	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2833	132.285	Not used	Not used	Not used	ACC-U	Not used	Not used
132.2917	132.290	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3000	132.300	FIS-U (GPS)	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.3000	132.305	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3083	132.310	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3167	132.315	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3250	132.325	FIS-U (GPS)	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.3250	132.330	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3333	132.335	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3417	132.340	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3500	132.350	FIS-U (GPS)	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.3500	132.355	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3583	132.360	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3667	132.365	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3750	132.375	FIS-U (GPS)	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
132.3750	132.380	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3833	132.385	Not used	Not used	Not used	ACC-U	Not used	Not used
132.3917	132.390	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4000	132.400	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.4000	132.405	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4083	132.410	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4167	132.415	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4250	132.425	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.4250	132.430	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4333	132.435	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4417	132.440	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4500	132.450	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.4500	132.455	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4583	132.460	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4667	132.465	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4750	132.475	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.4750	132.480	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4833	132.485	Not used	Not used	Not used	ACC-U	Not used	Not used
132.4917	132.490	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5000	132.500	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.5000	132.505	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5083	132.510	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5167	132.515	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5250	132.525	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.5250	132.530	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5333	132.535	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5417	132.540	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5500	132.550	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.5500	132.555	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5583	132.560	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5667	132.565	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5750	132.575	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.5750	132.580	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5833	132.585	Not used	Not used	Not used	ACC-U	Not used	Not used
132.5917	132.590	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6000	132.600	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.6000	132.605	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6083	132.610	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6167	132.615	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6250	132.625	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.6250	132.630	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6333	132.635	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6417	132.640	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6500	132.650	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.6500	132.655	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6583	132.660	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6667	132.665	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6750	132.675	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.6750	132.680	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
132.6833	132.685	Not used	Not used	Not used	ACC-U	Not used	Not used
132.6917	132.690	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7000	132.700	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.7000	132.705	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7083	132.710	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7167	132.715	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7250	132.725	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.7250	132.730	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7333	132.735	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7417	132.740	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7500	132.750	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.7500	132.755	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7583	132.760	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7667	132.765	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7750	132.775	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.7750	132.780	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7833	132.785	Not used	Not used	Not used	ACC-U	Not used	Not used
132.7917	132.790	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8000	132.800	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.8000	132.805	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8083	132.810	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8167	132.815	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8250	132.825	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.8250	132.830	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8333	132.835	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8417	132.840	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8500	132.850	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.8500	132.855	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8583	132.860	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8667	132.865	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8750	132.875	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.8750	132.880	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8833	132.885	Not used	Not used	Not used	ACC-U	Not used	Not used
132.8917	132.890	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9000	132.900	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.9000	132.905	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9083	132.910	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9167	132.915	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9250	132.925	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.9250	132.930	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9333	132.935	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9417	132.940	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9500	132.950	Not allotted	ACC-L, ACC-U	VOLMET, ATIS	ACC-U	ACC-L, ACC-U	VOLMET, ATIS
132.9500	132.955	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9583	132.960	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9667	132.965	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9750	132.975	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
132.9750	132.980	Not used	Not used	Not used	ACC-U	Not used	Not used
132.9833	132.985	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
132.9917	132.990	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0000	133.000	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.0000	133.005	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0083	133.010	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0167	133.015	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0250	133.025	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.0250	133.030	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0333	133.035	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0417	133.040	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0500	133.050	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.0500	133.055	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0583	133.060	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0667	133.065	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0750	133.075	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.0750	133.080	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0833	133.085	Not used	Not used	Not used	ACC-U	Not used	Not used
133.0917	133.090	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1000	133.100	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.1000	133.105	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1083	133.110	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1167	133.115	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1250	133.125	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.1250	133.130	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1333	133.135	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1417	133.140	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1500	133.150	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.1500	133.155	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1583	133.160	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1667	133.165	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1750	133.175	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.1750	133.180	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1833	133.185	Not used	Not used	Not used	ACC-U	Not used	Not used
133.1917	133.190	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2000	133.200	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.2000	133.205	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2083	133.210	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2167	133.215	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2250	133.225	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.2250	133.230	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2333	133.235	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2417	133.240	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2500	133.250	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.2500	133.255	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2583	133.260	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2667	133.265	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2750	133.275	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.2750	133.280	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2833	133.285	Not used	Not used	Not used	ACC-U	Not used	Not used
133.2917	133.290	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
133.3000	133.300	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.3000	133.305	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3083	133.310	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3167	133.315	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3250	133.325	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.3250	133.330	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3333	133.335	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3417	133.340	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3500	133.350	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.3500	133.355	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3583	133.360	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3667	133.365	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3750	133.375	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.3750	133.380	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3833	133.385	Not used	Not used	Not used	ACC-U	Not used	Not used
133.3917	133.390	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4000	133.400	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.4000	133.405	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4083	133.410	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4167	133.415	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4250	133.425	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.4250	133.430	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4333	133.435	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4417	133.440	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4500	133.450	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.4500	133.455	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4583	133.460	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4667	133.465	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4750	133.475	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.4750	133.480	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4833	133.485	Not used	Not used	Not used	ACC-U	Not used	Not used
133.4917	133.490	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5000	133.500	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.5000	133.505	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5083	133.510	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5167	133.515	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5250	133.525	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.5250	133.530	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5333	133.535	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5417	133.540	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5500	133.550	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.5500	133.555	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5583	133.560	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5667	133.565	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5750	133.575	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.5750	133.580	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5833	133.585	Not used	Not used	Not used	ACC-U	Not used	Not used
133.5917	133.590	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6000	133.600	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
133.6000	133.605	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6083	133.610	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6167	133.615	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6250	133.625	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.6250	133.630	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6333	133.635	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6417	133.640	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6500	133.650	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.6500	133.655	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6583	133.660	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6667	133.665	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6750	133.675	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.6750	133.680	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6833	133.685	Not used	Not used	Not used	ACC-U	Not used	Not used
133.6917	133.690	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7000	133.700	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.7000	133.705	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7083	133.710	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7167	133.715	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7250	133.725	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.7250	133.730	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7333	133.735	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7417	133.740	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7500	133.750	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.7500	133.755	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7583	133.760	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7667	133.765	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7750	133.775	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.7750	133.780	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7833	133.785	Not used	Not used	Not used	ACC-U	Not used	Not used
133.7917	133.790	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8000	133.800	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.8000	133.805	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8083	133.810	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8167	133.815	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8250	133.825	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.8250	133.830	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8333	133.835	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8417	133.840	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8500	133.850	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.8500	133.855	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8583	133.860	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8667	133.865	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8750	133.875	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.8750	133.880	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8833	133.885	Not used	Not used	Not used	ACC-U	Not used	Not used
133.8917	133.890	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9000	133.900	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.9000	133.905	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
133.9083	133.910	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9167	133.915	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9250	133.925	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.9250	133.930	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9333	133.935	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9417	133.940	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9500	133.950	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.9500	133.955	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9583	133.960	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9667	133.965	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9750	133.975	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
133.9750	133.980	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9833	133.985	Not used	Not used	Not used	ACC-U	Not used	Not used
133.9917	133.990	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0000	134.000	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.0000	134.005	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0083	134.010	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0167	134.015	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0250	134.025	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.0250	134.030	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0333	134.035	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0417	134.040	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0500	134.050	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.0500	134.055	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0583	134.060	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0667	134.065	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0750	134.075	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.0750	134.080	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0833	134.085	Not used	Not used	Not used	ACC-U	Not used	Not used
134.0917	134.090	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1000	134.100	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.1000	134.105	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1083	134.110	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1167	134.115	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1250	134.125	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.1250	134.130	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1333	134.135	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1417	134.140	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1500	134.150	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.1500	134.155	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1583	134.160	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1667	134.165	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1750	134.175	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.1750	134.180	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1833	134.185	Not used	Not used	Not used	ACC-U	Not used	Not used
134.1917	134.190	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2000	134.200	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.2000	134.205	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2083	134.210	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
134.2167	134.215	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2250	134.225	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.2250	134.230	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2333	134.235	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2417	134.240	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2500	134.250	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.2500	134.255	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2583	134.260	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2667	134.265	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2750	134.275	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.2750	134.280	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2833	134.285	Not used	Not used	Not used	ACC-U	Not used	Not used
134.2917	134.290	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3000	134.300	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.3000	134.305	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3083	134.310	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3167	134.315	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3250	134.325	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.3250	134.330	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3333	134.335	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3417	134.340	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3500	134.350	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.3500	134.355	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3583	134.360	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3667	134.365	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3750	134.375	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.3750	134.380	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3833	134.385	Not used	Not used	Not used	ACC-U	Not used	Not used
134.3917	134.390	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4000	134.400	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.4000	134.405	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4083	134.410	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4167	134.415	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4250	134.425	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.4250	134.430	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4333	134.435	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4417	134.440	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4500	134.450	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.4500	134.455	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4583	134.460	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4667	134.465	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4750	134.475	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.4750	134.480	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4833	134.485	Not used	Not used	Not used	ACC-U	Not used	Not used
134.4917	134.490	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5000	134.500	Not allotted	ACC-L, ACC-U	ACC	ACC-U	ACC-L, ACC-U	ACC
134.5000	134.505	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5083	134.510	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5167	134.515	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
134.5250	134.525	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
134.5250	134.530	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5333	134.535	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5417	134.540	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5500	134.550	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
134.5500	134.555	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5583	134.560	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5667	134.565	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5750	134.575	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
134.5750	134.580	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5833	134.585	Not used	Not used	Not used	ACC-U	Not used	Not used
134.5917	134.590	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6000	134.600	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.6000	134.605	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6083	134.610	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6167	134.615	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6250	134.625	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.6250	134.630	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6333	134.635	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6417	134.640	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6500	134.650	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.6500	134.655	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6583	134.660	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6667	134.665	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6750	134.675	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.6750	134.680	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6833	134.685	Not used	Not used	Not used	ACC-U	Not used	Not used
134.6917	134.690	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7000	134.700	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.7000	134.705	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7083	134.710	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7167	134.715	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7250	134.725	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.7250	134.730	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7333	134.735	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7417	134.740	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7500	134.750	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.7500	134.755	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7583	134.760	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7667	134.765	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7750	134.775	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.7750	134.780	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7833	134.785	Not used	Not used	Not used	ACC-U	Not used	Not used
134.7917	134.790	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8000	134.800	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.8000	134.805	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8083	134.810	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8167	134.815	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8250	134.825	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
134.8250	134.830	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8333	134.835	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8417	134.840	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8500	134.850	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.8500	134.855	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8583	134.860	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8667	134.865	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8750	134.875	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.8750	134.880	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8833	134.885	Not used	Not used	Not used	ACC-U	Not used	Not used
134.8917	134.890	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9000	134.900	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.9000	134.905	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9083	134.910	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9167	134.915	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9250	134.925	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.9250	134.930	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9333	134.935	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9417	134.940	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9500	134.950	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.9500	134.955	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9583	134.960	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9667	134.965	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9750	134.975	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
134.9750	134.980	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9833	134.985	Not used	Not used	Not used	ACC-U	Not used	Not used
134.9917	134.990	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0000	135.000	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.0000	135.005	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0083	135.010	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0167	135.015	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0250	135.025	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.0250	135.030	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0333	135.035	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0417	135.040	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0500	135.050	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.0500	135.055	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0583	135.060	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0667	135.065	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0750	135.075	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.0750	135.080	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0833	135.085	Not used	Not used	Not used	ACC-U	Not used	Not used
135.0917	135.090	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1000	135.100	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.1000	135.105	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1083	135.110	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1167	135.115	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1250	135.125	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.1250	135.130	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
135.1333	135.135	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1417	135.140	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1500	135.150	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.1500	135.155	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1583	135.160	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1667	135.165	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1750	135.175	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.1750	135.180	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1833	135.185	Not used	Not used	Not used	ACC-U	Not used	Not used
135.1917	135.190	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2000	135.200	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.2000	135.205	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2083	135.210	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2167	135.215	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2250	135.225	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.2250	135.230	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2333	135.235	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2417	135.240	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2500	135.250	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.2500	135.255	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2583	135.260	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2667	135.265	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2750	135.275	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.2750	135.280	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2833	135.285	Not used	Not used	Not used	ACC-U	Not used	Not used
135.2917	135.290	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3000	135.300	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.3000	135.305	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3083	135.310	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3167	135.315	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3250	135.325	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.3250	135.330	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3333	135.335	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3417	135.340	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3500	135.350	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.3500	135.355	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3583	135.360	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3667	135.365	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3750	135.375	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.3750	135.380	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3833	135.385	Not used	Not used	Not used	ACC-U	Not used	Not used
135.3917	135.390	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4000	135.400	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.4000	135.405	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4083	135.410	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4167	135.415	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4250	135.425	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.4250	135.430	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4333	135.435	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
135.4417	135.440	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4500	135.450	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.4500	135.455	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4583	135.460	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4667	135.465	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4750	135.475	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.4750	135.480	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4833	135.485	Not used	Not used	Not used	ACC-U	Not used	Not used
135.4917	135.490	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5000	135.500	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.5000	135.505	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5083	135.510	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5167	135.515	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5250	135.525	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.5250	135.530	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5333	135.535	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5417	135.540	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5500	135.550	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.5500	135.555	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5583	135.560	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5667	135.565	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5750	135.575	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.5750	135.580	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5833	135.585	Not used	Not used	Not used	ACC-U	Not used	Not used
135.5917	135.590	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6000	135.600	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.6000	135.605	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6083	135.610	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6167	135.615	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6250	135.625	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.6250	135.630	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6333	135.635	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6417	135.640	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6500	135.650	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.6500	135.655	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6583	135.660	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6667	135.665	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6750	135.675	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.6750	135.680	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6833	135.685	Not used	Not used	Not used	ACC-U	Not used	Not used
135.6917	135.690	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7000	135.700	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.7000	135.705	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7083	135.710	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7167	135.715	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7250	135.725	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.7250	135.730	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7333	135.735	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7417	135.740	Not used	Not used	Not used	ACC-U	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
135.7500	135.750	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.7500	135.755	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7583	135.760	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7667	135.765	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7750	135.775	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.7750	135.780	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7833	135.785	Not used	Not used	Not used	ACC-U	Not used	Not used
135.7917	135.790	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8000	135.800	Not allotted	FIS-U (GPS)	ACC	ACC-U	FIS-U (GPS)	ACC
135.8000	135.805	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8083	135.810	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8167	135.815	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8250	135.825	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
135.8250	135.830	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8333	135.835	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8417	135.840	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8500	135.850	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
135.8500	135.855	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8583	135.860	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8667	135.865	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8750	135.875	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
135.8750	135.880	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8833	135.885	Not used	Not used	Not used	ACC-U	Not used	Not used
135.8917	135.890	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9000	135.900	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
135.9000	135.905	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9083	135.910	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9167	135.915	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9250	135.925	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
135.9250	135.930	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9333	135.935	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9417	135.940	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9500	135.950	Not allotted	Not allotted	ACC	ACC-U	Not allotted	ACC
135.9500	135.955	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9583	135.960	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9667	135.965	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9750	135.975	Not allotted	Not allotted	Not allotted	ACC-U	Not allotted	Not allotted
135.9750	135.980	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9833	135.985	Not used	Not used	Not used	ACC-U	Not used	Not used
135.9917	135.990	Not used	Not used	Not used	ACC-U	Not used	Not used
136.0000	136.000	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.0000	136.005	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0083	136.010	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0167	136.015	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0250	136.025	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.0250	136.030	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0333	136.035	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0417	136.040	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0500	136.050	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
136.0500	136.055	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0583	136.060	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0667	136.065	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0750	136.075	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.0750	136.080	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0833	136.085	Not used	Not used	Not used	Not allotted	Not used	Not used
136.0917	136.090	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1000	136.100	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.1000	136.105	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1083	136.110	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1167	136.115	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1250	136.125	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.1250	136.130	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1333	136.135	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1417	136.140	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1500	136.150	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.1500	136.155	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1583	136.160	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1667	136.165	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1750	136.175	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.1750	136.180	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1833	136.185	Not used	Not used	Not used	Not allotted	Not used	Not used
136.1917	136.190	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2000	136.200	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.2000	136.205	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2083	136.210	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2167	136.215	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2250	136.225	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.2250	136.230	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2333	136.235	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2417	136.240	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2500	136.250	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.2500	136.255	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2583	136.260	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2667	136.265	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2750	136.275	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.2750	136.280	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2833	136.285	Not used	Not used	Not used	Not allotted	Not used	Not used
136.2917	136.290	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3000	136.300	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.3000	136.305	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3083	136.310	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3167	136.315	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3250	136.325	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.3250	136.330	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3333	136.335	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3417	136.340	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3500	136.350	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.3500	136.355	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
136.3583	136.360	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3667	136.365	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3750	136.375	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.3750	136.380	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3833	136.385	Not used	Not used	Not used	Not allotted	Not used	Not used
136.3917	136.390	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4000	136.400	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.4000	136.405	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4083	136.410	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4167	136.415	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4250	136.425	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.4250	136.430	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4333	136.435	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4417	136.440	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4500	136.450	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.4500	136.455	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4583	136.460	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4667	136.465	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4750	136.475	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.4750	136.480	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4833	136.485	Not used	Not used	Not used	Not allotted	Not used	Not used
136.4917	136.490	Not used	Not used	Not used	Not allotted	Not used	Not used
136.5000	136.500	Not allotted	VDL	Not allotted	Not allotted	Not allotted	Not allotted
136.5000	136.505	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5083	136.510	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5167	136.515	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5250	136.525	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.5250	136.530	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5333	136.535	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5417	136.540	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5500	136.550	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.5500	136.555	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5583	136.560	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5667	136.565	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5750	136.575	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.5750	136.580	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5833	136.585	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.5917	136.590	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6000	136.600	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.6000	136.605	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6083	136.610	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6167	136.615	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6250	136.625	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.6250	136.630	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6333	136.635	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6417	136.640	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6500	136.650	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.6500	136.655	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6583	136.660	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
136.6667	136.665	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6750	136.675	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.6750	136.680	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6833	136.685	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.6917	136.690	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7000	136.700	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.7000	136.705	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7083	136.710	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7167	136.715	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7250	136.725	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.7250	136.730	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7333	136.735	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7417	136.740	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7500	136.750	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.7500	136.755	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7583	136.760	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7667	136.765	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7750	136.775	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.7750	136.780	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7833	136.785	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.7917	136.790	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8000	136.800	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.8000	136.805	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8083	136.810	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8167	136.815	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8250	136.825	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.8250	136.830	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8333	136.835	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8417	136.840	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8500	136.850	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.8500	136.855	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8583	136.860	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8667	136.865	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8750	136.875	Not allotted	VDL	Not allotted	VDL	Not allotted	Not allotted
136.8750	136.880	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8833	136.885	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.8917	136.890	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9000	136.900	VDL	VDL	VDL	VDL	VDL	VDL
136.9000	136.905	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9083	136.910	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9167	136.915	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9250	136.925	VDL	VDL	VDL	VDL	VDL	VDL
136.9250	136.930	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9333	136.935	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9417	136.940	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9500	136.950	VDL	VDL	VDL	VDL	VDL	VDL
136.9500	136.955	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9583	136.960	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9667	136.965	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
136.9750	136.975	VDL	VDL	VDL	VDL	VDL	VDL
136.9750	136.980	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9833	136.985	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
136.9917	136.990	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked
137.0000	137.000	Blocked	Blocked	Blocked	Blocked	Blocked	Blocked

CNS/ATM Implementation Planning Matrix

(Updated in July 2011)

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
AFGHANISTAN									
AUSTRALIA	ATN tests were conducted. BIS Router and Backbone BIS Router and AMHS implemented.	AFTN based AIDC Implemented between Brisbane and Melbourne, Auckland, Nadi and Auckland. AIDC is also in use between Melbourne and Mauritius.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented	Implemented		A total of 29 UAP and 14 WAM stations are used to provide a 5 Nm separation service and operational. ADS-B mandate applies from 12/2013 at and above FL290. Mandates for additional flight level are considered for 2015 & 2017. WAM operating in Tasmania. Commissioned in 2010. WAM being installed in Sydney to provide 3 Nm separation service and PRM which is expected to be operational 2011. ADS-B data sharing with Indonesia operational since 2/2011.	FANS 1/A ADS-C implemented.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
AUSTRALIA (Cont'd)							ASMGCS using multilateration operational in Melbourne & Sydney in 2010. Brisbane and Perth being installed.		
BANGLADESH	BIS Router and AMHS planned for 2011.	AIDC between Dhaka and CTG, Dhaka and Sylhet planned for 2011.		Not yet planned	Not yet planned		Not yet planned	Not yet planned	
BHUTAN	ATN BIS Router and UA service 2011.					Procedures developed for NPA.			
BRUNEI DARUSSALAM	ATN BIS Router planned for 2012 and AMHS planned for 2012.								
CAMBODIA	BIS Router and AMHS planned for 2011.	Planned 2009	Planned 2009			Procedure developed for NPA.			

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
CHINA	ATN Router and AMHS deployed in 2008. Tripartite BBIS trial completed with Bangkok and Hong Kong, China in Jan. 2003. ATN trial with Hong Kong using XOT over internet conducted in 2006, Further trials planned in 2009. AMHS/ATN technical tests with Macau completed in 2009. ATN/AMHS tests with ROK completed in 2010. ATN/AMHS tests with India are on-going. ATN/AMHS tests with Hong Kong, China planned in 2011.	AIDC between some of ACCs within China has been implemented. AIDC between several other ACCs are being implemented. AIDC between Sanya and Hong Kong put in to operational use in Feb 2007. AIDC between Qingdao and Incheon planned for 2013.	Implemented to ATS Rout. L888 route, Trial on HF data link conducted for use in western China.	Implemented in certain airspace. L888, Y1 and Y2 routes.	RNAV (GNSS) implemented in certain airports. Beijing, Guangzhou, Tianjin.	Ali, Linzhi and Lhasa airports	5 UAT ADS-B sites are used for flight training of CAFUC. Chengdu-Jiuzhai project finished in 2008 with 2 ADS-B stations and additional site is planned to enhance the surveillance coverage. Chengdu - Lhasa route surveillance project completed with 5 ADS-B stations using 1090ES since 2010. Trials planned from May 2011. 1 ADS-B site installed in Sanya FIR since 2008. 3 additional ground stations planned, Trial planned for Jun, 2011.	FANS 1/A based ADS-C implemented. L888 route.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
HONG KONG, CHINA	ATN and AMHS technical trial with Japan conducted in 2003. 64 Kbps ATN Link with Bangkok put into operational use in June 2004. Preliminary ATN/AMHS technical trials with China (Beijing) using VPN over Internet connection conducted in September 2006. Operational AMHS commissioned in July2009. ATN/AMHS circuit with Macao put into operational use in Dec. 2009. ATN/AMHS interoperability tests with other adjacent communications centres commenced in late 2009, viz Taibei (2009), Beijing (2010), Japan (2012) AMHS trial with Philippines in late 2010. ATN/AMHS into operation in end 2009.	AFTN-based AIDC with Sanya put into operational use in February 2007. AIDC trial with other adjacent ATS authorities for new ATC system to be commissioned by 2013. AIDC technical trial with Taibei conducted in 2010. AIDC technical trial with Philippines to be undertaken by end 2011.	FANS 1/A based CPDLC trials completed in 2002. VDL Mode-2 technical trial conducted in 2002. D-ATIS, D-VOLMET and 1-way PDC implemented in 2001. PDC service upgraded to 2-way data link in June 2008.	Implemented in certain airspace	Implemented in certain airspace	RNAV (GNSS) departure procedures implemented in July 2005. RNP AR APCH procedures for 07L/25R runways implemented in June 2010.	A larger-scale A-SMGCS covering the whole Hong Kong International Airport put into operational use in April 2009. Data collection/ analysis on aircraft ADS-B equipage in Hong Kong airspace conducted on quarterly basis since 2004. ADS-B trial using a dedicated ADS-B system completed in 2007. ADS-B out operations over PBN routes L642 and M771 at or above FL 290 within HK FIR are planned in December 2013 and within HK FIR at or above FL 290 in December 2014 ADS-B trial using ADS-B signal provided	FANS 1A trials for ADS-C completed in 2002.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
							by Mainland China to cover southern part of Hong Kong FIR commenced in 2010.		
MACAO, CHINA	ATN/AMHS interoperability test with Beijing commenced in March 2009. ATN/AMHS circuit with Hong Kong put into operational use in end Dec 2009.								ATZ within Hong Kong and Guangzhou FIRs. In ATZ full VHF coverage exist. Radar coverage for monitoring purposes.
COOK ISLANDS									
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	The ATN BIS Router and AMHS to be implemented in 2011.	With neighboring ACCs to be implemented TBD		Implemented in certain ATS routes G711, B467		RNAV (GNSS) Non-precision approach to be implemented in 2011.	ADS-B has been used as back-up surveillance of SSR since 2008.		
FIJI	ATN BIS Router and AMHS implementation by 4th quarter 2010.	AFTN based AIDC implemented between Nadi, Brisbane, Auckland and Oakland.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented		Implemented	ADS- B /multilateration ground stations installed. Surveillance service will be provided starting from end of 2012	FANS 1/A ADS-C implemented.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
FRANCE ***(French Polynesia Tahiti)***		Implementation of limited message sets with adjacent centres under discussion.	FANS-1. Implemented since 1996.					FANS 1/A ADS-C implemented since March 1999.	
INDIA	MUMBAI – SINGAPORE – BBIS – Circuit Implemented MUMBAI – PAKISTAN – BIS – Operational Trial Completed MUMBAI – CHINA – BBIS – Under operational trials MUMBAI – OMAN – BIS -Presently AFTN over TCP/IP MUMBAI – THAILAND – BBIS -Awaiting readiness from Thailand MUMBAI AMHS – Commissioned in APRIL 2011	AIDC with Dhaka /Muscat – TBD Mumbai/Karachi under trial operations	FANS-1 implemented at Kolkata, Chennai, Mumbai and Delhi.	SBAS (GAGAN project) likely to operational in the year 2013	PBN based SIDs & STARS implemented at Delhi, Mumbai, Chennai, Ahmadabad, Hyderabad and Kolkata		ASMGCS with MLAT commissioned at Delhi, Hyderabad and Bangalore Mumbai and Chennai ASMGCS installed	FANS 1/A ADS-C implemented at Kolkata, Chennai, Delhi and Mumbai.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
INDONESIA	ATN BIS Router and AMHS planned for trial in 2009. Trial with Singapore planned. ATNBIS Router and AMHS are still on going trial with Singapore planned to complete by 2012. (Part D: AMHS Commission)	Brisbane and Makassar in planned in June 2009. Makasar and Brisbane is still on going trial AIDC, planned operational in 2011	FANS-1/A. CPDLC in Ujung Pandang FIRs already trial start from 2008 and will be implemented in 2009. FANS-1/A CPDLC in Ujung Pandang FIRs is completely trial operational and will be full operational for designated route on September 2010.				30 Ground Station successfully installed. Since 2009, ATC Automation in MATSC has capabilities to support ADS-B application. ADS-B Task Force team established to develop planning and action concerning ADS-B Implementation within Indonesia FIR	FANS-1/A ADS-C trial planned at Jakarta and Ujung Pandang ACC in 2007. FANS-1/A ADS-C in Ujung Pandang FIRs is completely trial operational and will be full operational in September 2010.	
JAPAN	ATN BBIS router and AMHS installed at 2000. Connection tests with USA 2000 - 2004 and put into operational use in 2005. Connection test with Taibei 2008 - 2009. Connection tests with Australia, China, Hong Kong, Singapore, Republic of Korea, Europe and Russian Federation is TBD	AFTN based AIDC implemented with Oakland, Anchorage and Incheon. Planned between Fukoka ATMC and Taibei ACC for 2012.	FANS1/A system Implemented in Fukuoka FIR.	SBAS implemented RNAV5 implemented.	RNAV1 implemented	RNP Approach implemented	Two Multilateration Systems have been implemented at Narita and Haneda airports.	FANS 1/A. ADS-C implemented in Fukuoka FIR.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
KIRIBATI									
LAO PDR	ATN BIS Router and AMHS completed planned for implementation with Bangkok in 2010.	AIDC with Bangkok planned for 2010.		Implemented. Planned for 2011.					
MALAYSIA	ATN BIS Router completed 2007. AMHS planned in 2012.	AFTN AIDC planned with Bangkok ACC - TBD	On trial since July 2008. On 7 oceanic ATS routes i.e. P628, L510, L645, L627, N571, B466 and P574 within the Kuala Lumpur FIR.	Implemented for Oceanic Routes.	Basic RNAV implemented		Malaysia planned to start mandate ADS-B requirement in KL FIR in 2018 and ADS-B implementation on 2020. Implementation of ADS-B proposed in 2010 - 2015.	FANS 1/A ADS-C already implemented for Bay of Bengal area. Implemented since July 2008 on 7 oceanic ATS routes within KL FIR.	
MALDIVES	Implementation planned for 2012.	Planned for 2012.	FANS1/A installed, system on trial.	Planned for 2012	PBN based SIDS and STARS implemented.	RNP approach implemented at Male' International Airport.	Planned for 2013.	Implemented since 2008.	
MARSHALL ISLANDS						NPA implemented at Majuro Atoll.			
MICRONESIA (EDERATED STATES OF)									
Chuuk				Implemented					

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
Kosrae				Implemented					
Pohnpei				Implemented					
Yap				Implemented					
MONGOLIA	ATN BIS Router and AMHS planned for 2005 and 2006. Trial with Bangkok conducted.		Function available. Regular trials are conducted.		GPS procedures are being developed and implemented at 10 airports.		ADS-B trial in progress implementation planned for 2006.	FANS 1/A ADS-C implemented since August 1998.	
MYANMAR	Implementation of AMHS to be completed by the end of 2011.	The capability of ATM Automation system to support AIDC by 2011	Implemented since August 1998.				A plan to implement ADS-B by 2011	Implemented since August 1998.	
NAURU									
NEPAL	BIS Router and AMHS planned for 2011.	AFTN/AMHS based AIDC between KTM-CAL, KTM-BAN, KTM-LHASA planned for 2011.			GPS departure and approach has been developed for 8 airports and planned for implementation in 2008.		ADS-B feasibility study planned for 2007.		

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
NEW CALEDONIA							Three ADS-B ground stations commissioned in 2010 to cover international traffic at La tontouta airport serving Tontouta ACC & APP. It is used for Situation awareness and SAR.		
NEW ZEALAND	AMHS implementation planned for 2012 using IPS links.	AFTN based AIDC implemented between New Zealand, Australia, Fiji, Tahiti, Chile and USA.	FANS-1/A. Implemented	Will be implemented as required.	RNAV procedures being implemented as developed.	RNP AR APCH implemented at Queenstown (NZQN).	MLAT being used in Queenstown (NZQN) and Aukland (airport surface movements).	FANS 1/A Implemented	
PAKISTAN	ATN/AMHS considered as Phase II implemented since 2010.	Implemented between Karachi and Lahore ACCs Plan to implement AIDC with Mumbai and Muscat for December 2010	Implementation planned from 2005-2010.	Planned for 2005-2010.	RNAV arrival and departure procedure being developed.	NPA (RNP) procedure are being developed and under flight inspection.	Feasibility study for using ADS-B is in hand. One station was installed at ACC Karachi and evaluation is in progress.	Planned for 2005-2010.	Existing Radar system being upgraded.

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
PAPUA NEW GUINEA	Plans to create a newly duplicated digital communications line connecting with existing and new sites and replacing AFTN switch with a AMHS before 2015	Implemented with Australia in April 2011	Plans for new ATM system supporting CPDLC by 2015	Implemented	GNSS based RNAV procedures have been developed by for five airports.	GNSS NPA approach implemented at 22 aerodromes.	Legislation mandating ADS-B and guidelines for aircraft equipage and operational approval to be issued by 31/12/2011 with target mandatory date by mid-2015 and plans to provide ADS-B service above FL245 within Port Moresby FIR and also in specific higher traffic areas domestically.	Plans for new ATM system with ADS-C within UTA airspace by 2015	
PHILIPPINES	ATN G/G BIS Router/AMHS implemented in 2006. AMHS trials with Singapore by end 2012 and Hong Kong planned in 2012.	Planned for 2013.	CPDLC Planned for 2011. Trials on-going.	New ACC on test.	RNAV routes of MLA. MACTAN for FLT validation.		Two ground stations scheduled for implementation in 2013.	FANS 1/A ADS-C planned for 2013.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
REPUBLIC OF KOREA	ATN/AMHS circuit with China put into operational use in June 2011. ATN/AMHS test with Japan to be conducted	AFTN based AIDC implemented between ACC and Fukuoka ATMC. AIDC between Incheon and Qingdao to be implemented.	PDC & D-ATIS implemented 2003.	Two RNAV5 routes were implemented in 2011. More RNAV5/2 routes will be implemented gradually.	RNAV1 SID/STAR were partially implemented at GIMPO and INCHEON airports. More SIDs/STARs will be implemented gradually	RNP approaches with Baro were implemented at GIMPO airport in 2011. More RNP approaches with Baro will be implemented gradually	ADS-B implemented 2008 for SMC in Incheon International Airport.	FANS 1/A based ADS-C implemented since 2003 for contingency purpose.	
SINGAPORE	AMHS implemented. ATN Router trial with Malaysia completed in 2007 On-going ATN/AMHS trial with Indonesia and planned to complete by 2012. ATN/AMHS circuit with India put into operational use in Mar 2011. Coordinating with Thailand on ATN/AMHS trial in Q3-Q4 2011. Coordinating with UK on ATN/AMHS trial using VPN over internet in Q4 2011.	AFTN based AIDC to be implemented	Implemented since 1997. Integrated in the ATC system in 1999.		RNAV SIDS and STARS implemented in 2006.	NPA Procedure implemented in 2005.	The airport M-lat system was installed in 2007 and "far-range" ADS-B sensor was installed in 2009.	FANS 1/A ADS-C implemented since 1997. Integrated with ATC system in 1999.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
SRI LANKA	ATN BIS Router Planned for 2013. AMHS (Domestic) and AMHS/AFTN Gateway to be implemented by Oct. 2011.	Trials with Male' planned in 2013.	Implemented (FANS 1/A based)	14RNAV10 routes already established. 05 RNAV5 routes to be established in 2013. Upgrade airspace above FL225 to RNAV10 and introduce RNP4 routes in a phased manner within 2013-2016.	GNSS based RNAV-1 SIDS and STARS trials being conducted. To be implemented in a phased manner within 2013-2016.	Introduction of RNP APCH (with Baro-VNAV) in a phased manner with 2013-2016. GNSS based Precision Approaches planned beyond 2016.	ADS-B Trials planned for 2012 and implementation in 2013.	Implemented (FANS 1/A based) .	Information pertaining to Navigation are based on the PBN Implementation plan of Sri Lanka .
THAILAND	BBIS/BIS Routers already implemented. Target date for AMHS in Q2-2012. Coordinating with Singapore on ATN/AMHS trial in Q3-Q4 2011.	AFTN based AIDC planned for TBD. (as a part of new ATM system)	FANS-1/A Implemented.	Under implementation	Implemented at Phuket Airport	Implemented at Phuket	Multilateration implemented in 2006 at Suvarnbhumi Int'l. Airport. ADS-B is planned to be part of future surveillance infrastructure.	FANS 1/A ADS-C Implemented.	
TONGA	AMHS planned for 2008.					NPA planned for 2007.	Trial planned for 2012		CPDLC and ADS-C is not considered for lower airspace
UNITED STATES	AMHS implemented. (Salt Lake City & Atlanta)	AFTN based AIDC implemented.	FANS-1/A based CPDLC implemented.	Implemented	Implemented		Status as of March 31, 2011 81 Radio Stations under construction or in Final Design	Implemented	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
							(77 in CONUS; 4 in AK) 342 Radio Stations constructed (313 in CONUS; 29 in Alaska) 326 Radio Stations Reporting on the SBS Network (297 in CONUS; 29 in AK) 275 Operational Radio Stations WAM implemented in areas of Colorado for 5nm separation services and coming to Juneau in 2011		
VANUATU									
VIET NAM	BIS Routers planned for 2009. ATN/AMHS trial in 2010 and operation in 2012.	AFTN based AIDC implemented in 2009. Trial for ATN based AIDC planned in 2010.	CPDLC operational trial conducted in early 2007.	For en-route TBD.	RNAV		TBD	FANS 1/A ADS-C operational trial conducted for oceanic area of Ho Chi Minh FIR since March 2002.	

* Navigation – Navigation including Performance Based Navigation (PBN), APV and precision approach

Part IV

COMMUNICATIONS, NAVIGATION AND SURVEILLANCE (CNS)

INTRODUCTION

1. This part of the Asia and Pacific (ASIA/PAC) Basic Air Navigation Plan contains elements of the existing planning system and introduces the basic planning principles, operational requirements and planning criteria related to communications, navigation and surveillance (CNS) as developed for the ASIA/PAC regions.

2. As a complement to the Statement of Basic Operational Requirements and Planning Criteria (BORPC) set out in Part I, Part IV constitutes the stable guidance material considered to be the minimum necessary for effective planning of CNS facilities and services in the ASIA/PAC regions. A detailed description/list of the facilities and/or services to be provided by States in order to fulfil the requirements of the plan is contained in the ASIA/PAC Facilities and Services Implementation Document (FASID). During the transition and pending full implemen-tation of the future communications, navigation and surveillance/air traffic management (CNS/ATM) system, it is expected that the existing requirements will gradually be replaced by new CNS/ATM system-related requirements. Further, it is expected that some elements of CNS/ATM system will be subject to amendment, as necessary, on the basis of experience gained in their implementation.

3. The Standards, Recommended Practices and Procedures to be applied are contained in:

a) Annex 10 — *Aeronautical Telecommunications*, Volumes I, II, III, IV and V;

b) Annex 11 — *Air Traffic Services*; and

c) *Regional Supplementary Procedures* (Doc 7030).

4. Background information of importance in the understanding and effective application of this part of the plan is contained in the *Report of the Third Asia/Pacific Regional Air Navigation Meeting* (Doc 9614, ASIA/PAC/3 (1993) on Agenda Items 10, 11 and 12.

5. The elements of the material referred to above are presented in the following paragraphs with appropriate cross-references to recommendations and/or conclusions of ASIA/PAC/3 and ~~regional planning groups~~Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG).

COMMUNICATIONS

General

6. The plan and details of the operational requirements for communications are contained in Tables CNS 1A, CNS 1B, CNS 1C, CNS 1D, CNS 1E, CNS 2, CNS 3, CNS 4A and CNS 4B, and associated charts in Part IV of the FASID.

Ground-ground communications

Aeronautical fixed service (AFS)

7. The aeronautical fixed service comprises of:

a) the aeronautical fixed telecommunication network (AFTN);

b) data communications subnetworks and associated systems supporting the ground-ground applications of the aeronautical telecommunication network (ATN), namely the ATS message handling services (ATS MHS) and ATS inter-facility data communications (AIDC);

c) ATS direct speech circuits; and

d) meteorological operation circuits, networks and broadcast systems.

Aeronautical fixed telecommunication network (AFTN)

8. States should ensure that telecommunication agencies engaged in providing aeronautical circuits be impressed of the need for:

a) high reliability terrestrial links connecting aeronautical facilities and common carrier terminals inclusive of priority restoration of service commensurate with the requirements of a safety service; and

b) rapid restoration of circuits in the event of breakdown.
[ASIA/PAC/3, Conc. 10/1]

9. States operating AFTN circuits which do not function satisfactorily 97 per cent of the time during which the circuit is scheduled to be in operation, should exchange monthly circuit performance charts on the form provided in Attachment A. Where a circuit consistently achieves 97 per cent reliability, the exchange of performance charts may cease. The circuit performance charts should be exchanged directly between the correspondent stations, with copies to the administrations concerned and to the ICAO Regional Office. States should also identify the causes for inadequate circuit performance and take necessary remedial measures.
[ASIA/PAC/3, Conc. 10/2]

10. States responsible for the operation of AFTN circuits which are not adequately meeting transit time requirements should record transit time statistics on the twenty-third day of each third month (January, April, July and October) of each year, in accordance with the existing practices, for the AFTN circuits and terminals under their jurisdiction which do not meet the specified transit time criteria. The data recorded should be exchanged directly between the correspondent stations, with copies to administrations concerned and to the ICAO Regional Office.
[ASIA/PAC/3, Conc.10/3]

10.1 States operating AFTN circuits may exchange circuit loading statistics only for those circuits where occupancy level exceed permissible levels specified in the Manual on Planning and Engineering of AFTN, Doc. 8259.
[APANPIRG/16, Conc. 16/28]

11. States operating AFTN circuits should:

a) record AFTN statistics on the form contained in Attachment B, from 23 to 25 April and October each year;

b) exchange the circuit loading data for each circuit with each correspondent station and provide a copy to the ICAO Regional Office; and

c) evaluate circuit loading and take appropriate remedial action when occupancy level exceeds permissible levels specified in the *Manual on the Planning and Engineering of the Aeronautical Fixed Telecommunications Network* (Doc 8259).
[ASIA/PAC/3, Conc. 10/4]

12. States concerned should take positive measures to ensure system reliability and provide adequate management and supervision of facilities to eliminate system failure, and to ensure data integrity and timely delivery of messages.
[ASIA/PAC/3, Conc. 10/5]

13. The AFTN entry/exit points:

a) between ASIA/PAC and AFI should be Brisbane and Mumbai;

b) between ASIA/PAC and EUR should be Bangkok, Singapore and Tokyo;

c) between ASIA/PAC and MID should be Karachi, Mumbai and Singapore;

d) between ASIA/PAC and NAM should be Brisbane, Nadi and Tokyo; and

e) between ASIA/PAC and CAR/SAM should be

Brisbane.
[APANPIRG/11, Conc. 11/6]

Technical aspects of AFTN rationalization.

14. The ~~main~~ trunk circuits interconnecting main AFTN communication centres should be provided by landline teletypewriter (LTT) facilities, operate at a modulation rate commensurate with operational requirements, and employ International Alphabet Number 5 (IA-5) and character-oriented data link control procedures — system category B, or bit-oriented data link control procedures as defined in Annex 10, Volume III, Part I, Chapter 8.

15. Also, the ~~tributary~~ circuits ~~inter~~connecting tributary AFTN communication centres with main AFTN communi~~-~~cation centres, or with other tributary AFTN communication centres, or with AFTN stations should be provided with LTT facilities where available and feasible, preferably operating at a modulation rate commensurate with operational requirements, and employing IA-5 code and procedures and an appropriately controlled circuit protocol.
[ASIA/PAC AFS RPG/3, Rec. 3/1]

16. To support data communication requirements and to provide needed data integrity and minimal transit time, the CCITT X.25 protocol should be used between AFTN COM centres and main and tributary COM centres in the ASIA/PAC regions.
[APANPIRG/4, Conc. 4/27 and APANPIRG/7, Conc. 7/14]

16.1 States should continue using X.25 as recommended protocol to support implementation of ATN ground infrastructure in the short to medium term (5-10 years) and consider acquisition of sufficient spares for the service life of the equipment. States not implementing X.25 consider the use of emerging replacement technology.
[APANPIRG/15 in 2004, Conc.15/11]

17. States should consider implementing digital communication networks or circuits in a coordinated manner in order to meet current and future AFS communication requirements for data/voice communications and to facilitate the introduction of ATN.
[APANPIRG/11, Conc. 11/14]

17.1 States should consider the provision of an alternative communication links for critical AFS communications which are supported by a single VSAT system between States and for remote control air-ground (RCAG) VHF stations supported by a single VSAT link.
[APANPIRG/11, Conc.11/15]

17.2 States in the Bay of Bengal area are urged to implement AFS circuits using VSAT technology as a matter of high priority to enhance safety and efficiency of aircraft operations and to meet AFS communication requirements for data/voice communications.
[APANPIRG/13 Conc.13/13]

~~ATN infrastructure transition and implementation~~

18. Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) in the further development of the ASIA/PAC communications, navigation and surveillance (CNS)/air traffic management (ATM) implementation plan, further determine plans for the integration of ground-ground communications systems necessary for the implementation of the aeronautical telecommunication network (ATN), taking into account the work of the aeronautical telecommunication network panel (ATNP) on this subject.
[ASIA/PAC RAN/3 Conclusion 11/8]

18.1 The ATN transition plan outlines the requirements to increase bandwidth and upgrade protocols for those trunk circuits that will support main data flow of traffic in the ASIA/PAC regions. The plan also provides target dates for implementation of boundary intermediate systems (BIS) and backbone BIS in the ASIA/PAC regions.
[APANPIRG/12, Conc. 12/14]

19. ATN development should be introduced in an evolutionary and cost-effective manner based on available ICAO SARPs and regional ATN technical and planning documents. ~~The ATN infrastructure transition is expected to be implemented in three phases as follows:~~ It is recommended that there will be three phases in the implementation of the ATN infrastructure

~~a) *Phase 1.* Upgrade of existing AFTN circuits where necessary to support the introduction of the ATN backbone BIS;~~
~~b) *Phase 2.* Implementation of the ATN regional backbone BIS; and~~
~~c) *Phase 3.* Implementation of supporting ATN BIS.~~

- Phase 1. Up-grade of existing subnetwork infrastructure to support the Backbone BISs (BBISs)

- Phase 2. Implementation of ATN Regional BBISs; and
- Phase 3. Implementation of supporting ATN BISs

[APANPIRG 12/14]

19.1 Considering the inclusion of ATN over IPS SARPs in ICAO Annex 10, Volume 3 and to support global harmonization of ATN implementation, States hosting BBIS be urged to implement ATN over IPS in addition to ATN over OSI and complete this implementation of Dual Stack ATN (ATN/OSI and ATN/IPS) by 2011.
[APANPIRG 19/20]

19.2 Permit non-backbone States, and States in other regions with connections to Asia/Pacific region, to connect their Message Transfer Agents (MTAs) to backbone States using either the OSI-based ATN Internet Communications Services (ICS) or the ATN IPS on a bilateral basis.
[APANPIRG 21/20]

20. States should consider establishment of gateways, where required, to allow inter-operation between AFTN and ATS MHS.

ATS direct speech circuits

~~*ATS direct speech communications*~~.

21. States concerned should assign a high priority to the establishment, in accordance with Annex 11, 3.6.1.1, of efficient direct-speech communications between ATS units serving adjacent areas in order to permit proper use of air-ground frequencies and further implementation of the air traffic control (ATC) service.
[ASIA/PAC/3, Conc. 5/21]

~~22. Voice switching centres should be provided at the following locations:~~

~~1) Auckland 2) Bangkok~~
~~3) Beijing 4) Mumbai~~
~~5) Calcutta 6) Guangzhou~~
~~7) Jakarta 8) Karachi~~
~~9) Lahore 10) Kuala Lumpur~~
~~11) Chennai 12) Nadi~~
~~13) Tokyo 14) Brisbane~~
~~[ASIA/PAC/3, Rec. 10/15]~~

~~23. Dissemination of World Area Forecast System (WAFS) products in the ASIA/PAC regions will be accomplished by satellite broadcast.~~
~~[ASIA/PAC/3, Rec. 10/19]~~

ATS inter-facility data communications (AIDC) circuits

24. States should consider implementing ~~the ATN application~~ AIDC in order to enable the exchange of ATS messages ~~for active flights~~ related to flight notification, flight coordination, transfer of control surveillance data and free (unstructured) text data for active flights.

24.1 Noting the continued prevalence of RVSM Large Height Deviation (LHD) occurrences resulting from ATC Unit-to-ATC Unit coordination errors, APANPIRG recommended that States work towards the implementation of compatible AIDC capabilities based on the Asia/Pacific AIDC ICD between ATC units as soon as possible
[APANPIRG/18, Conc.18/3]

24.2 States are urged to expedite implementation of AIDC between neighboring ATS facilities in accordance with the Regional Air Navigation Plan and the Asia/Pacific AIDC ICD.
[APANPIRG/19, Conc.19/19]

Support for Global ICD for AFTN AIDC

24.3 Recognizing the benefits to be gained from globally harmonized interface arrangements for AIDC, APANPIRG supports the work being undertaken by the United States to coordinate a global Interface Control Document for AFTN AIDC and invites the Asia/Pacific Regional Office to act as the regional point of contact for this work.
[APANPIRG/20, Conc.20/14]

Air/ground communications

Aeronautical mobile service and aeronautical mobile satellite service

Frequency utilization lists.

25. States in the ASIA/PAC regions should coordinate, as necessary, with the ICAO Regional Office all radio frequency assignments for both national and inter-national facilities in the190–526.50 kHz, 108–117.975 MHz, 960–1215 MHz and 117.975–137 MHz bands. The ICAO Regional Office, based on the information provided for this purpose by the States, will issue Frequency Lists Nos. 1, 2 and 3 at periodic intervals.

[ASIA/PAC/3, Conc. 11/4, 11/5 and 12/9]

HF en-route communications

26. States should be urged to coordinate on a national basis with the appropriate interested authorities, a programme directed towards achieving the elimination of the interference currently being experienced on some of the frequencies allocated to the Aeronautical Mobile (R) Service in the ASIA/PAC regions. When reviewing methods for developing such a national programme, consideration should be given to the procedures in Article S15 of the ITU Radio Regulations.

27. In the case of an unidentified interfering station, States should notify the ICAO Regional Office concerned, utilizing the procedure and report form developed by the Fifth Session of the Communications Division (1954) and updated by the Communications Divisional Meeting (1978). The Harmful Interference Report Form is provided in Attachment C. However, in the case of persistent harmful interference to an aeronautical service which may affect safety, it should be immediately reported to ICAO and to the ITU, using the prescribed format, for appropriate action.
[ASIA/PAC/3, Conc. 11/6]

27.1 States where aeronautical stations are experiencing HF radio interference, take necessary actions in coordination with respective radio regulators to identify the source of interference and to eliminate problem.
[APANPIRG/17, Conc.17/32]

~~***Air-ground elements of ATN***~~

~~28. With the implementation of the air-ground applications of ATN, it is important to ensure that transit response times are kept to a minimum level so as not to affect the overall response time that it takes for traffic such as automatic dependent surveillance (ADS) reports and controller pilot data link communications (CPDLC) messages to be delivered to their final destination. This also reflects the need to ensure that critical ground links within the ASIA/PAC regions are capable of handling this information efficiently.~~

~~29. One important factor with air-ground traffic is the generation of routing information caused by aircraft that will move between various ATN routing domains. As aircraft move through various coverage media and FIR boundaries, the ATN routing backbone will be notified of the changing routing data for each mobile aircraft in the region. To allow this routing information to be propagated within the region will require a minimum number of backbone routers to be implemented which protect all other ATN routers form being inundated with routing information.~~
~~[ASIA/PAC ATN transition plan]~~

Satellite Communication Service Performance

28. States and International Organizations be requested to liaise with satellite service providers to establish a mechanism to maintain and modernize the satellite communication infrastructure.
[APANPIRG/19, Conc.19/24]

29. Provision of Aeronautical Mobile (R) Service in the ASIA/PAC Region will be guided by following strategy:

1. A channel spacing of 25 kHz will continue to be operational specification.

2. The VHF voice service, backed by CPDLC and HF will be the primary communication medium for transcontinental traffic; and a combination of CPDLC and HF voice will be the communication medium for oceanic traffic.

3. The requirement for basic voice communication will continue, supplemented by data-link Flight Information Service (DFIS) applications including D-VOLMET, D-ATIS and PDC to significantly reduce pressure on VHF spectrum congestion.

4. Frequency band 136 – 137 MHz will be used exclusively for the air-ground VHF data-link application.

[APANPIRG18, Conc.18/29]

NAVIGATION

General

30. The plan and details of operational requirements for radio navigation aids are contained in Table CNS 3 and associated charts in Part IV of the FASID.

31. States should continue to provide ICAO with information on their flight inspection activities for

inclusion in the *ASIA/PAC Catalogue of Flight Inspection Units* and circulation to States in the ASIA/PAC regions and to the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG).
[ASIA/PAC/3, Conc. 12/8]

32. The development of the radio navigation aids plan, and its subsequent documentation in relevant air navigation plan (ANP) publications, defines the respective radio navigation aid requirements at each location without reference to discrete frequency assignments. The ICAO Regional Office will continue to maintain its frequency selection and co-ordination role, including the maintenance and promulgation of Frequency Lists Nos. 1 and 2 in a timely and periodic manner.
[ASIA/PAC/3, Conc. 12/9]

Radio navigation aid requirements

33. States that have not yet done so should install VHF omnidirectional radio range (VOR) supplemented by distance measuring equipment (DME) as the primary aid for en-route navigation and, except in specified circumstances, delete any parallel requirement for a non-directional radio beacon (NDB) from the ANP.
[ASIA/PAC/3, Rec. 5/22]

Agreement for sharing DME Infrastructure

33.1 In the interest of efficiency, States with DME coverage extending beyond their FIRs be requested to consider allowing neighboring States to develop PBN procedures utilizing these DMEs.
[APANPIRG/19, Conc.19/26]

Constant Descent Final Approach (CDFA) and Baro-VNAV

34. In order to reduce the likelihood of CFIT accidents, States be urged to review non-precisioin approach procedures with LNAV lines of minima to include CDFA profile and include the Baro-VNAV design in the current and new RNP APCH approaches and consequent LNAV/VNAV approach minima.
[APANPIRG/19, Conc.19/28]

RF interference on the protected DME frequency

35. States' civil aviation administrations be encouraged to work closely with the respective regulatory authorities and undertake all necessary action to ensure the DME and SSR service are not interfered by devices such as wireless CCTV cameras.

SURVEILLANCE

General

~~34. The plan and details of operational requirements for surveillance are contained in Table CNS 4A of Part IV of the FASID.~~

36. Surveillance systems for terminal and en-route ATC purposes should be installed, maintained and operated at international aerodromes and en-route area control centres whenever it is necessary to improve the safe and expeditious handling of air traffic and wherever the traffic density and associated complexity of operations, system delays, meteoro~~-~~logical conditions and/or transition from oceanic to continental airspace would justify these installations.
[ASIA/PAC/3, Rec. 5/28]

37. Where different systems are used for navigation and position determination within the same controlled airspace, the ground facilities involved should be collocated and/or orientated so as to provide compatible flight paths and to ensure, as far as practicable, a fully integrated ATC pattern.
[ASIA/PAC, Rec. 7/14]

3~~8~~7. The ASIA/PAC regions are characterised by the use of:

a) secondary surveillance radar (SSR) Mode A, C and~~, in the near future,~~ Mode S in some terminal and high-density continental airspace;

b) ADS in some parts of the ASIA/PAC regions;

c) Automatic Dependent Surveillance – Broadcast (ADS-B); and

~~e~~d) the diminishing use of primary radar.

3~~9~~8. ADS-C is ~~becoming~~ available over the oceanic and continental airspace of the ASIA/PAC regions. SSR (augmented as necessary with Mode S) will continue to be used in terminal areas and in some high density airspace.

Automatic Dependent Surveillance -Contract - (ADS-C)

~~***Coordination of activities related to the implementation of ADS***~~

~~39. The introduction of air-ground data links, together with sufficiently accurate and reliable aircraft navigation systems, presents the opportunity to provide surveillance services in areas lacking such services in the present infrastructure, in particular oceanic areas and other areas where the current systems prove difficult, uneconomic, or even impossible, to implement. ADS is a function for use by ATS in which aircraft automatically transmit, via a data link, data derived from on-board navigation systems. As a minimum, the data should include the four-dimensional position. Additional data may be provided as appropriate. The ADS data would be used by the automated ATC system to present information to the controller. In addition to areas which are at present devoid of traffic position information other than pilot-provided position reports, ADS will find beneficial application in other areas including high density areas, where ADS may serve as an adjunct and/or backup for SSR and thereby reduce the need for primary radar. Also, in some circumstances, it may even substitute for secondary radar in the future. As with current surveillance systems, the full benefit of ADS requires supporting complementary two-way pilot-controller data and/or voice communication (voice for at least emergency and non-routine communication).~~

40. States should closely cooperate in the development of procedures for the implementation of ADS-C in the ASIA/PAC regions and participate to the extent possible in trials and demonstrations related to the implementation of ADS-C.
[ASIA/PAC/3, Conc. 14/21]

Automatic Dependent Surveillance – Broadcast (ADS-B)

41. Mode S Extended Squitter (1090 ES) be used as the data link for ADS-B radar like services in the ASIA/PAC Region in the near term
[APANPIRG/14,Conc.14/20]

42. States are advised to use the following guidelines for the development of ADS-B implementation plan.

a) minimize capital and operating costs of ADS-B data facilities;

b) give priority to provide ADS-B coverage over major traffic flows and *those airspaces currently not covered by radar. ADS-B should have overlapping area with existing radar coverage.*

c) provide ADS-B coverage in areas within 150 NM from FIR boundaries;

d) suitable sites with power, shelter, access routes and data communication links shall be preferred; and

e) overlapping of ADS-B coverage is preferred.

f) Integrate ADS-B data with the ATM automation system wherever possible taking advantage of synergies with other means of surveillance (such as radar, ADS-C, flight plan tracks) ;

g) Mandate ADS-B OUT equipage on the aircraft operating in the airspaces, at the flight levels or area where currently no radar surveillance is available and where ADS-B based services are offered (served with ADS-B ground stations).

h) Expand the “mandate” to aircraft operating in other airspace when the ANSP is able to provide ADS-B based services in the airspace.

i) ADS-B Implementation is more effective when it is implemented regionally both on the ground and on the aircraft.

j) When considering the benefits of ADS-B Implementation, it is necessary to consider the total benefits to all stakeholders (airline operators, passengers, efficiency of the ATM network, and society etc) and not only the benefit derived for airlines operators and air navigation services providers.

[APANPIRG/20, Conc. 20/53]

Exchange of ADS-B surveillance data with neighbours

43. States are encouraged to share ADS-B surveillance data with neighbouring States and to develop mechanisms to achieve this as ADS-B ground infrastructure requirements are being identified during the design phase
[APANPIRG/15 Conc.15/26]

Support provision of VHF radio voice communication associated with ADS-B data sharing between adjacent States

44. States are urged to consider following regional policy on supporting provision of direct controller pilot communication capability associated with ADS-B data sharing between adjacent FIRs of States.

"In order to provide radar like separation services using ADS-B, it is necessary for the controllers to have direct controller pilot communication (DCPC). In some cases, to achieve radar like separation services it may be necessary for the States to provide VHF radio voice communication services for use by adjacent States.
It is therefore recommended that States capable to do so support provision of VHF radio voice communication services to adjacent States when this is required to support the delivery of ADS-B based separation services. Cost of such service provision shall be agreed between the States concerned."
[APANPIRG/19, Conc.19/38]

Secondary surveillance radar (SSR)

Implementation of surveillance systems

451. Implementation of surveillance systems should be pursued as an enhancement to ATS where so required and the use of SSR alone, in accordance with the procedures in the *Regional Supplementary Procedures* (Doc 7030), should be considered as a cost-effective alternative to primary surveillance radar.
[ASIA/PAC/3, Rec. 14/20]

Coordination for SSR Mode S Interrogator Identifier Code

46. In view of low density of SSR interrogator installations in the region, only Interrogator Identifier (and not Surveillance Identifiers) codes be used for SSRs Mode S in the areas of overlapping coverage.
[APANPIRG/19 Concl 19/40]

47. while implementing SSR Mode S, States should take into account following issues while assigning Interrogator Identifier codes for these installations:

- for planning the implementation of SSR Mode S interrogators, administrations should ensure that the interrogators with overlapping coverage are not operating with the same Interrogator Identifier (II) codes.
- where, the coverage of the interrogator extends beyond the boundaries of the State, The II code and PRF should be worked out in coordination with the ICAO Asia and Pacific Office and the neighboring States, and

- administrations should inform the ICAO Asia and Pacific Office about the assigned II codes and PRFs for these installations.
[APANPIRG/19, Conc.19/40]

48. Recognizing more Mode S Radar ground stations being introduced in the region, States in the Asia and Pacific Region are urged to have aircraft registered having Mode S transponder regularly inspected to ensure correct operation of the Mode S transponders.
[APANPIRG17, Conc.17/29]

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Agenda Item 3.5: Other Air Navigation Matters

Agenda Item 3: Performance Framework for Regional Air Navigation Planning and Implementation

3.5 Other Air Navigation Matters

3.5.1 Civil Aviation and the Environment (WP/32)

3.5.1.1 The meeting was provided with a summary of current ICAO activities related to environmental protection, including initiatives to assist States in the preparation of action plans on CO_2 emissions reduction activities. The meeting recognized the importance of the subject and encouraged member States to develop action plans on international aviation CO_2 emissions and to submit them to ICAO.

3.5.1.2 The meeting requested ICAO to consider the possibility of conducting yet another regional workshop for Asia/Pacific Region on the preparation of action plans so as to assist those States who could not attend the earlier event.

3.5.1.3 The meeting called upon States to continue to consider environmental issues in the planning and implementation of air navigation systems.

3.5.2 ICAO Fuel Saving Estimation Tool (IFSET) (WP/21)

3.5.2.1 The meeting was introduced to the ICAO Fuel Savings Estimation Tool (IFSET), developed to estimate fuel savings resulting from national or regional operational improvements considering that to-date, a tool to assist those States without an automated means to estimate, model or report those benefits in a harmonized way, has not been available.

3.5.2.2 The meeting noted that the environment benefits calculated should be sent to the ICAO Regional Office as soon as the State/Region has the definition of the improvements to be made, considering that this information will be used by ICAO for the generation of the ATM environment report to be issued by the end of 2012.

The meeting recognized ICAO efforts on the development of IFSET and adopted the proposed draft conclusion:

Conclusion 22 /49 — Estimating Environment Benefits

That:

a) States are urged to use IFSET or an advanced tool/measurement capability available to estimate environment benefits accrued from operational improvements and the benefits should be reported on a quarterly basis to ICAO;

b) States agree that all plans to implement operational improvements shall encompass an environment benefits analysis.

3.5.3 Measurement of Environment Benefits from Operational Improvements (WP/20)

3.5.3.1 The meeting was informed on the benefits that different initiatives being put in place at a national and regional level have, to improve the efficiency of the ATM system in general and specifically to the reduction in fuel consumption by aircraft capable of using new procedures, concepts of operations or technologies.

3.5.3.2 The meeting was informed that the terms of reference of the ATM/AIS/SAR Subgroup already covers environmental issues and agreed that this sub group should be in charge of the tasks related to the measurement and reporting of environment benefits accrued from operational improvements using the proposed format.

3.5.3.3 It was highlighted that a State or ANSP already planning or implementing operational improvements can report directly to ICAO the results obtained with the use of the ICAO Fuel Savings Estimation Tool (IFSET) or an advanced tool.

3.5.3.4 To facilitate the realization of the task at a regional level IATA offered to establish an electronic platform as well as to provide information on the process of estimation of environment benefits accrued from operational improvements to the interested States. The meeting appreciated IATA's offer and accepted the proposal.

3.5.4 CANSO IFSET Workshops for APAC (WP/24)

3.5.4.1 The meeting was informed on CANSO's support for ICAO in the roll-out of the ICAO Fuel Saving Estimation Tool (IFSET) in the Asia Pacific Region that will enable ANSPs and their States to measure and report operational improvements to ICAO. To this end the meeting noted that CANSO will be holding a two day IFSET workshop in Singapore in December 2011 and the second IFSET workshop will be held in April 2012 during CANSO's Asia Pacific Conference in Maldives.

3.5.4.2 The meeting noted with appreciation CANSO's initiative and support and encouraged ANSPs and CAAs in the Region to participate in the IFSET Workshops scheduled in 2011 and 2012.

3.5.5 Status of the Asia and Pacific Initiatives to Reduce Emissions (ASPIRE) Partnership, Japan (WP/37)

3.5.5.1 The meeting received information regarding the ASPIRE Partnership that was initiated in February 2008 and has achieved many milestones and successes since its inception. It was informed that the ASPIRE Strategic Plan has been developed and is a living document that is driving ASPIRE Partners towards actual accomplishments and operational benefits. The ASPIRE Partnership has welcomed three new members: the Civil Aviation Bureau, Japan (JCAB), the Civil Aviation Authority of Singapore (CAAS) and Aeronautical Radio of Thailand. The meeting noted that the ASPIRE Partners have established the ASPIRE-Daily Program to identify city-pair routes where best practices with demonstrated and proven success in the reduction of greenhouse gases are available on a daily basis.

3.5.6 Indian Ocean Strategic Partnership to Reduce Emission (INSPIRE) WP/29

3.5.6.1 The meeting also received information regarding another initiative called INSPIRE which is an informal partnership of ANSPs in Indian Ocean and Arabian Sea area dedicated to reduce the environmental footprints of aviation by utilizing technological advances and adopting best practices. The partners have developed a systematic approach to achieve, demonstrate and report short term, medium term and long term goals. Airports Authority of India is one of the founder members of this partnership.

3.5.7 Traffic Forecast for Transpacific and Intra Asia/Pacific Regions (WP/22)

3.5.7.1 The meeting was presented with a report on the forecasts produced by the Asia Pacific Area Traffic Forecasting Group (APA TFG) at its 15th meeting held in Bangkok in November 2010. The report is available in ICAO Doc 9961, *Asia/Pacific Area Traffic Forecasts 2010-2030* and is posted on the ICAO website at http://www.icao.int/icaonet.

3.5.7.2 This report contained both medium (Passengers 6.2 % and aircraft 4.1%) and long-term (Passengers 5.5 % and aircraft 4.2%) air traffic forecasts in the Trans-Pacific area of the Asia/Pacific Region and for selected city-pair markets with a horizon to the year 2030, including a short-term forecast for 2010-2014 and intermediate forecasts for each of the years 2020 and 2030.

3.5.7.3 The meeting also noted that Intra-Asia/Pacific passenger traffic is expected to increase under a "most likely" scenario at an average annual rate of 6.9 per cent during 2009 to 2020, reaching close to 211 million passengers in the year 2020. The average annual growth rate of 5.4 per cent is forecast to result for the period 2020-2030 in some 356.2 million passengers by the year 2030. In case of Intra-Asia/Pacific passenger aircraft movements for the period 2009-2030, they are expected to increase at a most likely average annual growth rate of 5.1 per cent, slightly higher than Trans-Pacific, and anticipated to reach some 2.9 million movements by 2030.

3.5.7.4 In reviewing the present scope of the APA TFG activities, the meeting recalled that as per Assembly Resolution 37-20 Appendix C, (Consolidated statement of continuing ICAO policies in the air transport field) the Council has been mandated to develop methodologies and procedures for the preparation of forecasts, the analyses of cost-benefit or cost-effectiveness, and the development of business cases to meet the needs of the Organization, the regional air navigation planning groups and, as required, other systems or environmental planning bodies of the Organization. Consequently, the meeting did not consider necessary to modify the current scope and called upon APA TFG to continue to provide its support to APANPIRG as necessary. The working process needed for providing APA TFG deliverables to APANPIRG lies within the ambit of APA TFG.

3.5.8 Review of the Statement of Basic Operational Requirements and Planning Criteria (BORPC) WP/23

3.5.8.1 The Statement of Basic Operational Requirements and Planning Criteria (BORPC), the global vision and a part of the every Regional Air Navigation Plan, was last reviewed and updated in 2005. In view of recent developments, an updated Statement of BORPC for use by all regions was deemed necessary and as such, proposals to update the Statement were presented to ANC on 3 February 2011. Considering the fact that Global Air Navigation Plan already addresses global vision, it was considered duplication to reflect BORPC in the Regional Plans and moreover the subsequent survey of Regional offices also confirmed this view.

3.5.8.2 Consequently, the ANC, in its final review on 8 March 2011, decided that no further action will be taken with respect to the current proposal to amend the BORPC in regional plans and that that a new BORPC will be developed in conjunction with and consideration for inclusion in the upcoming revision of the Global Air Navigation Plan. The meeting noted that consequently, the current BORPC Statement will be withdrawn from all Regional ANPs at the appropriate time.

3.5.9 Update on Air Navigation Planning and Implementation-Maldives (IP/7)

3.5.9.1 The meeting was informed of improvements carried out in airspace management and upgrade of communication and surveillance systems within Male FIR. The upgrades include MSSR, ADS-C, Extended VHF, and CPDLC. In close cooperation with other regional air navigation service providers and leading carriers, Maldives has successfully implemented series of way points along Male/Melbourne FIR, Male/Colombo FIR and Male/Mumbai FIR. RNAV 10 capable aircraft transiting Male FIR above FL285 are now able to fly between these waypoints form entry to exit without reference to the Air Traffic Services (ATS) route network.

3.5.10 ATC Skill Development Programme India (IP/9)

3.5.10.1 India informed the meeting that the phenomenal growth of traffic since 2004, led to operationalization of new airports, restructuring of airspace with the introduction of EMARSSH routes and RVSM, creation of additional sectors and demand for increase in watch hours of remote stations necessitated India to make a comprehensive review of ATC manpower.

3.5.10.2 India provided an insight into Air Traffic Controllers capacity and skill enhancement programmes adopted by Airports Authority of India with the development of new technologies/concepts like PBN, RNAV, ADS-B/ Data-link operations etc and that regular/periodic training programmes have been introduced to keep the controllers abreast with the current requirements. The meeting also noted that in order to enhance skills of the rated controllers, AAI has planned to install integrated ATC Training Simulators at four Regional ATC Centers, viz., Mumbai, Delhi, Kolkata and Chennai. The simulator has multi functionalities catering to the requirements of Surface Movement with SMGCS, Tower, Approach Radar and Non Radar, Enroute, Oceanic ADS-CPDLC.

3.5.11 New CNS and ATM System Initiatives India (IP/10)

3.5.11.1 The meeting noted that Airports Authority of India (AAI), responsible for providing Air Navigation Services (ANS) over the designated airspace, has developed an air navigation plan called Futuristic Indian Air Navigation Systems (FIANS) that is consistent with ICAO Global Air Navigation Plan. Keeping with the developments and availability of globally proven technology, AAI is implementing and commissioning new systems for enhancing safety and efficiency. It includes communication, navigation and surveillance infrastructure

3.5.12 Introduction of CARATS - Japan (IP/17)

3.5.12.1 The meeting noted that Japan Civil Aviation Bureau (JCAB) has developed a long-term vision for the future air traffic systems called “Collaborative Actions for Renovation of Air Traffic Systems (CARATS)” in coordination with parties concerned. The CARATS Committee consists of members representing industry including operators, academia and government. CARATS Committee has defined a roadmap toward 2025 known as “CARATS Roadmap”. It comprises of 39 Operational Improvements and 16 Enablers. The short-term measures are being initiated for its implementation step by step, while research and development efforts are ongoing for the long-term measures. CARATS roadmap may be revised as necessary to meet changing requirements.

3.5.13 Updates on Air Navigation Activities in Viet Nam and Main Required Coordination Activities (IP/20)

3.5.13.1 The meeting noted that Air Navigation System of Viet Nam provide ATS and other air navigation services (ANS) for more than 100 airlines operating within or over Ha Noi and Ho Chi Minh FIRs, as well as at 06 international airports and more than 15 domestic airports for the civil flight operations in the whole country. The meeting received updates to its programme that encompasses ATM, CNS and AIM improvements. The meeting encouraged the concerned CAAs to support and closely coordinate with Civil Aviation Authority of Vietnam in implementing the activities.

3.5.14 CNS/ATM Systems Development in Cambodia and Lao PDR (IP/25)

3.5.14.1 Cambodia and Lao PDR jointly presented information paper on the activities that they have taken up for “Capacity Development for Transition to the New CNS/ATM Systems in Cambodia, Laos and Vietnam” with the cooperation of Japan International Cooperation Agency (JICA). Scope of

the project includes improvement of safety and efficiency of flights and enhancement of airspace capacity in Eastern Mekong Region. Presentation described three levels of output expected from the project and explained the activities proposed to attain these levels. The meeting noted capacity development for establishing flight procedures design, training system and introduction of safety management system (SMS) in the air navigation services

3.5.15 Updates on Improvement Activities in Civil Aviation Sector in Nepal (IP/26)

3.5.15.1 Nepal provided a brief update on the various improvement activities carried out in Civil Aviation sector in Nepal during 2010-2011. The upgrades/improvements include replacement of DVOR/DME, submission of PBN implementation plan to ICAO, implementation of RNP AR Approach Procedure by early 2012, demolition of obstructive FM Broadcast Antenna, corrective action plan for resolving Annex 14 deficiencies and provision of SIGMET by 2012.

3.5.16 PBN Implementation in Nepal (IP/27)

3.5.16.1 Providing a brief on the status of PBN implementation, Nepal informed the meeting that the State had developed its National PBN Implementation Plan in 2010 in accordance with the Asia/Pacific Regional PBN Implementation Plan. The plan was updated in April 2011 to meet the requirements of ICAO APAC Review Report. Significant initiatives included in the National PBN Implementation Plan were described.

3.5.16.2 Nepal proposes to implement PBN in three distinct phases. Short Term Plan (2010-2012) includes implementation of RNP10 on selected routes, basic RNP1 SIDs and STARs within Kathmandu TMA and introduction of GNSS based approach procedures at TIA. Medium Term plan (2013-2016) will include extension of existing route or development of new routes, extension of RNP 1 SIDs and STARs at other major airports and promulgation of RNP Approach with BARO-VNAV for selected runways. Long Term Plan (2017-2025) includes introduction of RNAV 5 routes in the whole Nepalese FIR, RNP1 and RNAV1 SIDs and STARs at all the major airports and promulgation of RNP AR Approach procedures. Nepal expects enhance safety and reliability of operations through the implementation of PBN and increase its airspace/airport capacity to enable future growth.

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Agenda Item 4: REGIONAL AIR NAVIGATION DEFICIENCIES

Agenda Item 4: Regional Air Navigation Deficiencies (WP/25)

4.1 Under the Terms of Reference, the APANPIRG has been regularly reviewing the status of implementation of the Asia Pacific Air Navigation Plan through its subgroups to identify and address the air navigation deficiencies according to the uniform methodology approved by the ICAO Council. In meeting this objective, APANPIRG facilitates the development and implementation of action plans by States to resolve identified deficiencies, where necessary.

4.2 The online deficiency database is available through the ICAO APAC website www.bankok.icao.int via secure access provided by the Regional Office to States and International Organizations.

4.2.1 The meeting received a PowerPoint presentation related to the current work in progress in ICAO Headquarters on the subject of addressing regional air navigation deficiencies. The meeting noted that ICAO is considering quantitative approach to categorization of deficiencies through hazard identification and risk analysis and that GREPECAS will be using this methodology on test basis for one year. Subsequently, based on the experience gained, its application to other regions would consider through the ANC/Council. The meeting also noted that the present five regional deficiency databases, which are different from each other, will be merged into one single harmonized database in Headquarters without any modifications to current usage of the regional database. The harmonized database will reside in Integrated Safety Trend Analysis and Reporting Systems (iSTARS) platform.

4.3 **Deficiencies in the ATM/AIS/SAR Fields**

4.3.1 The meeting noted the List of ATM deficiencies updated by ATM/AIS/SAR SG which was based on information provided by concerned States. The meeting reminded States to advise the Regional Office of any change in status of these deficiencies, and to respond accordingly to the State Letter that had been issued on this subject.

4.3.2 Regarding the ATS route deficiencies and the non-implementation of R216 into and out of China, IATA noted that seasonal approvals and the use of flexible entry/exit points were not always compatible with the effective date of new routes/ waypoints. IATA asked China to consider in the future if new routes/waypoints could be automatically included in these seasonal approvals and the flexible entry/exit points as appropriate. IATA had no objections to the deletion of ATS route R216. China noted that they have had some issues in coordinating with Kazakhstan. China has not received any formal feedback from Kazakhstan and has written to the ICAO Asia/Pacific Regional Office to request that they coordinate with the ICAO EUR/NAT Regional Office in order to close this deficiency.

4.3.3 The updated List of Air Navigation Deficiencies in the ATM, AIS and SAR fields is in **Attachment A** to the report on agenda item 4.

4.4 Deficiencies in the AOP Field

4.4.1 The meeting noted that simple approach lighting system has been installed for runway 03 at Yangon International Airport.

4.4.2 The meeting noted the findings observed by the AGA mission and the corrective action plan provided by Bangladesh, Cambodia, India, Maldives, Nepal and Thailand. The updated information is placed at **Attachment B1**. The meeting urged States concerned to provide the necessary resources for the elimination of the deficiencies. Recognizing the important for urgent elimination of deficiencies APANPIRG/22 adopted the following Conclusion.

Conclusion 22/50 – Addition of the APANPIRG Air Navigation Deficiencies for non compliance with Annex 14 SARPs

That, the AOP Air Navigation Deficiencies reported and identified in Attachment B1 to the Report on Agenda Item 4 be added to the APANPIRG Air Navigation Deficiencies List B.

4.4.3 The updated List of Air Navigation Deficiencies in the AOP field is in **Attachment B** to the Report on Agenda Item 4.

4.5 Deficiencies in the CNS Field

4.5.1 The meeting noted the updated list of Air Navigation Deficiencies in CNS Field which was reviewed by CNS/MET SG/15.

Air-ground VHF Communication in Yangon FIR

4.5.2 The meeting noted that Myanmar had upgraded their air ground Communication capability to provide a reliable, safe and efficient service to the traffic transiting Yangon FIR and loss of communication with aircraft in Yangon FIR is rare now. However a report of communication difficulty was received from a pilot flying over the Yangon FIR in June 2011. The meeting appreciated the efforts made by the Administration. IATA acknowledged the achievement by Myanmar and informed the meeting that a target date is being workout to remove requirement for the In-flight Broadcast Procedure (IFBP) in Yangon FIR and a survey was being circulated seeking feedback from airlines.

HF Communication problem in Mumbai FIR

4.5.3 India informed the meeting that efforts have been made by Airport Authority India to improve the services by replacing the antenna and a significant improvement has been reported. Two new HF Transmitters and 5 New HF antennas have been installed. In addition 43 new HF Receivers are being procured and will be installed shortly. No further report on poor communication has been received from the airspace users.

Navigation Aids Performance deficiencies in Philippines

4.5.4 Disruption of Air Traffic Services in Manila FIR was reported on 13 September 2009 for about two hours. It was reported that standby power supply source failed to take over the load when the main power failed. This was considered a deficiency in CNS field subject to remedial action by the Civil Aviation Authority of Philippines. Philippines further reported that the new CNS/ATM project is in the procurement stage and is expected to be operational by 2013.

4.5.4.1 Philippines informed the meeting that the interim project of replacement of EUROCAT ATM system is still going on and is due for validation. ILS at both ends of the runway has been commissioned on 4 and 6th April 2011. Replacement of DVOR is expected to be completed in January 2012. The power supply module has been replaced. It was informed that associated DME will be replaced as well. IATA informed the meeting that there have been no adverse reports about navigation aids performance in the recent past but expressed concern about the discontinuation of CPDLC trial due to some technical problem.

Poor ground/ground communication between Afghanistan and Pakistan

4.5.5 Lack of reliable communication infrastructure between Afghanistan and Pakistan, poor performance of Aeronautical Fix Service including data communication between Kabul and Karachi and ATS voice communication between Lahore and Kabul have become issues of concern. Karachi – Kabul AFTN circuit has been intermittent since 29 June 2010 due to unstable performance of VSAT system. Currently e-mail and AFTN messages are reportedly being sent from Karachi AFTN centre but no response is normally received. AFS requirements as specified in the regional air navigation plan are not met. Administrations were urged to work out a remedial solution and improve AFS service.

4.5.6 The updated List of Air Navigation Deficiencies in the CNS field is given in **Attachment C** to this paper.

4.6 Deficiencies in the MET field

4.6.1 The meeting noted the progress made to overcome some of the deficiencies based on report of implementation by States and Regional OPMET Data Bank (RODB) monitoring.

4.6.2 The meeting noted with appreciation that Lao PDR had established a Meteorological Watch Office (MWO) on 1 April 2010 and began issuing SIGMET in March 2011. RODB Bangkok monitored SIGMET issued by Lao PDR for the period from 1 March 2011 to 27 April 2011. Lao PDR was advised of the formatting problems identified during the monitoring and was requested to correct such problems. The meeting considered that this deficiency should be removed provided that: 1) format errors have been addressed; 2) SIGMET is issued routinely when warranted, and 3) the airlines are satisfied with the results. It was recognized that further progress was warranted before removing this deficiency from the list.

4.6.3 The Regional Office received notification from DPR Korea on 30 March 2009 of the establishment of a MWO. It was evident that DPR Korea was producing SIGMET on a regular basis and was providing routing SIGMET to RODB Tokyo. The meeting commended the progress associated with the Sunan MWO. It was agreed that if DPR Korea continued issuance of SIGMET in accordance to Annex 3 occurred for another six months and if DPR Korea participated in the APAC SIGMET tests in November 2011, the deficiency would be considered for removal from the list.

4.6.4 SIGMET is currently issued for the Phnom Penh FIR by the Chengdu MWO of China based on the letter of agreement between Cambodia and China. The MWO in Cambodia may be implemented by the end of 2011 and subsequently this deficiency would be considered for removal from the list.

4.6.5 Deficiencies related to volcanic ash SIGMET needs to be corrected by Indonesia, Philippines and Papua New Guinea.

4.6.6 A focus on the lack of SIGMET issued for the Port Moresby, Honiara, and Nauru FIRs raised serious concerns since this sub regional area is prone to tropical cyclones, CB and at times volcanic ash. IATA emphasized the importance of having hazards reported in this large sub-regional area that straddled the equator and deemed this situation unsafe and unacceptable to airline operations. It was suggested that State in a position to do so should be urged to provide this service until such time the respective States can provide SIGMET; as a result, the meeting adopted the following Conclusion.

Conclusion 22/51 – Addition of the APANPIRG Air Navigation Deficiency for lack of SIGMET in equatorial region

That,

a) the lack of SIGMET for Port Moresby, Honiara, and Nauru FIRs be included in the list of air navigation deficiency; and

b) States concerned be urged to take urgent action to seek assistance from State in a position to do so to provide the service until such time the States concerned can provide their own SIGMET.

4.6.7 WAFS forecasts for flight briefings

4.6.7.1 Myanmar had provided the Regional Office with letters from Thai Airways and Silk Air stating that they are receiving WAFS forecasts in flight briefings issued by Myanmar. This has happened as a result of implementation of SADIS FTP. It was therefore agreed to remove this deficiency from the list.

4.6.7.2 WAFS forecasts for flight briefings can be obtained by the WAFS Internet File Server (WIFS), which would be less expensive than the hardware associated with satellite retrieval. The South Pacific Islands States (all but two – Samoa and Solomon Islands) have registered for WIFS. It was noted that activation and utilization of WIFS will assist in removing the related deficiencies for Nauru, Kiribati and Solomon Islands

4.6.8 Volcanic ash observations and dissemination

4.6.8.1 Lack of volcano monitoring for the Kingdom of Tonga (AP-MET-17) was identified by the ICAO Technical Co-operation Project *Cooperative Agreement for Enhancement of the Meteorological Service for Aviation in the South Pacific (CAEMSA-SP).* A letter of agreement is being considered for the observation and dissemination of volcanic ash information between the Ministry of Lands, Survey, and Natural Resources and the Ministry of Transport. A recent account of volcanic ash observed by aircraft, but not reported by MLSNRMT of Tonga to VAAC Wellington, indicated the need for further action.

4.6.8.2 The updated List of Air Navigation Deficiencies in the MET field is given in **Attachment D** to this paper.

4.7 ICAO assistance to States to resolve deficiencies

4.7.1 IFFAS REGIONAL PROJECT – Assistance to South Pacific Island States in Aerodrome Certification and SMS Implementation

4..7.1.1 Recognizing the importance on the implementation of Annex 14, provisions related to aerodrome certification and Safety Management Systems (SMS) in the South West Pacific Small Island States, ICAO is providing assistance to these States in order to build their capacity to provide the required services in a sustainable and cost efficient manner. To this end, an ICAO IFFAS grant to be executed by TCB has been approved. The project will be based and monitored from the ICAO Regional Office Bangkok, and will include project missions by an expert to the 8 participating States. An ICAO expert in Aerodrome certification and SMS implementation has been identified and recruitment process is ongoing. The project is expected to commence by mid Sept 2011.

4.7.2 Cooperative Agreement for the Enhancement of Meteorological Services for Aviation in the South Pacific (CAEMSA-SP)

4.7.2.1 A 2005 fact finding mission by the ICAO Regional Office to the South Pacific Region led to the conception of a project to be run under the ICAO TCB initiative, together with the cooperation of the World Meteorological Organization (WMO). This project -Cooperative Agreement for Enhancement of Meteorological Services for Aviation in the South Pacific (CAEMSA-SP) was established for improving the safety and efficiency of air transport operations in the region by enhancing the meteorological services in the South Pacific. Eight States- Cook Islands, Fiji, Kiribati, Nauru, Samoa, Solomon Islands, Tonga and Vanuatu participated in this programme. An ICAO IFFAS grant was approved in 2008 (IFFAS Project RAS/06/802).

4.7.2.2 Through this project the services of an Aviation Meteorological Expert was sourced to identify the MET deficiencies, assist States develop medium and long term action plans for the provision of meteorological services and facilities and improve coordination of stakeholders. The Project Terminal Report detailing the status of meteorological facilities of the Governments of Cook Islands, Republic of the Fiji Islands, Kingdom of Tonga, Republic of Kiribati, Republic of Nauru, Independent State of Samoa, Solomon Islands, Republic of Vanuatu, was completed in February 2010. The main project achievements/outputs consisted of:

- Action plans by States for the provision of meteorological services and facilities;
- Improved ability to meet the next phase of the USOAP;
- Training on Management techniques, Quality Management Systems carried out; and
- Improved knowledge among stakeholders of ICAO and Met Service obligations under the relevant conventions.

4.7.3 PASO Project for performance based Air Navigation Systems:

4.7.3.1 PASO requested for assistance from ICAO in establishing a project to review and address Air Navigation Issues that currently exist in the South Pacific. The aim of the above mentioned project is to provide assistance to South Pacific Small Island States (SPSIS) of Asia/Pacific Region (APAC), who are also members of PASO, to progress with the implementation of performance based air navigation systems leading to a seamless global ATM system. The project will cover all of air navigation systems elements (AGA, CNS, ATM, MET and AIM) and meets requirements of the 11 States of PASO.

4.7.3.2 The implementation plan for the SPSIS is harmonized with the Global Air Navigation Plan (GANP) and Asia/Pacific Regional Air Navigation Plan (ANP). The “Aviation System Block Upgrades” (ASBU) initiative, the framework for global harmonization, will be the basis for the implementation of this TC Project. The project will focus on four key performance areas: Safety; Capacity; Environment; and Cost effectiveness. The Project outcome will meet agreed levels of safety, provides for optimum economic operations and environmentally sustainable.

4.7.3.3 The project is expected to commence in March 2012. While the funding issue is still at the discussion stage it is expected that the PASO States will have to make an annual contribution to the running of the project.

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AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

(deletions and additions are the updates by ATM/AIS/SAR/SG/21)								
Identification		**Deficiencies**			**Corrective Action**			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
ATS Routes								
Requirements of Part VIII, Table ATS 1 of the Air Navigation Plan	~~India/Nepal~~	~~A473 - Not implemented~~	~~16/3/99~~	~~A new proposal was submitted in mid-2003 by Nepal. This was coordinated by Airport Authority of India (AAI) with defense authorities.~~	~~Nepal - propose to delete A473 from BANP. India submitted the proposal in March 2008. Nepal yet to submited the proposal in January 2010. The Regional Office has forwarded the proposal to the headquartes.~~	~~Nepal~~ ~~ICAO~~	~~Item captured in Chapter 2 of the Route Catalogue. APANPIRG/19 (September 2008, Bangkok) updated re progress. No longer applies and replaced by new RNAV route L626.~~	~~B~~
	China	R216 - Not implemented	24/11/93	China advised current the routing B215 KUQA A460 REVKI to Alma Ata met the requirements for traffic from Urumqi to Alma Ata and requests deletion of R216 from BANP (14 Apr 03).	China will coordinate with Kazakhstan to delete R216 from BANP.	China/Kazakhstan ICAO	Captured in Chapter 2 of the Route Catalogue.	B
	Indonesia	R459 - Implemented as W51 and W36	24/11/93	ICAO has requested Indonesia to implement as R459.	Indonesia, Singapore - consider implementation of the route with designator L504. Singapore advised ATM/AIS/SAR/SG/20 (July 2010, Singapore) that a hollistic sub-regional review of ATS routes were being undertaken by Indonesia and Singapore.	Indonesia/Singapore	To be implemented as L504. Target implementation date TBD	B

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
WGS-84								
Requirements of Paragraph 3.7.1 of Annex 15	Bhutan	WGS-84 - Not implemented	2/7/1999	Data conversion completed, but not published		Bhutan	TBD	A
	China	WGS-84 - Patially implemented * implemented in the Sanya FIR as of 1 Nov 2001	2/7/1999	Differences to Annex 15 - *Aeronautical Information Services* are notified		China	China advised APANPIRG/19 (September 2008, Bangkok) that WGS 84 implementation is in progress and planned to be completed in 2010 for all existing airports. All new airports will use WGS84 immediately. China confirmed to ATM/AIS/SAR/SG/20 that the implementation would be completed by the end of 2010.	A
	DPR Korea	WGS-84 - Not implemented				DPR Korea	DPRK advised ATM/AIS/SAR/SG/18 verbally that WGS 84 implementation was completed. The Regional Office is waiting for a formal report.	A
	Kiribati	WGS-84 - Not implemented				Kiribati	TBD	A
	Nauru	WGS-84 - Not implemented		Conferring with consultant		Nauru	TBD	A
	Solomon Islands	WGS-84 - Not implemented				Solomon Islands	1999	A
	Vanuatu	WGS-84 - Implemented at main airports	2/7/1999			Vanuatu	1999	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Airspace Classification								
Requirements of Paragraph 2.6 of Annex 11	China	Airspace Classification - Not implemented	7/7/99		Difference to Annex 11 is published in AIP, China.	China	APANPIRG/19 updated, implementation planned by end 2010.	A
	Kiribati	Airspace Classifcation - Not implemented	7/7/99			Kiribati	TBD	A
	Nauru	Airspace Classification - Not implemented	7/7/99			Nauru	TBD	A
	Papua New Guinea	Airspace Classification - Not implemented	7/7/99			Papua New Guinea	~~Project in place~~. Implemented. The secretariat responded by e mail seeking supporting document	A
	Solomon Islands	Airspace Classification - Not implemented	7/7/99			Solomon Islands	TBD	A
	Viet Nam	Airspace Classification - Not implemented	7/7/99			Viet Nam	ATM/AIS/SAR/SG/19 updated implementation planned in 2010. Revised target date- December 2011.	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
AIP Format								
Requirements of Chapter 4 of Annex 15	Cook Islands	AIP Format - Not implemented	7/7/99			Cook Islands	ATM/AIS/SAR/G/16 (June 2006) updated - AIP COOK ISLANDS in new format in progress with assistance of New Zealand.	A
	Kiribati	AIP Format - Not implemented	7/7/99			Kiribati	ATM/AIS/SAR/SG/18 (June 2009) was advised AIP in draft stage	A
	Nauru	AIP Format - Not implemented	7/7/99			Nauru	ATM/AIS/SAR/SG/18 (June 2008) was advised work soon to start	A
	Papua New Guinea	AIP Format - Not implemented	7/7/99			Papua New Guinea	~~TBA~~. Implemented. The Secretariat r	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
SAR capability								
Requirements of Annex 12	Cook Islands	Annex 12 requirements not implemented. No agreements with adjacent States.	31/1/95		Cook Islands - implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Cook Islands	2009. SAR agreement with New Zealand completed 2007.	U
	Maldives	Annex 12 requirements not implemented. No agreements with adjacent States.	24/4/97	SAR services and facilites provided (details to be confirmed). SAR agreements with neighbouring States under development	Maldives - implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Maldives	2009	U

ATTACHMENT A to Report on Agenda Item 4

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Carriage of ACAS II								
Requirement of Chapter 6 of Annex 6	Bhutan	Annex 6 requirement not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U
	Cook Islands	Annex 6 requirement not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
	Kiribati	Annex 6 requirement not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
	Marshall Islands	Annex 6 requirement not implemented.	26/8/05		Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U
	Micronesia	Annex 6 requirement not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
	Nauru	Annex 6 requirement not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
	Palau	Annex 6 requirement not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U
	Papua New Guinea	Annex 6 requirement not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	~~TBD.~~ Implemented. The Secretariat r	U
	Solomon Islands	Annex 6 requirement not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
	Tonga	Annex 6 requirement not implemented.	26/8/05		Tonga - implement Annex 6 as required.	Tonga	Tonga-advised ATM/AIS/SAR/SG/19 verbally that ACAS II implementation was completed. The Regional Office is waiting for a formal report.	U
	Vanuatu	Annex 6 requirement not implemented.	26/8/05	Pressure altitude reporting transponder required in all airspace since 1/1/00.	Vanuatu - implement Annex 6 as required.	Vanuatu	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Carriage of Pressure Altitude Reporting Transponder								
Requirement of Chapter 6 of Annex 6	Bhutan	Annex 6 requirement not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U
	Cook Islands	Annex 6 requirement not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
	Kiribati	Annex 6 requirement not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
	Marshall Islands	Annex 6 requirement not implemented.	26/8/05	ACAS II required.	Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U
	Micronesia	Annex 6 requirement not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
	Nauru	Annex 6 requirement not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
	Palau	Annex 6 requirement not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U
	Papua New Guinea	Annex 6 requirement not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	~~TBD~~. Implemented. The Secretariat r	U
	Solomon Islands	Annex 6 requirement not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
	Tonga	Annex 6 requirement not implemented.	26/8/05	ACAS II required.	Tonga - implement Annex 6 as required.	Tonga	Tonga-advised ATM/AIS/SAR/SG/19 verbally that the pressure altitude reporting transponder implementation was completed. The Regional Office is waiting for a formal report.	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Non Provision of Safety-related Data								
Requirement of Paragraph 3.3.4.1 of Annex 11	Bangladesh	Annex 11 requirement not implemented.	11/9/09		Bangladesh - provide the safety-related data as required. Bangladesh advised ATM/AIS/SAR/SG/20 that the data were submitted to MAAR in 2008 and 2009. Thailand to confirm.	Bangladesh		U
	Lao PDR	Annex 11 requirement not implemented.	11/9/09		Lao PDR - provide the safety-related data as required.	Lao PDR		U
	Papua New Guinea	Annex 11 requirement not implemented.	21/8/06		Papua New Guinea - provide the safety-related data as required.	Papua New Guinea	TBD	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**State/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Date of completion**	**Priority for action**
Annex 14 **Vol. I** **Amendment 6** ***§ 10.1*** ***§ 10.2***	**Myanmar**			A maintenance programme should be established to maintain facilities in a condition which does not impair safety of air navigation.	DCA establishes and implements procedures to aerodrome operators meet national requirements for maintenance programmes	DCA Myanmar	End of 2011	"A"
Annex 14 **Vol. I** **§** 5.3.4		No approach Lighting RWY 03	1994	PAPI installed in 2002. Approach lights to be Installed when funds available.	Precision approach Cat I available for runway 21 and simple approach has been installed for runway 03.	DCA Myanmar	Complete July 2010 Letter dated 17 January 2011	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Nepal							
Annex 14, Volume I	Katmandu International Airport	Runway/ taxiways	ICAO Mission of February 2008	Poor condition of runway -surface irregular with rut formation, cracks and base failure at some locations. Annex 14,Vol I, Section 10.2	Improve runway surface	Tribhuvan International airport/ CAAN	Runway and taxiway overlay completed on 3 Feb 2011	U
				Growth of thick grass on the airfield pavements.	Removal of grass from the pavement			U
				Provision of RESA in accordance with section 3.5 of ICAO Annex 14, Volume I.	Provision of RESA		2015	U
				Provision of runway markings in accordance with the specifications given in Chapter 5 of Annex 14, Volume I.	Provide runway markings as per ICAO SARPs		Completed	A
				Insufficient runway strip, refer recommendations given in section 3.4 of Annex 14, Volume I.	Provide runway strip as per ICAO recommendations		Not possible	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Maldives							
Annex 14, Volume I	**Male International Airport**	**Runway/ Taxiways**	AGA Mission Report April 2008	Poor condition of runway shoulders. Water body within runway strip. Insufficient runway strip.	Improve runway shoulders. Fill water body.	MACL/CW Unit	Runway shoulders repaired and water body on runway strip filled Runway strip will be provided as per ICAO requirements by 2014. Exemption granted by State and published in AIP	U
				Growth of grass on the airfield pavements.	Remove grass from pavements		Grass grown removed and process is on going	U
				Provision of RESA in accordance with section 3.5 of ICAO Annex 14, Volume I.	Provide RESA		RESA will be provided as per ICAO requirements before end 2014. Exemption granted by State and published in AIP.	A
				Airfield signs provided are not in accordance with the requirements given in section 5.4 of Annex 14, Volume I.	Provision of signage's as per ICAO requirements		Signage provided as per ICAO requirements except Taxi F. Will be completed before March 2011	A
				Poor condition of alpha and bravo taxiways and shoulders	Improve the pavement conditions		Taxiway Bravo repaired. Taxiway A will be repaired by end of February 2011.	
	Gan International airport	**Runway**	**AGA mission Report**	Provision of RESA in accordance with section 3.5 of ICAO Annex 14, Volume I.	Provide RESA		CAP to be submitted to CAD by end of February 2011. ICAO will be updated.	U

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	India							
Annex 14 Volume I	**Chennai International Airprot**	**Runway**	**AGA mission January 2009**	non frangible signage on runway strip. (5.4.1.3 & 9.9 of Annex 14, volume I)	Provision of frangible signs	AAI	Frangible signs provided. Complete	A
				RESA not provided in accordance with Para 3.5 of Annex 14, Volume I requirements;	Provision of RESA	AAI	December 2012	U
				Runway strip is insufficient-300m strip width is not available for the full length of runway 07/25 in accordance with 3.4.3 of Annex 14, Volume I	Provision of 300m strip width for full length of runway 07/25.	AAI	December 2013	A
Annex 14, Volume I	**Mumbai International Airprot**	**Runway**	**AGA mission January 2009**	RESA not provided for R/W 09 and R/W 14 in accordance with Para 3.5 of ICAO Annex 14, volume I;	Provision of RESA	MIAL	R/w-09 RESA provided R/w-14- March 2012	U
				Taxiway light foundations not flush with shoulder - section 9.9 of Annex 14, volume I.	Taxiway light foundations flushed with shoulder surface.	MIAL	complete	A
				Runway strip is insufficient-300m strip width is not available for the full length of runway 09/27 in accordance with 3.4.3 of Annex 14, Volume I	Provision of 300m strip width for full length of runway 09/27.	MIAL	R/w 09/27- August 2013 R/w 14/32- June 2013	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I	**India** **Delhi International Airprot**	**Runway/ Taxiway**	**AGA mission of January 2009**	Object(fence) strip near runway 27 threshold;	Relocate fence.	DIAL	Oct 2011	U
				Poor condition of pavement (pre threshold pavement areas of r/w 10-28)- cracking, rutting and vegetation growth; 10.2	Improved pavement conditions	DIAL	Complete	U
				Poor condition of taxiway N adjoining r/w 10.	Improved pavement condition	DIAL	Complete	A
				Taxiway light foundations not flush with shoulder - section 9.9 of Annex 14, volume I.	Taxiway light foundations flushed with shoulder surface	DIAL	October 2011	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I	**Cambodia** **Phnom Penh International Airport**	**Runway**	**AGA mission of March 2009**	RESA not provided in accordance with Para 3.5 of Annex 14, Volume I.	Provision of RESA	SSCA Cambodia	RESA provided. RESA improvement plan under consideration to satisfy Para's 3.5.7 to 3.5.11 of Annex 14	U
				Runway strip is insufficient-300m strip width is not available for the full length of runway	Provision of 300m strip width for full length of runway.		Full runway strip now available.	U
				non frangible signage on runway strip. (5.4.1.3 & 9.9 of Annex 14, volume I)	Provision of frangible signs		Replacement with frangible equipment in progress	A
	Siem Reap International Airport	**Runway**	**AGA mission of March 2009**	RESA not provided as per Para 3.5 of Annex 14, Volume I. ;	Provision of RESA		RESA provided. RESA improvement plan under consideration to satisfy Para's 3.587 to 3.5.10 of Annex 14	U
				non frangible signage on runway strip. (5.4.1.3 & 9.9 of Annex 14, volume I)	Provision of frangible signs		Non Frangible signs removed	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Bangladesh							
Annex 14 Volume I	**Zia International Airport, Dhaka**	**Runway/ Taxiway**	**ICAO mission April 2009**	Runway strip width insufficient(300m strip not available for the full length of runway);	Provide runway strip in accordance with Annex 14, volume I	CAABD	December 2011	A
				RESA not provided in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA		December 2011	U
				runway edge lights and taxiway edge lights does not meet frangibility requirements in accordance with 9.9 of Annex 14, Volume I. ;	Provision of airfield lighting system satisfying frangibility requirements		August 2010	A
Annex 14, Volume I	**Shah Amanat International Airport, Chittagong**	**Runway**	**ICAO mission April 2009**	RESA not provided in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA		June 2010	U
				Runway strip width insufficient(300m strip not available for the full length of runway;	Provide 300m runway strip for full length of runway		Dec 2010	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Thailand					DCA/AOT		
Annex 14 Volume I	**Chiang Mai**	**Runway**	**AGA mission of July 2009**	300m strip width not available for the full length of precision approach CAT I runway in accordance with the standard 3.4.3, Annex 14, Volume I;	Provide 300m strip for full length of runway		Oct 2011	A
				RESA to satisfy Section 3.5 of Annex 14, Volume I requirements; and	Provide RESA		Oct 2011	U
				road hold position signage not provided at roads intersections crossing the runway/active taxiways.	Provide road holding position signage		Complete	A
Annex 14, Volume I	**Phuket International Airport**	**Runway**	**AGA mission of July 2009**	R ESA to satisfy Section 3.5 of Annex 14, Volume I requirements;	Provide RESA		Dec 2011	U
				Runway strip width insufficient(300m runway strip for precision approach runways in accordance with Para 3.4.5 of Annex 14, Volume I;	Provide 300m runway strip width for full length of runway		AOT has submitted risk assessment report to DCA. Approved by DCA.	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Myanmar							
Annex 14 Volume I	Yangon International Airport	**Runway/ Taxiway**	**ICAO mission April 2010**	Runway shoulder higher than adjacent strip	Flush strip with adjacent runway shoulder	Department of Civil Aviation	October 2011	A
				Provision of enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I.	Provide enhanced taxiway markings		DCA has planned to implement SMGCS. The system will start in 2012	A
				Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA		March 2011	A
				Provisions of shoulders for taxiways	Provide taxiway shoulders		Beginning of 2012	B
				Provision of road holding position signs at entrances to active runways	Provide road holding position signs		October 2011	A
		Bird Hazard		Establishment of a national bird committee in accordance with APANPIRG Conclusion 18/1.	Establish National Bird Committee		DCA will establish National Bird committee.	B

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14, volume I	**Mandalay Airport**	**Runway/ Taxiway**	**April 2010**	Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA	Department of Civil Aviation	Oct 2011	A
				Provision of enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I.	Provide enhanced taxiway markings		DCA is reviewing the requirement for taxiway enhanced centerline marking	A
				Provision of road holding position signs at entrances to active runways	Provide road holding position signs		Oct 2011	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Fiji Islands							
Annex 14 Volume I	Nadi international Airport	**Runway/ Taxiway**	**ICAO mission June 2010**	Flush the strip with the adjacent runway shoulder	Flush strip with adjacent runway shoulder	Civil Aviation Authority of Fiji		A
				Provision of runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, Volume I	Provide runway hold position lights			A
				Provision of enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I.	Provide enhanced taxiway markings			A
				Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA			A
				Provision of Airfield signage in accordance with ICAO Annex 14, volume I, section 5.4	Provide signage as per ICAO standards			A
		Bird Hazard		Establishment of a national bird committee in accordance with APANPIRG Conclusion 18/1.	Establish National Bird Committee			B
Annex 14,	Nausori	**Runway/**						

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
volume I	International Airport	**Taxiway**	**June 2010**	Provision of 300m strip width for the full length of precision approach CAT I runway in accordance with the standard 3.4.3, Annex 14, Volume I; remove obstacles from runway strip; flush the strip with the adjacent runway shoulder	Provide runway strip, flush strip with adjacent runway shoulder	Civil Aviation Authority of Fiji		A
				Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA			A
				Provision of runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, Volume I	Provide runway hold position lights			A
				Provision of enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I.	Provide enhanced taxiway markings			A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I	**Sri Lanka** Bandaranaike International Airport	**Runway/ Taxiway**	**ICAO mission April 2010**	Provision of 300m strip width for the full length of precision approach CAT I runway in accordance with the standard 3.4.3, Annex 14, Volume I; remove obstacles from runway strip; flush the strip with the adjacent runway shoulder	Provide runway strip in accordance with Annex 14, volume I, remove obstacles from strip and flush strip with adjacent runway shoulder	CAASL	AASL has been granted a period of 12 years to cover the drains. Exemption for the period granted has been published in the AIP.	A
				Provision of runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, Volume I	Provide runway hold position lights		Airside safety committee has been formed to study all runway makings, signs and lighting to determine the adequacy of the system in order to prevent runway incursion	A
				Provision of enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I.	Provide enhanced taxiway markings		February 2011	A
				Establishment of a national bird committee in accordance with APANPIRG Conclusion 18/1.	Establish National Bird Committee		July 2010	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Vietnam							
Annex 14 Volume I	Noi Bai international Airport, Hanoi	**Runway/ Taxiway**	**ICAO mission March 2010**	Runway shoulder higher than adjacent strip and obstacles on strip	Flush strip with adjacent runway shoulder and remove obstacles	Civil Aviation Administration of Vietnam		A
				Provision of enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I.	Provide enhanced taxiway markings			A
				Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA			A
		Bird Hazard		Wildlife strike report submission to ICAO for inclusion in IBIS	Submission of wildlife strike reports to ICAO for inclusion in IBIS			B

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION FOR VALIDATION BY STATES

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14, volume I	Tan Son Nhat International Airport, Ho Chi Minh City	**Runway/ Taxiway**	**March 2010**	Runway shoulder higher than adjacent strip and obstacles on strip	Flush strip with adjacent runway shoulder and remove obstacles	Civil Aviation Administration of Vietnam		A
				Provision of enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I.	Provide enhanced taxiway markings			A
				Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA			A
				Wildlife strike report submission to ICAO for inclusion in IBIS	Submission of wildlife strike reports to ICAO for inclusion in IBIS			B

* Priority for action to remedy the shortcoming is based on the following safety assessments:

"U" priority = Urgent requirements having a direct impact on safety and requiring immediate corrective actions. Urgent requirement consisting of any physical, configuration, material, performance, personnel or procedures specification, the application of which is urgently required for air navigation safety.

"A" priority = Top priority requirements necessary for air navigation safety. Top priority requirement consisting of any physical, configuration, material, performance, personnel or procedures specification, the application of which is considered necessary for air navigation safety.

"B" priority = Intermediate requirements necessary for air navigation regularity and efficiency. Intermediate priority requirement consisting of any physical, configuration, material, performance, personnel or procedures specification, the application of which is considered necessary for air navigation regularity and efficiency.

Attachment C to Report on Agenda Item 4

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE CNS FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
Adequate and reliable VHF COM	Myanmar	Quality and reliability of RCAG VHF inadequate and unavailability of required coverage. Improvement has been observed and pilot reports continued to indicate occasional communication difficulties. Further improvement has been observed with occasional communication problems reported.	1998 Early 2008 **June 2011**	Improvements in the quality of link to RCAG stations and power supply system at some remote stations are required.	. An action plan was developed to upgrade equipment at RCAG stations, provide VSAT link at all RCAG stations, to improve power supply system. ICAO missions were conducted. DCA Myanmar has replaced equipments at all 6 RCAG sites with digital VHF system and has provided VSAT links and solar power supply system at all sites. The installation of new high power HF with full associated equipment to be done at Yangon ACC by the end of year 2011; The current VCSS (Voice Control Switching System) has already been upgraded since first quarter 2011 Initiated an action to integrate a new ADS-C/ CPDLC system into the new ACC displays (EUROCAT-C) at the Yangon ACC. The timeline for implementation of this integrated system is planned for the end of 2011; - Replacement of new communication equipments such as head set, inter-com system and DSC line configuration have already been completed since the end of May 2011;	DCA Myanmar	Revised target date is end of 2011 This deficiency will be removed from the list upon receipt of official report providing full details of action taken by Myanmar and confirmation by the users.	A

Attachment C to Report on Agenda Item 4

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
~~Requirements for provision of AFS circuits between Hong Kong and Manila is specified in FASID Table CNS 1A and 1D (Doc.9673 Vol.II)~~	~~Philippines~~	~~Total disruption of the AFTN circuit between Manila and Hong Kong after Philippines Long Distance Telephone Company (PLDT) failed to provide communication link between Manila and Hong Kong.~~ ~~The fluctuation of service availability of AFTN circuit and ATS direct speech circuit were recently observed from total outage of 4,000 minutes in June to over 13,000 minutes in August 2009~~	~~February 2007~~ ~~June 2009~~ ~~The normal operation fully restored in February 2010.~~	~~It is urgently required to improve the performance of the AFTN circuit to meet the requirement for the exchange of safety messages between Manila and Hong Kong within the established transit time of 5 minutes.~~	~~Prolonged delay in rectification of problem experienced at Manila has resulted in diversion of message traffic for a long time via Taipei with alternate routing via Hong Kong/Fukuoka/Singapore/Manila causing traffic congestion as well as higher transit time of AFTN message.~~ ~~Remedial actions for improvement of the circuit performance were discussed among ICAO Secretariat, Hong Kong CAD and the CAAP Philippines.~~ ~~ICAO mission was carried out and action plan was developed.~~	~~Civil Aviation Authority of the Philippines (CAAP)~~	~~By the end of September 2009~~ ~~The circuit was resumed fully normal operational in February 2010. Latest monthly performance report indicates its serviceability meets the operational requirements.~~ ~~The CAAP is invited to notify Regional Office to remove the deficiency from the list.~~	~~U~~
Adequate and reliable Navaids and navigation service	Philippines	Un-serviceability of both the ILSs and the DVOR at Manila airport	19 June 2010	In the APANPIRG/21 meeting, Philippines reported that the ILS system was installed on 26 August 2010.	The significant breakdown of the services was considered a deficiency if remedial action was not taken. The Administration was requested to inform about the remedial action taken to avoid breakdown of power supply. ILS on both ends of the runway has been commissioned on 4 and 6 April 2011. Replacement of DVOR expected to be completed in January 2012; Power supply module has been replaced; The associated DME will be replaced as well.	Civil Aviation Authority of the Philippines (CAAP)	Feb. 2012 The CAAP is invited to notify Regional Office to remove the deficiency from the list once normal navigation service is provided.	A

Attachment C to Report on Agenda Item 4

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
Reliable ground to ground communication as specified in the regional air navigation plan (Doc.9673)	Afghanistan and Pakistan	Unreliability of AFS communication between Afghanistan and Pakistan was brought to the notice of APANPIRG/21. Lack of reliability in the AFS including data communication between Kabul and Karachi and ATS voice communication between Lahore and Kabul was identified.	September 2010	Follow-up letters from ICAO regional offices were sent to Administrations concerned in April 2010 and further follow- up in March 2011	On 13 July 2011, it was reported by Pakistan that the performance of the Karachi-Kabul circuit is still unsatisfactory and most of the incoming messages from Kabul are rejected by the system at Karachi side due to format errors. A COM coordination meeting was recommended to identify problems and develop solutions. Necessary training to the operators on the procedures was also recommended.	Ministry of Transport and Civil Aviation Afghanistan and CAA. Pakistan	July 2013	A

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Meteorological observations and reports. (Annex 3, Chapter 4)	Solomon I.	Weather information is inadequate and not provided on a regular basis	1996 Confirmed 2006 SOA	Reported by airlines operating to Solomon I.	Equipment to be upgraded and arrangements to be made for regular observations TC expert recommendation to replace and/or calibrate MET obs. equipment AGGH – 2008 State made aware of MET Services gaps identified by ICAO TC Project, CAEMSA-SP, in late 2008 CAEMSA-SP Phase II plan for Donors and associated remedies Activation of WIFS will assist in overcoming deficiency	Ministry of Transport, Works and Aviation, Solomon I. *Note: OPMET/MTF to carry out survey*	2011	A
Meteorological observations and reports. (Annex 3, Chapter 4)	Kiribati	METAR from Kiribati not available on regular basis.	1998 Confirmed 2005 SIP	Reported by airlines	State's MET authority to consider urgent action to be taken for providing regular observations and reports TC expert recommendation to purchase/install AWOS – 2008 ICAO SIP conducted in 2005 State made aware of MET Services gaps identified by ICAO TC Project CAEMSA-SP, in late 2008 CAEMSA-SP Phase II plan for Donors and associated remediesActivation of WIFS will assist in overcoming deficiency	Directorate of Civil Aviation, Kiribati. *Note: OPMET/MTF to carry out survey*	2011	A

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION

Identification		Deficiencies			Corrective action			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Indonesia	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Three-party LOA to be signed between the MGA, DGCA and DVGHM Information exchange between CVGHM & ABA in draft form. VSAT comms installed to improve the monitoring in E Nusa Tenggara – provides direct transfer of data to CVGHM HQ full time. (AusAID-funded project) Bilingual reporting form based on VONA to improve comm. to VAAC in Sulawesi	DGCA, MGA Indonesia	TBD (no action plan submitted to RO)	A
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Papua New Guinea	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Procedures to be set up for exchange of data between NWS, ATS and Rabaul Volcano Observatory (RVO) and a LOA to be signed Discussion of an agreement between RVO & PNG CAA to provide volcanic information to aviation through cost recovery is underway.	NWS, ATS Papua New Guinea *Note: ICAO Regional Office to monitor*	TBD (no action plan submitted to RO)	A
Provision of SIGMET for volcanic ash (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Indonesia Philippines Papua New Guinea	Requirements for issuance and proper dissemination of SIGMET, including SIGMET for volcanic ash, have not been fully	ICAO SIP mission Dec 2003	a) Reported by airlines b) Noted by Volcanic Ash Advisory Centres	a) ICAO to carry out a Special Implementation Project (SIP) with the primary objective to improve implementation of SIGMET procedures, especially for VA. b) State to take urgent actions to implement the SIGMET procedures. Note. ICAO SIP carried out in 2003, progress in issuance of SIGMET for VA is noted; the outstanding problems to be resolved within 1-year	a) State's Met authorities b) ICAO to implement the SIP. c) ICAO Regional Office to	To be advised	U

Attachment D to Report on Agenda Item 4

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
		implemented			(progress reported by VAAC Darwin) LOA between ATO, PHIVOCS & PAGASA signed in 2004 to make reporting part of information dissemination practice. LOA is undergoing periodic review (ref. letter of PAGASA dated March 12, 2008) VAAC Darwin trained forecasters in PNG and Philippines to prepare VA SIGMET Participated in VA SIGMET test 17 Nov 2009	co-ordinate and monitor.		
a) Service for operators and flight crew members. (Annex 3, Chapter 9). b) WAFS products for flight documentation. (ASIA/PAC FASID Table MET 1A).	Cambodia ***(AP-MET-09)***	Briefing and flight documentation not provided as required. WAFS products not available	1999	Airlines do not receive the required flight documentation including WAFS forecasts.	States to consider urgent action for installation of SADIS VSAT for receiving WAFS products and OPMET information. Action plan proposed by ICAO MET mission 2003 A TC project proposal submitted to SSCA, Cambodia Cambodia expects to have SADIS FTP operational in 2011 and may require training from a nearby State	State's MET authorities	End 2011	A
MWO for Phnom Penh FIR and SIGMET (Annex 3, Chapter 3 & 7; ASIA/PAC FASID Table MET 1B)	***Cambodia*** ***(AP-MET-11)***	Requirements for meteorological watch office (MWO) to be established at Phnom-Penh international airport have not		MWO not established due to lack of trained personnel and technical facilities. No SIGMET service for	Establishment of MWO currently not feasible. SIGMET service is provided under bilateral agreement with China to meet requirements. A TC project proposal submitted to SSCA, Cambodia Cambodia is in process of establishing its own MWO with target date end of 2011	SSCA, Cambodia	TBD End 2011	A

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION

Identification		Deficiencies			Corrective action			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
		been met.		Phnom Penh FIR				
Provision of SIGMET information (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	***Lao PDR*** ***(AP-MET-12)***	Requirements for issuance and dissemination of SIGMET have not been fully implemented.	2000	SIGMET frequently not available Reported by airlines	State's MET authority to take urgent actions to implement the SIGMET procedures. Lao PDR has established MWO in 2010 and started issuing SIGMET since March 2011. As a result of monitoring by RODB Bangkok LAO PDR was advised to correct noted formatting problem and to issue SIGMET on a regular basis to meet requirements. Lao PDR is expected to issue SIGMET regularly by the end of 2011. This deficiency can be considered for removal after correcting the above problems.	State's MET authorities	End 2011	A
Provision of SIGMET information for Kathmandu FIR. (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	***Nepal*** ***(AP-MET-14)***	Requirements for issuance and dissemination of SIGMET have not been met.	2000	Not established due to lack of technical facilities. No SIGMET service for Kathmandu FIR	Issuance of SIGMET currently not feasible. Action being taken to have SIGMET service provided under bilateral agreement with a neighboring country to meet immediate requirement. Nepal is also planning to issue its own SIGMET	MET Authority Nepal	End 2011 TBD	A
MWO for Pyongyang FIR and SIGMET (Annex 3, Chapter 3 & 7; ASIA/PAC	***DPR Korea*** ***(AP-MET-16)***	Requirements for meteorological watch office (MWO) to be established at	2008	MWO not established due to lack of trained personnel and	MWO established in February 2009 as reported by State. . DPR. Korea is subsequently producing SIGMET on a regular basis and is routing SIGMET to	General Administration of Civil Aviation (GACA) DPR	Jan 2012	A

Attachment D to Report on Agenda Item 4

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
FASID Table MET 1B)		Pyongyang international airport have not been met.		lack of resources. No SIGMET service for Pyongyang FIR Reported by RO mission	RODB Tokyo. It is required for Sunan MWO to participate the APAC SIGMET test in November 2011. This deficiency can be removed if SIGMET is continued to be issued regularly for another six months.	Korea		
Volcanic activity information to be provided to ATS units, MWOs, and VAAC (Annex 3, 3.6 and 4.8)	***Tonga*** ***(AP-MET-17)***	Information on volcanic activity not provided regularly to ATS units, MWOs, and VAAC	2008	Reported by TCB CAEMSA-SP technical expert	Agreement drafted for the dissemination of volcanic ash information from MLSNRKT to MTKT for distribution to ACCs, MWOs and VAACs (under consideration)	Ministry of Transport of the Kingdom of Tonga (MTKT) Ministry of Lands, Survey and Natural Resources of the Kingdom of Tonga (MLSNRKT)	2011	U
Briefing and flight documentation (Annex 3, Chapter 9, Appendix 2 & 8)	***Kiribati*** ***(AP-MET-18)*** ***Naurui*** ***(AP-MET-19)*** ***Solomon Islands*** ***(AP-MET-20)***	WAFS products not accessed and therefore not available for inclusion in flight briefings and documentation	2008	Reported by TCB CAEMSA-SP Technical Expert	WAFS Internet File Service (WIFS) allows for the retrieval of WAFS forecasts for flight briefings and documentation (versus more expensive satellite dish) – available for operations since May 2010 Will seek donor ship for installation and training on WIFS as part of CAEMSA-SP Phase II	MET Services, TCB, Donor, ISCS Provider State	2012	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Provision of meteorological observations (Annex 3, 4.3.1, 4.5, 4.6)	***Nauru*** ***(AP-MET-21)***	No METAR/SPECI observing programme in place (no calibrated and maintained equipment available)	2008	Reported by TCB CAEMSA-SP Technical Expert	Automatic observing station needed as well as maintenance programme Will seek donor for observing system and maintenance contract and/or training as part of CAEMSA-SP Phase II	MET Service, TCB, Donor	2012	U

Narratives on specific deficiencies are provided:

AP-MET-10: The CNS/MET SG/ 15 meeting also noted that Myanmar notified the Regional Office (February 2010) of an action plan on obtaining SADIS FTP in 2010 that would provide the required WAFS information in flight briefings. Confirmation of WAFS information is received from users therefore this deficiency is removed from the list.

AP-MET-17: Included in the list of deficiencies with adoption of APANPIRG/20 Conclusion 20/75. Specifically, lack of volcano monitoring for the Kingdom of Tonga was identified. An agreement between the Ministry of Transport of the Kingdom of Tonga (MTKT) and the Ministry of Lands, Survey and Natural Resources of the Kingdom of Tonga (MLSNRKT) on the dissemination of volcanic ash information from MLSNRKT to MTKT for distribution to ACCs, MWOs and VAACs is under consideration.

AP-MET-18, 19, 20: Kiribati, Nauru and Solomon Islands were encouraged to obtain WAFS forecasts via WIFS, which would mitigate this deficiency. The cost of acquiring WIFS will be provided by the WAFC Washington Provider State and added in the proposal to obtain a sponsor to assist States in acquiring WAFS products.

AP-MET-21: Included in list of deficiencies with adoption of APANPIRG/20 Conclusion 20/75. Lack of meteorological observing station for Nauru was identified. Assistance is likely needed from a Donor to provide the necessary equipment and possible training for maintenance or a maintenance contract, which is expected to be discussed at the ICAO TCB CAEMSA-SP Phase II Donor Workshop in Vanuatu.

AGENDA ITEM 5: FUTURE WORK PROGRAMME

Agenda Item 5: Future Work Programme

5.1 Schedule of Future Meetings (WP/27)

5.1.1 APANPIRG/22 agreed that the tentative schedule of meetings for the rest of 2011, 2012 and 2013 should be as follows (Notes: A decode of acronyms has been included in **Appendix A** to the Report on Agenda Item 5):

5.1.2 The meeting noted that the Provisional Agenda for APANPIRG/22 was prepared in line with Air Navigation Commission's proposal for a uniform approach to formulation of agenda for the PIRGs Meetings. The Provisional Agenda for future APANPIRG Meetings will be in this format.

2011 – Outstanding Meetings

BOB RHS/TF/6	19 - 21 September	Bangkok
ATNICG WG/10	26 - 29 September	India
SEA RR/TF/5	3-5 October	Bangkok
FPL&AM/TF/5 & Seminar	7 - 9 November	Manila
BBA CG/22	22 - 23 September	Bangkok
SOCM/2	15 - 18 November	Bangkok
ADS-B WG/7	28-30November	Chennai India
2012		
MET/ATM Seminar & TF/3 Meeting	January	TBD
Seamless ATM Planning Group	Jan	Bangkok
BBACG/23& SAIOACG	TBD	Bangkok
ATNICG WG/11	TBD	Chiang Mai
RASMAG 16	February	
PBN/TF/9	February	
OPMET/M TF/10	March	Bangkok
METWARN/I TF/2	March	Bangkok
PBN TF/10	TBD	TBD
ADS-B SITF/11	April	RoK
Regional Contingency Plan TF	April	Bangkok
ATN IC G/7	May	TBD
FIT Asia	July	Bangkok
RASMAG/17	August	Bangkok
Seamless ATM Planning Group	August	Bangkok
SEACG/19 & FIT-SEA/12	May	Bangkok
ATM/AIS/SAR/SG/22	June – July	Bangkok
CNS/MET SG/16	23 – 27 July	Bangkok
APANPIRG/23	10 - 14 September	Bangkok
ADS-B WG/8	November	TBA
2013		
BBACG/24 & FIT-BOB/16	January	Bangkok
Seamless ATM Planning group	Feb	TBD
OPMET/M TF/11	March	Bangkok
METWARN/I TF/2	March	Bangkok
SEACG/20 & FIT-SEA/13	April	Bangkok
ADS-B SITF/12	April	TBA
AAITF/8	May	
ATN IC G/8	May	TBA
SEACG/19 & FIT-SEA/12	May	Bangkok
ATM/SG/23	Jun	Bangkok
CNS/SG/17	July	Bangkok
MET/SG/17	July	Bangkok
RASMAG	August	Bangkok
APANPIRG/24	9 – 13 September	Bangkok

5.2 Coordination meeting between Chairmen of Sub-Groups (WP/41)

5.2.1 The Chairman of CNS/MET SG presented a paper on the coordination meeting among chairpersons of Sub-groups (ATM/AIS/SARSG, CNS/MET/SG and RASMAG) held on 4th September 2011.

5.2.2 The coordination meeting took note of the updated list of APANPIRG Contributing Bodies. The list was updated by the Chairmen with assistance provided by the Secretariat. The meeting agreed with the general principle that Task Forces and Working Groups under the Sub-Groups should be focused on the delivery of objectives as stated in the Terms of Reference approved by the constituting body. The Terms of Reference of the Task Forces/Working Groups should specify the reporting arrangements, duration of the Task Force. The work progress of the Task Forces/Working Groups should be regularly reviewed and monitored by constituting bodies. Task Forces that have achieved their assigned objectives or are assessed as unable to achieve their objectives or dysfunctional should be discontinued.

5.2.3 The Chairmen expressed concerns about the number of Task Forces currently constituted under the three Sub-groups and the subsequent burden that was imposed on States and Organizations to support the work programme of these Task Forces. It was agreed that any proposals for establishment of new Task Forces should be critically assessed by APANPIRG and would only be endorsed when fully justified by the tasks at hand being supported by appropriate resources.

5.2.4 The Chairmen identified some common matters between the sub groups and stated that these issues have been appropriately presented through individual Sub-group Reports.

5.3 Report of the APANPIRG Contributory Bodies Review Task Force Meeting (WP/26)

5.3.1 APANPIRG/22 reviewed the Report of the First Meeting of the APANPIRG Contributory Bodies Structure Review Task Force (ABSRTF) convened from 23 to 24 May 2011 in Bangkok and recalled that APANPIRG/21 considering the need to review the APANPIRG Structure and Terms of Reference of its Contributory Bodies established the APANPIRG Contributory Bodies Structure Review Task Force under Decision 21/57. The ABSRTF meeting was attended by 13 participants from 8 member States.

5.3.2 The meeting noted that ABSRTF in fulfilling its mandate as outlined in Decision 21/57 endorsed the following Terms of Reference to achieve the objectives.

Terms of Reference of ABSRTF

- Review of the existing APANPIRG structure. Suggest new structure taking into account the possible requirement for inclusion of AOP, Aviation Security and others to be identified.
- Review of the existing Terms of Reference of the contributory bodies including the Term of the Sub Group Chairperson. Suggest proposed TOR considering the current and future developments in air navigation systems & technologies and related programs for addressing air navigation issues.
- Review activities of APANPIRG Contributory Bodies and propose rationalization of their structures to APANPIRG/22 to meet the changing environment.
- Identify any possible issues of significance.

5.3.3 The meeting noted the following recommendations proposed by ABSRTF:

a) ICAO APAC Office to pursue AVSEC policy issues which are outside the purview of APANPIRG Terms of Reference;

b) Proposal for a separate MET/SG;

c) Establishment of a new AOP Working Group under ATM/SG;

d) ICAO secretariat to coordinate with respective Chairperson for scheduling SG meetings back-to-back, as required;

e) New structure for APANPIRG;

f) The new APANPIRG structure to be effective from 2013 meeting year (APANPIRG/24) with 2012 (APANPIRG/23) being used for transitional arrangements;

g) APANPIRG to review the new structure after three years i.e. in 2016 in light of the experience gained and considering the effectiveness and work load of each of the SGs then;

h) Considering the work of AIM and MET being closely related in terms of Data sharing and information it is appropriate for AIM to join MET SG in the next structure review (2016); and

i) The AOP Working Group will mature in light of experience gained in the next few years and should be considered as a separate sub group in the next structure review.

5.3.4 The meeting reviewed the proposed APANPIRG structure developed and recommended by ABSRTF and adopted the following Decision.

Decision 22/52 - New APANPIRG Structure

That, in consideration of optimizing the effectiveness and efficiency of the contributory bodies of APANPIRG and in accordance with the provisions of the APANPIRG Procedural Handbook the new APANPIRG Structure as shown in **Appendix B to the Report on Agenda Item 5** will become effective from 2013 meeting year and is subject to a further review in 2016.

5.3.5 The meeting reviewed the Term of Chairperson/Vice Chairperson of the Sub Groups proposed by ABSRTF and adopted the following Decision.

Decision 22/53 - Term for Chairperson/Vice Chairperson of Sub Groups

That, the term of the Chairperson and Vice Chairperson of the Sub Groups shall be for a maximum period of four years. The incumbent may stand for re-election.

5.3.6 The meeting reviewed the proposed Terms of Reference of the APANPIRG Sub Groups developed by ABSRTF and adopted the following Decision.

Decision 22/54 - Revised Terms of Reference of APANPIRG Sub group and AOP Working Group

That, the revised Terms of Reference of APANPIRG Sub Group and AOP Working Group as shown in **Attachment C to the Report on Agenda Item 5** be adopted and become effective from 2013 meeting year.

5.3.7 APANPIRG/22 noted that the work of the Task Force has been completed and no further meetings were required. According, the meeting agreed that the ABSRTF should be dissolved and adopted the following Decision:

Decision 22/55- Dissolution of ABSRTF

That, the ABSRTF having completed its task as set out in its Terms of Reference, be dissolved

5.4 Report of the ICAO Asia/Pacific Seamless Air Traffic Management Symposium and Ad Hoc Meeting (WP/39)

5.4.1 APANPIRG/22 reviewed the Report of the ICAO Asia/Pacific Seamless Air Traffic Management Symposium and Ad Hoc Meeting (Bangkok, 15 to 17 August 2011).

5.4.2 The 46th Conference of Directors General of Civil Aviation, Asia/Pacific Region (DGCA/46, Osaka, and October 2009) first addressed the 'Seamless Sky' and how this may affect the Asia/Pacific (APAC) Regions. DGCA/46 issued the Kansai Statement, which requested, *interalia*, the APANPIRG to be 'a starting platform for the discussion on 'Seamless ATM'.

5.4.3 APANPIRG/21 (Bangkok, Thailand, 6 – 10 September 2010) then developed ICAO Asia/Pacific Seamless ATM Workshop and Conclusion 21/12, which established the Seamless ATM Ad Hoc Meeting.

5.4.4 Seamless ATM Presentations

5.4.4.1 The following presentations and key points were made during the Seamless ATM Symposium (Monday 15 and Tuesday 16 August 2011):

- Seamless Global Drivers, ICAO HQ
- CARATS Seamless ATM Perspective, Japan Civil Aviation Bureau (JCAB)
- NextGen Seamless ATM Perspective, Federal Aviation Administration (FAA)
- SESAR Seamless ATM Perspective, SESAR JU (Joint Undertaking)
- Harmonizing ATM Modernization Programmes, ICAO HQ
- Aviation System Block Upgrades and Conferences, ICAO HQ
- Flexible Use of Airspace/Civil-military Cooperation, ICAO HQ, ICAO APAC
- Airline Perspective, IATA Asia/Pacific
- ANSP Perspective, CANSO Asia/Pacific Integrated PBN and ATFM, FAA
- Integration of UAS into ATM Systems, FAA
- AIM-SWIM, FPL 2012, ICAO HQ, ICAO APAC

- ATM Procedures and Drivers, FAA
- Airline Operations, IATA Asia/Pacific
- CNS Technology Roadmap, ICAO HQ
- ATS Surveillance, Airservices Australia
- PBN-GNSS development, ICAO HQ, ICAO APAC

5.4.5 Seamless ATM Symposium Discussion

5.4.5.1 A 'round table' discussion provided an opportunity for participants to debate and summarise the information that had been presented during the Symposium. Mr. David Burkholder, FAA and Mr. Colman Ng CADHK, China acted as Co-Chairs.

5.4.5.2 The Co-Chairs noted that the necessary enabling technology was there but it was somewhat fragmented, and being implemented slowly. This was mainly because of rigid regulatory systems and the very diverse APAC economies and environment. Often overlooked was terminal airspace congestion. The Co-Chairs identified that there were many different programmes, concepts, many technologies that have been around for some times but were under-utilized.

5.4.5.3 China wanted a clear definition of Seamless ATM and suggested that progress should be prioritised into several projects.

5.4.5.4 Hong Kong, China stated that it would be helpful if there was a list of tasks and a time line for achievement of these tasks; thus Seamless would become tangible.

5.4.5.5 Japan stated that in order to improve the way in which ANSPs worked, there was a need for clear guidance from ICAO from a body like a Task Force; and espoused the benefit of ANSP research and development collaboration.

5.4.5.6 The Republic of Korea stated that there was confusion caused by the proliferation of documents and terms such as the GANP with its 23 Global Plan Initiatives (GPIs), the many acronyms, the regional performance framework form and now Block Upgrades; thus there needed to be simple guidance.

5.4.5.7 Singapore suggested the scope of any work must focus on the systems and specific areas of improvement that enable seamlessness – not multiple projects, and followers could leapfrog steps from start to implementation, which could result in mass participation. Singapore asked whether the Asia and Pacific Regions needed to establish a dedicated pool of engineers to share expertise and resources.

5.4.5.8 SESAR JU advised that there were six main European service provision areas with almost 80% of the traffic, so if benefits focused on these areas, then others could benefit consequentially.

5.4.5.9 CANSO emphasised that there was a need to determine how to use the Seamless ATM 'box of tools'. There should be a focus on the MTFs and 'low hanging fruits' (simpler projects with good deliverables).

5.4.5.10 IATA stated that it was a reality that many ANSPs were institutional in their structure, which was quite different to the business model of airlines. There was a need to start looking at the gate-to-gate traffic flow perspective, and focus on capabilities, not technology. States did not need to replicate all aspects of Seamless ATM, as each had very different capabilities. A key

part of Seamless ATM was the military aspect. The concept can be done on a regional basis, and the implementation can be done on a sub-regional basis. There was a need to support controllers much better in some less-developed States. Some States were vulnerable to vendors.

5.4.5.11 IFATCA stated that there was a need to ensure that there are not too many 'holes' if States did not participate, and thus it was important that all administrations were involved.

5.4.6 Ad-Hoc Meeting, Wednesday, 17 August 2011

5.4.6.1 The ICAO APAC Deputy Regional Director opened the Ad Hoc Meeting, recalling the ICAO framework for Seamless ATM formed by the GANP and Operational Concept, and the direction from the DGCA Conference and APANPIRG.

- Development vision and programme: Australia, Airservices Australia
- Development vision and programme: China, CAAC
- Development vision and programme: Hong Kong, China, DGCA
- Development vision and programme: India, Airports Authority of India (AAI)
- Development vision and programme: Singapore, CAAS
- Development vision and programme: Thailand, Aerothai, Thailand
- Seamless ATM Research and Development Activities, ENRI, Japan
- Regional Harmonization, ICAO APAC

Ad Hoc Meeting Discussion

5.4.6.2 A 'round table' discussion provided an opportunity for participants to debate and summarise the information that had been presented during the Ad Hoc Meeting.

- Co-Chair summary:
  - There was a need for a Seamless Sky vision, which included the high level objectives, and a set of principles and guidelines.
  - There should be an Asian Skies Planning Team or Committee, to develop the vision and high level Seamless ATM concept, under APANPIRG.
  - The Group's tasks and objectives should keep evolving to deal with the challenges, and the group could track and monitor what was happening.
  - There should be a focus on the MTF and the ATM Coordination Group gaps, to ensure that the vision stayed in line with the Block Upgrades.
  - Asia/Pacific Regions did not need as detailed a plan as NextGen or SESAR.
  - Incremental targets could be set and suitable times for the body to complete its work, meeting more frequently than once a year.
  - The ATM modernization framework should be completed in two years.
  - This body should comprise members from key member States that had the expertise, technical support and resources to progress the work.
  - The group needed to be able to conduct its work and coordinate effectively between the APANPIRG Meeting dates.

- China comments:
  - The body should be a high level coordination group that avoided overlap with other task forces and groups.
- Hong Kong China comments:
  - Everyone needs to make a collective effort.
- Japan comments:
  - All Air Navigation Service Providers must be 'on board'.
  - There was a need to share information about this work.
  - The meeting had to be high level.
- Singapore comments:
  - Block Upgrades must be part of the solution.
  - The group's members must be sufficiently senior to support such a high-level group.
  - The group's scope should go beyond vision to specific capabilities and tangible deliverables, which can be implemented by Sub-Groups and/or ATM Coordination Groups.
  - Two years may not be enough to evaluate Seamless issues properly.
- IFATCA comments:
  - The establishment of core principles was not difficult as some information was already provided, such as the GPIs, Block Upgrades, etc.
- IATA comments:
  - A concept should be defined for each every traffic flow.
  - Work was achievable for a core team, which could then drill down to other expertise when required.
  - APAC had a broad Operational Concept, but it needed to add details.
  - Collaborative research and development was possible, so work was required to identify which States had research and development, and resources to support clustering capabilities (AIPS, manuals, etc.).
  - The regulators and military must be involved.

5.4.6.3 From the Symposium and Ad Hoc Meeting's presentations and discussions, the formation of a new group was supported by the Ad Hoc Meeting and the following were recommended as key principles, requirements and focus areas:

a) membership of the group: high level officials from States in the Asia Pacific Region and International Organizations that can provide the necessary expertise, research resources and leadership for the tasks and objectives of the group;

b) Meetings either two or three times a year (dependent on resources);

c) Work should focus on identifying Seamless ATM gaps, barriers and enablers for gate-to-gate operations on the busiest APAC MTFs in an incremental manner (project orientated), with a concept defined for each MTF; and

d) Information on Seamless ATM would be circulated by administrations and through an Internet site, which would aim to provide simple templates, guidance material and Seamless ATM principles for administrations.

5.4.6.4 APANPIRG/22 reviewed the Report of the Symposium and Ad Hoc Meeting as presented by the Secretariat, noting several key points from the Symposium and Ad Hoc Meeting presentations:

- Asian skies were like a jigsaw puzzle, consisting of 50 Flight Information Regions (FIRs) of various sizes, many that mirrored national boundaries.
- Moving from procedural and surveillance-based control (where the location of the aircraft is known) to trajectory-based control (where the future location of the aircraft is known) was critical.
- Specific technology was not necessarily considered relevant; what was relevant was the performance outcome.
- A small high level working group was suggested to develop the regional direction through key States, to act as an advisor to APANPIRG.
- CANSO noted the need to focus on customers using a business approach.
- The highly fragmented nature of airspace worked against Seamless ATM.
- Airservices Australia was working with the military to synchronise training, procurement of ATM and operating procedures.
- China had some difficult problems such as mountainous terrain, insufficient airspace, and inflexible utilisation.
- Closer international cooperation was required, and Seamless ATM was viewed as a high level principle in China.
- The growth in air traffic had been highly challenging to manage, with conflicting user requirements from civil, military and space users.
- The rigid airspace configuration caused airspace congestion.
- Ground systems needed to be addressed, especially in the areas of aerodrome complexity, taxiing and pushback, and runway capacity.
- The Seamless ASEAN Sky Initiative, led by Thailand and Singapore, was highlighted as having high level political support.
- There were numerous APAC initiatives that contributed to Seamless ATM, including ATS surveillance data sharing, and almost seamless operations between some city pairs, common rules used by most Pacific Island States, and the draft Airspace and ATFM Concepts of Operations.

5.4.6.5 Japan stated that this initiative was an excellent platform for Seamless ATM development and supported the formation of the Planning Group. Singapore also supported the Group, although they were concerned about the limitations of a two year timeline, suggesting that the planning group should decide themselves about the time needed to complete the task. India concurred with the Group. Australia was concerned about forming another group and potential overlaps with current Sub-Group work, stating that there needed to be a balance with Pacific and Asian States. Australia fully supported Seamless ATM development, but was concerned about the structural issues.

5.4.6.6 Malaysia fully supported the Group, but was concerned about the impact on States which were not represented at the Group, adding that would like to be an active member. New Zealand wanted the membership of the group to be not named in the TOR, so they could join later if desired. Japan also commented that they did not want to restrict the membership. Hong Kong, China recalled that the reason why the membership limitations of the Group was suggested was that it was intended to be small enough to be effective.

5.4.6.7 China fully supported the group, suggesting that it focus on policies and rule making. Thailand also fully supported the initiative, as did the Republic of Korea, which expressed willingness to join the Group.

5.4.6.8 The Chairman suggested that the group should be a high level group comprising senior officials/representatives nominated by the APAC Member States and International Organizations recognized by the ICAO Council; however Specialists/Advisors nominated by APAC member States could be co-opted by the group.

5.4.6.9 APANPIRG/22 reviewed the suggestions made by States and adopted the following Decision:

Decision 22/56- Establishment of Asia/Pacific Seamless ATM Planning Group

That an Asia/Pacific Seamless ATM Planning Group (APSAPG) composed of high level officials/representatives nominated by the States in the Asia/ Pacific Region and International Organizations be established, reporting to APANPIRG, in accordance with the Terms of Reference as shown in **Appendix D to the Report on Agenda Item 5.**

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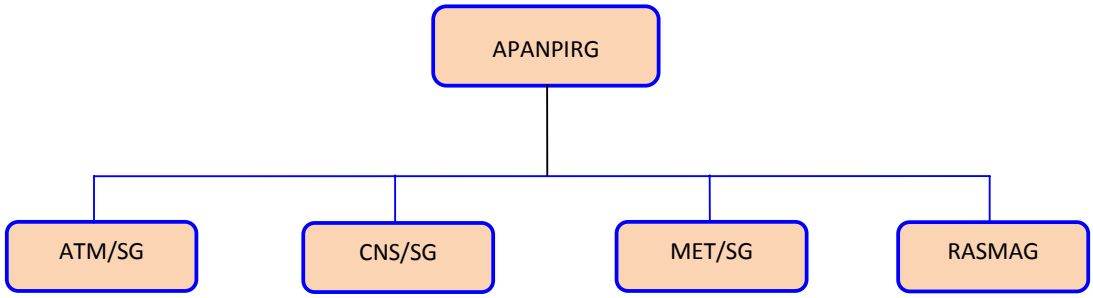
APPENDIX A
ACRONYMS

ATFM	Air Traffic Flow Management
RNP-SEA/TF	South East Asia RNP Implementation Task Force
RASMAG	Regional Air Space Monitoring Advisory Group of APANPIRG
BBACG	Bay of Bengal ATS coordination Group
FIT-BOB	FANS 1/A Implementation Team, Bay of Bengal
SAIOACG	South Asia Indian ocean ATM coordination Group
TRASAS	Trans-Regional Airspace and supporting ATM systems Steering Group
OPMET/M TF	Operational Meteorological Management Task Force
ADS-B SITF	ADS-B Study and Implementation Task Force
ATN IC G	Aeronautical Telecommunication Network Implementation and Coordination Group
SEACG	South East Asia ATS coordination Group
FIT-SEA	FANS 1/A Implementation Team, South East Asia
ATM/AIS/SAR/SG	ATM/AIS/SAR Sub-Group of APANPIRG
CNS/MET SG	CNS/MET Sub- Group of APANPIRG
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Group
AAITF	Aeronautical Information Services – Aeronautical Information Management Implementation Task Force
FPL & AM/TF	ICAO Flight Plan and ATS Messages Task Force
BOB-RHS/TF	Bay of Bengal Reduced Horizontal Separation Implementation Task Force
PBN TF	Performance Based Navigation Task Force
SEA-RR/TF	Southeast Asia Route Review Task Force
SEA ADS-B WG	The Southeast Asia Sub-regional ADS-B Implementation Working Group
SOCM	Satellite Data Link Operational Continuity Meeting
METWARN	Meteorology Warning

APPENDIX B

PROPOSED NEW STRUCTURE OF APANPIRG



APPENDIX C

TERMS OF REFERENCE OF CNS SUB-GROUP

1) Ensure continuous and coherent development of the ASIA/PAC Regional Air Navigation Plan in the CNS field in accordance with the Global Air Navigation Plan and Global Aviation Safety Plan.

2) Review, identify and address deficiencies that impede the implementation or provision of efficient CNS services in the ASIA/PAC Region.

3) Monitor CNS systems research and development, trial and demonstrations in the fields of CNS and facilitate the transfer of this information and expertise between States.

4) Make specific recommendations and guidance materials aimed at improving CNS services by the use of existing procedures and facilities and/or through the evolutionary implementation of CNS/ATM systems.

5) Review and identify inter-regional and intra-regional co-ordination issues in the field of CNS, harmonize and recommend actions to address those issues.

6) Ensure CNS environmental initiatives are consistently identified and progressed, and report outcomes from CNS environmental initiatives.

APPENDIX C

TERMS OF REFERENCE OF MET SUB-GROUP

1) Ensure continuous and coherent development of the ASIA/PAC Regional Air Navigation Plan in the MET field in accordance with the Global Air Navigation Plan and Global Aviation Safety Plan.

2) Review, identify and address deficiencies that impede the implementation or provision of efficient MET services in the ASIA/PAC Region.

3) Monitor research and development, trial and demonstrations in the field of MET and facilitate the transfer of this information and expertise between States.

4) Make specific recommendations and develop guidance materials aimed at improving MET services by the use of existing and/or new procedures, facilities and technologies

5) Review and Identify Inter-regional and intra-regional co-ordination issues in the field of MET and recommend actions to address those issues.

APPENDIX C

TERMS OF REFERENCE OF AIR TRAFFIC MANAGEMENT SUB-GROUP OF APANPIRG

1. Ensure continuous and coherent development of the ASIA/PAC Regional Air Navigation Plan in the ATM/AIM/SAR/AOP fields in accordance with the Global Air Navigation Plan and the Global Aviation Safety Plan;

2. Review, identify and address deficiencies that impede the implementation or provision of efficient ATM/AIM/SAR/AOP in the Asia/Pacific region;

3. Monitor CNS/ATM systems research and development, trials and demonstrations in the fields of ATM/AIM/SAR/AOP and facilitate the transfer of this information and expertise between States;

4. Make specific recommendations aimed at improving ATM/AIM/SAR/AOP by the use of existing procedures and facilities and/or through the evolutionary implementation of CNS/ATM systems;

5. Review and identify inter-regional co-ordination issues in the fields of ATM/AIM/SAR/AOP and recommend actions to address those issues; and

6. Ensure ATS and AOP environmental initiatives are consistently identified and progressed, and report outcomes from ATM /AOP environmental initiatives.

APPENDIX C

REGIONAL AIRSPACE SAFETY MONITORING ADVISORY GROUP (RASMAG)

TERMS OF REFERENCE OF RASMAG

The objectives of the Group are to:

a) facilitate the safe implementation of reduced separation minima and CNS/ATM applications within the Asia and Pacific Regions in regard to airspace safety monitoring; and

b) assist States to achieve the established levels of airspace safety for international airspace within the Asia and Pacific Regions.

To meet these objectives the Group shall:

a) review airspace safety performance in the Asia and Pacific Regions at the regional level and within international airspace;

b) review and develop as necessary, guidance material for airspace safety monitoring, assessment and reporting activities, including the duties, responsibilities and scope of regional monitoring entities;

c) recommend, and facilitate as necessary, the implementation of airspace safety monitoring and performance assessment services;

d) review and recommend on the competency and compatibility of monitoring organizations and recommend to APANPIRG specific airspace responsibility for individual regional monitoring entities;

e) review, coordinate and harmonize regional and inter-regional airspace safety monitoring activities;

f) review regional and global airspace planning and developments in order to anticipate requirements for airspace safety monitoring and assessment activities;

g) address other airspace safety related issues as necessary;

h) facilitate the distribution of safety related information to States, and

i) provide to APANPIRG comprehensive reports on regional airspace safety and coordinate with other contributory bodies of APANPIRG as appropriate.

Task List

To review the safety monitoring programmes in the Asia and Pacific Regions for implementation and operation of:

a) reduced vertical separation minimum (RVSM);

b) reduced horizontal (lateral and longitudinal) separation minima using RNP;

c) aircraft separation applications using data link, e.g. ADS and CPDLC; and

d) ATS Unit to ATS Unit operational messaging using AIDC

APPENDIX C

TERMS OF REFERENCE for AOP WORKING GROUP

1. Ensure the continuous and coherent development of the Asia/Pacific Regional Air Navigation Plan in the AOP Field in accordance with the GANP and GASP.

2. Promote and follow up the implementation of the AOP requirements of the APAC ANP.

3. Review, identify and address deficiencies in the provision of aerodrome installations, equipment and Services according to established procedures, and propose corresponding timely corrective actions to the shortcomings/deficiencies affecting aerodrome operations.

4. Monitor developments in the field of aerodrome operations in the APAC Regions, new operational requirements and /or technological developments including environment aspects and make proposals to meet the operational requirements related to these developments.

APPENDIX D

ASIA-PACIFIC SEAMLESS ATM PLANNING GROUP (APSAPG) – Terms of Reference

APSAPG Objective and Scope

The objective of the Asia/Pacific (APAC) Seamless ATM Planning Group (APSAPG) is to determine the means for Seamless ATM development in the Asia and Pacific Regions.

APAC Seamless ATM Plan

The Plan will be aligned with the ICAO Global ATM Operational Concept (Doc 9854) and the Global Air Navigation Plan (Doc 9750), taking into account of the output from the GANIS in 2011 and AN Conference in 2012, and other global Seamless ATM initiatives that may affect the APAC Regions.

In defining the Concept Plan the APSAPG shall:

- conceptualise future Seamless APAC air traffic operations, paying due regard to traffic forecasts for major airports and major traffic flows;

- determine the key and minimum requirements (including but not limited to, technologies, regulations, training, airspace organisation) for seamless ATM for the following phases:

    - surface movements;
    - departure;
    - en-route; and
    - arrival and approach;

- verify the current status of APAC administration's Seamless ATM capability, including the identification of gaps affecting harmonization and interoperability;

- determine priorities, programmes, and mechanisms for implementation of Seamless ATM, including phases with broad timelines and projected deliverables; and

- develop guiding principles related to the Seamless ATM consultation and collaboration processes, including reference material for decision-makers.

Coordination

APSAPG shall coordinate through the Secretariat with other Regional Groups, including ASEAN and future modernisation of ATM systems in other regions to ensure trans-regional issues are managed.

Composition

The APSAPG will be a high level group comprising of senior officials/representatives nominated by the APAC Member States and International Organizations recognized by the ICAO Council, that can provide the necessary expertise, research resources and leadership for the tasks and objectives of the APSAPG. Specialists/Advisors nominated by the APAC member States could be co-opted by the group.

APSAPG is expected to meet approximately twice a year, subject to resources and work progress.

Reporting

The APSAPG shall submit a preliminary/interim study to APANPIRG/23 in 2012 and a final study to APANPIRG/24 in 2013.

AGENDA ITEM 6: ANY OTHER BUSINESS

Agenda Item 6: Any other business

6.1 Addressing Deficiencies and APANPIRG Conclusion Obligations through the ICAO Technical Cooperation Programme (WP/28)

6.1.1 The meeting was informed that ICAO Technical Co-operation Bureau (TCB) can assist the Asia and Pacific States in eliminating air navigation deficiencies and contribute towards assuring safety and regularity of aircraft operations. The meeting noted that ICAO Technical Co-operation is a long established programme in assisting States with the effective implementation of SARPs and Air Navigation Plans, developing civil aviation systems and human resources, expanding or improving infrastructures and remedying, in a coordinated way.

6.1.2 The meeting noted that among the advantages to States/Administrations derived from using ICAO's Technical Cooperation Programme include: cost-effective solutions while guaranteeing strict neutrality, objectivity and transparency at the same time promoting the enhancement of oversight capabilities of States and their compliance.

6.1.3 Services provided by ICAO TCB range from the recruitment of international experts and national professionals, the provision of training, the development or strengthening of training institutions, and the procurement of equipment and services. TCB's unique expertise in field procurement will ensure that high-quality; SARPs compliant equipment is acquired at the best price to meet specific requirements, either by providing a complete procurement service or by offering assistance during specific phases of the procurement process.

6.1.4 The meeting noted that in the Asia/Pacific Region, the Technical Cooperation Officer position has been established at the RO Bangkok to serve as a focal point of contact.

6.2 Update on the Next Generation of Aviation Professionals Initiatives (WP/38)

6.2.1 The meeting recalled that ICAO launched the Next Generation of Aviation Professionals (NGAP) initiatives to develop mitigating measures to a foreseen shortage of personnel so that enough qualified and competent aviation professionals are available to operate, manage and maintain the future international air transport system. In May 2009, ICAO with the assistance of several stakeholders created the NGAP Task Force. The work programme of the Task Force includes the enhancement of training for flight crew, air traffic management personnel and aircraft maintenance personnel to meet the demands of new procedures and increasingly complex technologies. The recent work of the Task Force include Amendment 170 to Annex 1 that enables an alternative means of compliance with the experience requirements for the aircraft maintenance technician license when competency-based approved training programmes are used and the first amendment to ICAO Doc 9868 – *PANS-Training*. It introduces a new chapter addressing competency-based training and assessment for aircraft maintenance personnel.

6.2.2 ICAO published two other documents closely related to NGAP initiatives: Document 9956 – *Global and Regional 20-year Forecasts and the ICAO Training Report*. The NGAP outreach activities include organization of a series of NGAP/TRAINAIR Plus regional conferences which will lead to the 2nd NGAP Symposium in April 2012.

6.2.3 The meeting encouraged the participation of States in the upcoming fourth meeting of the NGAP Task Force from 24 to 26 October 2011 at ICAO Headquarters in Montreal.

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ATTACHMENTS TO THE REPORT

Attachment 1 to the APANPIRG/22 Report

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
1.	**AUSTRALIA (2)**				
	1.	Mr. Malcolm MCGREGOR	Manager Airways and Aerodromes	Tel: +61 (2) Fax: +61 (2)	
	2.	Mr. Jeffrey BOLLARD	Senior Engineer Airservices Australia	Tel: +61 (2) 6268 4949 Fax: +61 (2)	jeffrey.ballard@airservicesaustralia.com
2.	**BANGLADESH (2)**				
	3.	Mr. Shaikh Abul BASHER	Consultant (ANS) Flight Safety & Regulations Division Civil Aviation Authority Kurmitola, Dhaka 1229	Tel: +88 (2) 891 1126 Fax: +88 (2)	Basher.fs@gmail.com
	4.	Mr. Haque AKM FAIZUL	Assistant Director (ATS) ATS & Aerodromes Division Civil Aviation Authority Kurmitola, Dhaka 1229	Tel: +88 (2) 891 4810-9 Ext: 3431 Fax: +88 (2) 891 3322	Faizul_bsl@yahoo.com adats@caab.gov.bd
3.	**CAMBODIA (2)**				
	5.	H.E. Chea AUN	Director General State Secretariat of Civil Aviation No. 62 Preah Norodom Blvd. Phnom Penh	Tel: +855 (23) 220371, 427141, 360617 Fax: +855 (23) 220370, 426169, 725938	civilaviation@bigpond.com.kh; cheaaun@dgcac.gov.kh; cheaaun@online.com.kh; cheaaun@gmail.com
	6.	Mr. Chhun SIVORN	Deputy Director of Safety and Flight Operation	Tel: +855 (23) Fax: +855 (23)	
4.	**CHINA (4)**				
	7.	Ms. Jing ZHANG	Director, International Cooperation Division ATMB, Civil Aviation Administration of China No. 12, East San-huan Road Middle, Chaoyang District, Beijing China 100022	Tel: +86 (10) 8778 6051 Fax: +86 (10) 8778 6055	cherry@atmb.net.cn

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	8.	Ms. Rui WANG	Assistant, International Cooperation Division ATMB, Civil Aviation Administration of China No. 12, East San-huan Road Middle, Chaoyang District, Beijing China 100022	Tel: +86 (10) 8778 6053 Fax: +86 (10) 8778 6055	wangrui@atmb.net.cn wr2252@hotmail.com
	9.	Mr. Hui Chen ZHU	Deputy Director, Air Traffic Control Division ATMB, Civil Aviation Administration of China No. 12, East San-huan Road Middle, Chaoyang District, Beijing China 100022	Tel: +86 (10) 8778 6816 Fax: +86 (10) 8778 6810	zhuchenhui@atmb.net.cn
	10.	Mr. Hui Guo ZHU	Assistant, CNS Division ATMB, Civil Aviation Administration of China No. 12, East San-huan Road Middle, Chaoyang District, Beijing China 100022	Tel: +86 (10) 8778 6916 Fax: +86 (10) 8778 6910	zhuguohui@atmb.net.cn
	HONG KONG (9)				
	11.	Mr. Norman LO	Director-General of Civil Aviation Civil Aviation Department 46th Floor, Queensway Government Offices 66 Queensway Hong Kong, China	Tel: +852 2867 4201 Fax: +853 2501 0640	nsmlo@cad.gov.hk
	12.	Mr. NG Shung Ching Colman	Assistant Director-General of Civil Aviation (Airport Standards), Civil Aviation Department Room 6T067, Passenger Terminal Building, Hong Kong International Airport, 1 Cheong Hong Road, Lantau	Tel: +852 2182 1223 Fax: +852 2795 8469 +852 2261 2728	cscng@cad.gov.hk
	13.	Mr. WONG Ping Fai	Assistant Director-General of Civil Aviation (Air Traffic Management) Civil Aviation Department 4/F, Air Traffic Control Complex Hong Kong International Airport	Tel: +852 2910 6402 Fax: +852 2910 0186	pfwong@cad.gov.hk

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	14.	Dr. Cho M CHENG	Acting Assistant Director (Forecasting and Warning Services) Hong Kong Observatory 134A, Nathan Road, Tsim Sha Tsui, Kowloon	Tel: +852 2926 8223 Fax: +852 2311 9448	cmcheng@hko.gov.hk cmcheng.hku@gmai.com
	15.	Mr. Raymond LI	Chief (Operations and Personnel) Civil Aviation Department 4/F, Air Traffic Control Complex Hong Kong International Airport	Tel: +852 2910 6438 Fax: +852 2910 0186	rkcli@cad.gov.hk
	16.	Mr. WU Chi Kwong, Richard	Chief Electronics Engineer Civil Aviation Department 3/F, Dragon House, No. 11 Tung Fai Road Hong Kong International Airport	Tel: +852 2591 5001 Fax: +852 2845 7160	rckwu@cad.gov.hk
	17.	Mr. Lucius FAN	Senior Operations Officer Civil Aviation Department 4/F, Air Traffic Control Complex Hong Kong International Airport	Tel: +852 2910 6466 Fax: +852 2910 0186	lwcfan@cad.gov.hk
	18.	Mr. Gildas FUNG	Air Traffic Control Officer Civil Aviation Department 4/F, Air Traffic Control Complex Hong Kong International Airport	Tel: +852 2910 6808 Fax: +852 2910 0186	
	19.	Mr. HUI Man Ho	Electronics Engineer Civil Aviation Department 3/F, Dragon House, No. 11 Tung Fai Road Hong Kong International Airport	Tel: +852 2591 5035 Fax: +852 2845 7160	mhhui@cad.gov.hk
	MACAO (3)				
	20.	Mr. Wa Kin, Stanley PUN	Acting Director-Flight Standards & Licensing Civil Aviation Authority of Macao Alameda Dr. Carlos D'Assumpção, 336-342 Centro Comercial Cheng Feng, 18° andar	Tel: +853 8796 4136 Fax: +853 2833 8089	stanleypun@aacm.gov.mo aacm@aacm.gov.mo

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	21.	Mr. Veng Tong, Freeman LO	Senior Safety Officer (CNS) Civil Aviation Authority of Macao Alameda Dr. Carlos D'Assumpção, 336-342 Centro Comercial Cheng Feng, 18° andar	Tel: +853 8796 4132 Fax: +853 2833 8089	freemanlo@aacm.gov.mo aacm@aacm.gov.mo
	22.	Mr. Kuan Hou, Bryan CHIU	Safety Officer (Air Traffic Control) Flight Standards & Licensing Civil Aviation Authority of Macao Alameda Dr. Carlos D'Assumpção, 336-342 Centro Comercial Cheng Feng, 18° andar	Tel: +853 8796 4142 Fax: +853 2833 8089	bryanchiu@aacm.gov.mo aacm@aacm.gov.mo
5.	**DPR KOREA (3)**				
	23.	Mr. Hong Sung RI	Chief, Navaids Air Traffic Management Dept. General Administration of Civil Aviation Sunan District, Pyongyang	Tel: +850 2 18111 ext. 8108 Fax: +850 2 3814410	gaca@silibank.net.kp
	24.	Mr. Tae Hun KIM	Supervisor, Air Traffic Control Center, Pyongyang General Administration of Civil Aviation Sunan District, Pyongyang	Tel: +850 2 18111 ext. 8108 Fax: +850 2 3814410	gaca@silibank.net.kp
	25.	Mr. Kyong Ho HAN	Officer, International Organization Dept. General Administration of Civil Aviation Sunan District, Pyongyang	Tel: +850 2 18111 ext. 8108 Fax: +850 2 3814410	gaca@silibank.net.kp
6.	**FIJI ISLANDS (3)**				
	26.	Mr. Isei T TUDREU	Controller Ground Safety Civil Aviation Authority of Fiji Private Mail Bag, NAP 0354, Nadi Airport	Tel: +679 672 1555 Fax: +679 672 1500	cgs@caaf.org.fj iseitudreu@hotmail.com
	27.	Mr. Epeli NAIVALU	General Manager Air Traffic Management & Training Academy Airports Fiji Limited Private Mail Bag, Nadi Airport	Tel: +679 6725 777 Mob: +679 990 6900 Fax: +679 6725 161	epelin@afl.com.fj

List of Participants

		NAME	TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	28.	Mr. Konrad SZCZEPANIAK	General Manager Engineering & Infrastructure Airports Fiji Limited Private Mail Bag, Nadi Airport	Tel: +679 6725 777 ext. 4707 Mob: +679 990 6781 Fax: +679 6724 161	konrads@afl.com.fj
7.	**FRANCE (2)**				
	29.	Mr. Fabrice TUSSAU	Director Asia-Pacific–EGISAVIA 4 bis rue Paul Mesplé B.P. 20603 31106 Toulouse Cedex 1 France	Tel: +33 5 62 245 606 Fax: +33 5 62 244 994	fabrice.tussau@egis.fr
	30.	Mr. Vivian ELISE	Head of ANS in French Polynesia SEAC/Pf Service Navigation Aérienne B.P. 6011 98702 Faa'a Centre Tahiti, French Polynesia	Tel: +689 86 10 21 Fax: +689 86 12 29	vivian.elise@seac.pf
8.	**INDIA (7)**				
	31.	Mr. E.K. Bharat BHUSHAN	Director General of Civil Aviation Directorate General of Civil Aviation Opposite Safdarjung Airport New Delhi, India 110003	Tel: +91 (11) 2462 0784 Fax: +91 (11) 2465 2760	dgoffice@dgca.nic.in
	32.	Mr. V.P. AGRAWAL	Chairman, Airports Authority of India	Tel: +91 (11) Fax: +91 (11)	
	33.	Mr. V. SOMASUNDARAM	Member (ANS), Airports Authority of India	Tel: +91 (11) Fax: +91 (11)	memberans@aai.aero
	34.	Mr. P.K. KAPOOR	ED (CNS-OM), CHQ, Airports Authority of India	Tel: +91 (11) Fax: +91 (11)	pkkapoor@aai.aero

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	35.	Mr. N. G. CHIKKATHIMMIAH	ED (Aerodrome Licensing) Airports Authority of India	Tel: +91 (11) Fax: +91 (11)	
	36.	Mr. Sylvester ISRAEL	GM (ATM), CHQ, Airports Authority of India	Tel: +91 (11) Fax: +91 (11)	sylvy197@gmail.com
	37.	Mr. K. GANESAN	GM (CNS-SR), Airports Authority of India	Tel: +91 (11) Fax: +91 (11)	kganeshan@aai.aero
9.	**INDONESIA (5)**				
	38.	Ms. Dinni NOERDIANI	Chief of Sub Directorate Aeronautical Information Management Directorate General of Civil Aviation Jl. Medan Merdeka Barat No. 8 Jakarta 10110	Tel: +62 (21) 3505 550 Fax: +62 (21) 3507 569	
	39.	Ms. Cindy MAYRIANTI	Head of Air Law Section, Directorate of Political, Security, Territorial Affairs Ministry of Foreign Affairs Jl. Taman Pejambon 6, Jakarta 10110	Tel: +62 (21) 384 9618 Fax: +62 (21) 352 4154	cindydjelani@yahoo.com
	40.	Mr. RUSMANTO	Manager Yan ACC BSH PT Angkasa Pura II (Persero)	Tel: +62 (21) Fax: +62 (21)	
	41.	Mr. NURHASAN	Manager ATS Standardization PT Angkasa Pura II (Persero)	Tel: +62 (21) Fax: +62 (21)	
	42.	Mr. PURWOTO	ATS Coordinator BSH PT Angkasa Pura II (Persero)	Tel: +62 (21) Fax: +62 (21)	

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
10.	**JAPAN (3)**				
	43.	Mr. Takeshi IMAGOME	Director, Air Traffic International Affairs Office Japan Civil Aviation Bureau 2-1-3, Kasumigaseki, Chiyoda-ku, Tokyo	Tel: +81 (3) 5253 8740 Fax: +81 (3) 5253 1663	imagome-t43s3@mlit.go.jp
	44.	Mr. Tomoo MATSUMURA	Chief Official of Air Traffic International Affairs Office Japan Civil Aviation Bureau 2-1-3, Kasumigaseki, Chiyoda-ku, Tokyo, 100-8919, Japan	Tel: +81 (3) 5253 8740 Fax: +81 (3) 5253 1663	matsumura-t2jw@mlit.go.jp
	45.	Ms. Tomoko NAKAGAWA	Assistant to the Director, Air Traffic International Affairs Office Japan Civil Aviation Bureau 2-1-3, Kasumigaseki, Chiyoda-ku, Tokyo, 100-8919, Japan	Tel: +81 (3) 5253 8740 Fax: +81 (3) 5253 1663	nakagawa-t07au@mlit.go.jp
11.	**LAO PDR (5)**				
	46.	Mr. Somchit VINITKEOPHAVANH	Director General of Lao Air Traffic Management Department of Civil Aviation of Lao PDR Wattay International Airport P.O. Box 2985, Vientiane Capital, Lao PDR	Tel: +856 (21) 512 006 Fax: +856 (21) 512 216	laoats@yahoo.com
	47.	Mr. Amdounla SALINTHONE	Director of Air Traffic Services Center Wattay International Airport P.O. Box 2985, Vientiane Capital, Lao PDR	Tel: +856 (21) 512 006 Fax: +856 (21) 512 216	amdounla@hotmail.com asalinthone@gmail.com
	48.	Mr. Sithideth SAVANMANOTHAY	Director of Air Traffic Technical Services Center Wattay International Airport P.O. Box 2985, Vientiane Capital, Lao PDR	Tel: +856 (21) 512 006 Fax: +856 (21) 512 216	s_savanmanothay@hotmail.com
	49.	Mr. Bountaeng SYMOON	Director of Air Navigation Division Department of Civil Aviation of Lao PDR Wattay International Airport P.O. Box 119, Vientiane, Lao PDR	Tel: +856 (21) 512 164 Fax: +856 (21) 520 237	bountaeng@yahoo.com laodca@laotel.com

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	50.	Mr. Bounthueng SOUMONTHA	Deputy Director of Aeronautical Telecommunication Division Department of Civil Aviation of Lao PDR Wattay International Airport P.O. Box 119, Vientiane, Lao PDR	Tel: +856 (21) 512 164 Fax: +856 (21) 520 237	b_soumontha@yahoo.com laodca@laotel.com
12.	**MALAYSIA (12)**				
	51.	Dato' Azharuddin Abdul RAHMAN	Director General of Civil Aviation ARAS 1-4, Blok Podium No. 27, Persiaran Perdana, Presint 4 Pusat Pentadbiran Kerajaan Persekutuan 62618 Putrajaya	Tel: +60 (3) 8871 4000 Fax: +60 (3) 8890 1640	azhar@dca.gov.my;
	52.	Mr. Ahmad Nizar ZOLFAKAR	Director, Air Traffic Management Sector Department of Civil Aviation	Tel: +60 (3) 8871 4000 Fax: +60 (3) 8890 1640	
	53.	Mr. V.P.R. NATHAN	Deputy Director, Air Traffic Management Sector Department of Civil Aviation	Tel: +60 (3) 8871 4000 Fax: +60 (3) 8890 1640	
	54.	Mr. Tarlochan Singh Kernal SINGH	Department of Civil Aviation	Tel: +60 (3) 2071 2812 Fax: +60 (3)	tarlochan.kernal@airforce.gov.my
	55.	Mr. Mohamad Daud Bin SULAIMAN	Department of Civil Aviation	Tel: +60 (3) 2071 6578 Fax: +60 (3) 2692 4423	duad.sulaiman@airforce.gov.my
	56.	Dato' Mustaffa Haji Abd. RAHMAN	Department of Civil Aviation		
	57.	Mr. Abdul Rahim WAHAB	Department of Civil Aviation		
	58.	Mr. Shahiran JAAFAR	Department of Civil Aviation		
	59.	Mr. Mohd Razmin Sham MAZLAN	Department of Civil Aviation		

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	60.	Mr. Saharudin TUMIRAN	Department of Civil Aviation	Tel: +6019 230 4444 Fax: +	dino@aai.my
	61.	Mr. Mohd Iskandar Zulkarnain Mohd Noh	Assistant Director Dept of Civil Aviation Malaysia		
	62.	Mr. Zulfadzly Abdul HAMID	Technical Manager Dept of Civil Aviation Malaysia 64000 Kuala Lumpur International Airport Sepang, Selangor	Tel: +60 (3) 8787 2099 Fax: +60 (3) 8787 2066	zulfadzly@amcop.com.my
13.	**MONGOLIA (5)**				
	63.	Mr. Baldandorj ALTANTSOM	Deputy DG and Director of Air Navigation Services Administration Civil Aviation Authority of Mongolia Building Buyant Ukhaa 17120, Khan-Uul district Ulaanbaatar	Tel: +976 (11) 282 002 Fax: +976 (11) 282102	altantsom@mcaa.gov.mn
	64.	Mr. Purevjav GANBOLD	Director of CNS Division Civil Aviation Authority of Mongolia Building Buyant Ukhaa 17120, Khan-Uul district Ulaanbaatar	Tel: +976 (11) 285050 Fax: +976 (11) 285050	ganbold@mcaa.gov.mn
	65.	Mr. Purev ARIUNGEREL	Director of AIS Division Civil Aviation Authority of Mongolia Building Buyant Ukhaa 17120, Khan-Uul district Ulaanbaatar	Tel: +976 (11) 283131 Fax: +976 (11) 313157	ariungerel@mcaa.gov.mn ariungerel.p@mcaa.gov.mn
	66.	Mr. Davaadorj ODGEREL	Officer for Airspace Management Civil Aviation Authority of Mongolia Building Buyant Ukhaa 17120, Khan-Uul district Ulaanbaatar	Tel: +976 (11) 282 002 Fax: +976 (11) 282102	odgerel@mcaa.gov.mn Odgerel0@yahoo.com

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	67.	Mr. Gurdorj BAT	Officer Ministry of Road, Transportation, Construction and Urban Development Barilgachdiin talbai 3, Chingeltei district Ulaanbaatar 15170	Tel: +976 (99) 106064 Fax: +976 (99)	Bat_gurdorjiin@yahoo.com
14.	**MYANMAR (2)**				
	68.	Mr. Tike AUNG	Director (ANS) Air Navigation Safety Division Department of Civil Aviation, Myanmar Ministry of Transport Yangon	Tel: +95 (1) 533 008 Fax: +95 (1) 533 016	ats@dca.gov.mm utikeaung@gmail.com
	69.	Mr. Aung Myint THEIN	Deputy Director (ANS) Air Navigation Safety Division Department of Civil Aviation, Myanmar Ministry of Transport Yangon	Tel: +95 (1) 533 008 Fax: +95 (1) 533 016	ats@dca.gov.mm
15.	**NEPAL (4)**				
	70.	Mr. Dinesh Prasad SHRESTHA	Deputy Director General Civil Aviation Authority of Nepal Babar Mahal, Kathmandu	Tel: +977 (1) 426 2532 Fax: +977 (1) 426 2324	dnshprasadshrestha2@gmail.com dindps@yahoomail.com
	71.	Mr. Mahendra Singh RAWAL	Director, CNS Civil Aviation Authority of Nepal Babar Mahal, Kathmandu	Tel: +977 (1) 426 2387 +977 (1) 426 5243 Fax: +977 (1) 426 2516	mrawal@wlink.com.np mahendra.rawal9@gmail.com
	72.	Mr. Rishikesh SHARMA	Director Civil Aviation Authority of Nepal Babar Mahal, Kathmandu	Tel: +977 (1) 449 8775 Fax: +977 (1) 411 3296	rishi_kesh67@yahoo.com

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	73.	Mr. Punya Raj SHAKYA	Officiating Director, Department of Aerodrome Safety and Standards Civil Aviation Authority of Nepal Babar Mahal, Kathmandu	Tel: +977 (1) 426 2532 Fax: +977 (1) 426 2324	dwpwshakya@ntc.net.np tiaip@caanepal.org.np
16.	**NEW ZEALAND (1)**				
	74.	Mr. Mike HAINES	Manager, Aeronautical Services New Zealand Civil Aviation Authority PO Box 3555, Wellington 6140	Tel: +64 (4) 560 9429 Fax: +64 (4) 569 2024	mike.haines@caa.govt.nz piru@caa.govt.nz
17.	**PAPUA NEW GUINEA (1)**				
	75.	Mr. James TUGURU	Senior Air Traffic Services Inspector Civil Aviation Safety Authority P.O. Box 1941 Boroko	Tel: +675 302 7560 Fax: +675 325 1919	jtuguru@casapng.gov.pg james.tuguru@gmail.com
18.	**PHILIPPINES (1)**				
	76.	Mr. Andrew B. BASALLOTE	Assistant Director General II Air Navigation Service Civil Aviation Authority of the Philippines	Tel: +63 (2) Fax: +63 (2)	
19.	**REPUBLIC OF KOREA (4)**				
	77.	Mr. Dong-Cheol JANG	Deputy Director/ATM Division Office of Civil Aviation/Ministry of Land, Transport and Maritime Affairs 1-8, Byeoryang-dong, Gwacheon-si, Gyeonggi-do, 427-040	Tel: +82 (2) 2669 6423 Fax: +82 (2) 6342 7289	djang@korea.kr dcatom@naver.com
	78.	Mr. Hyungjin PARK	Assistant Director/ATM Division Office of Civil Aviation/Ministry of Land, Transport and Maritime Affairs 1-8, Byeoryang-dong, Gwacheon-si, Gyeonggi-do, 427-040	Tel: +82 (2) 2669 6428 Fax: +82 (2) 6342 7289	galahad@korea.kr

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	79.	Mr. Kyeong-beom KANG	Assistant Director Office of Civil Aviation/Ministry of Land, Transport and Maritime Affairs 1-8, Byeoryang-dong, Gwacheon-si, Gyeonggi-do, 427-040	Tel: +82 (2) 2669 6449 Fax: +82 (2) 2662 6749	kangops@korea.kr
	80.	Mr. Seong-Hoon JEONG	Staff Regional Aviation Administration, Ministry of Land, Transport and Maritime Affairs Flight Inspection Center 244-2, Ogok-dong, Gangseo-gu, Seoul 157260	Tel: +82 (2) 2660 2162 Fax: +82 (2) 2660 0881	airjeong@korea.kr jetapen1@mltm.go.kr
20.	**SINGAPORE (8)**				
	81.	Mr. Ong Heng YAP	Director-General Civil Aviation Authority of Singapore PO Box 1 Singapore Changi Airport Singapore 918141	Tel: +65 6541 2010 Fax: +65 6542 1231	yap_ong_heng@caas.gov.sg
	82.	Mr. Poh Theen SOH	Assistant Director-General (ANS) Civil Aviation Authority of Singapore PO Box 1 Singapore Changi Airport Singapore 918141	Tel: +65 6541 2002 Fax: +65 6542 1231	soh_poh_theen@caas.gov.sg
	83.	Mr. Cheng Nam YEO	Director (ATE) Civil Aviation Authority of Singapore PO Box 1 Singapore Changi Airport Singapore 918141	Tel: +65 6541 2442 Fax: +65 6545 6516	yeo_cheng_nam@caas.gov.sg
	84.	Ms. Penny NG	Head (ANS Policy) Civil Aviation Authority of Singapore PO Box 1 Singapore Changi Airport Singapore 918141	Tel: +65 6595 6067 Fax: +65 6545 6516	penny_ng@caas.gov.sg

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	85.	Mr. Kong Beng KUAH	Director (ATS) Civil Aviation Authority of Singapore PO Box 1 Singapore Changi Airport Singapore 918141	Tel: +65 6541 2405 Fax: +65 6545 6516	kuah_kong_beng@caas.gov.sg
	86.	Mr. Kelvin HENG	Senior Manager (National ANS Policy) Civil Aviation Authority of Singapore PO Box 1 Singapore Changi Airport Singapore 918141	Tel: +65 6541 2794 Fax: +65 6545 6516	kelvin_heng@caas.gov.sg
	87.	Mr. Edmund HENG	Deputy Chief SATCC Civil Aviation Authority of Singapore Singapore Air Traffic Control Centre 60 Biggin Hill Road Singapore 509950	Tel: +65 6541 2430 Fax: +65 6545 6252	edmund_heng@caas.gov.sg
	88.	Mr. Hermizan JUMARI	Senior ATC Manager (ATM/Sys) Civil Aviation Authority of Singapore PO Box 1 Singapore Changi Airport Singapore 918141	Tel: +65 6595 6064 Fax: +65 6545 6516	hermizan_jumari@caas.gov.sg
21.	**SRI LANKA (2)**				
	89.	Mr. Chandrasena NIMALSIRI	Director General of Civil Aviation & Chief Executive Officer Civil Aviation Authority of Sri Lanka No. 4 Hunupitiya Road, Colombo 02	Tel: +94 (11) 230 4666 Fax: +94 (11) 230 4706	sldgca@caa.lk sldgca@slt.lk
	90.	Mr. Atula JAYAWICKRAMA	Director/Aeronautical Services Civil Aviation Authority of Sri Lanka No. 4 Hunupitiya Road, Colombo 02	Tel: +94 (11) 235 8910 Fax: +94 (11) 230 4645	ddans@caa.lk atulacaa@sltnet.lk

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
22.	**THAILAND (21)**				
	91.	Mr. Nakorn YOONPAND	Air Traffic Control Specialist Department of Civil Aviation 71 Soi Ngarmduplee, Rama IV Road Bangkok 10120	Tel: +66 (2) 287 0320 ext. 1139 Fax: +66 (2) 286 8159	
	92.	Mr. Veera CHEEVAIDSARAKUL	Aviation Safety Inspection Department of Civil Aviation 71 Soi Ngarmduplee, Rama IV Road Bangkok 10120	Tel: +66 (2) 287 3547 Fax: +66 (2) 286 2913	veera@aviation.go.th
	93.	Mr. Noppadol CHINPUMIWASANA	Flight Operation Inspector Department of Civil Aviation 71 Soi Ngarmduplee, Rama IV Road Bangkok 10120	Tel: +66 (2) 286 2374 Fax: +66 (2) 286 2913	noppadol.c@aviation.go.th
	94.	Ms. Yaovapa TANADCHANGSEANG	Director, Bureau of Aeronautical Meteorology Thai Meteorological Department 6th floor ATC Complex Suvarnabhumi International Airport Bang Phli, Samutprakarn 10540	Tel: +66 (2) 134 0011 ext.216 Fax: +66 (2) 134 0010	yaovapa@tmd.go.th
	95.	Mr. Somchai YIMSRICHAROENKIT	Director, Aeronautical Meteorology Forecast Div. Thai Meteorological Department 6th floor ATC Complex Suvarnabhumi International Airport Bang Phli, Samutprakarn 10540	Tel: +66 (2) 134 0011 ext.214 Fax: +66 (2) 134 0010	somchai_yim@tmd.go.th
	96.	Mr. Bancha KAEWNGAM	Professional Meteorologist Thai Meteorological Department Bureau of Aeronautical Meteorology 6th floor ATC Complex Suvarnabhumi International Airport Bang Phli, Samutprakarn 10540	Tel: +66 (2) 134 0007 Fax: +66 (2) 134 0010	khink08@hotmail.com

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	97.	Ms. Rassmee DAMRONGKIETWATTANA	Professional Meteorologist Thai Meteorological Department Bureau of Aeronautical Meteorology 6th floor ATC Complex Suvarnabhumi International Airport Bang Phli, Samutprakarn 10540	Tel: +66 (2) 134 0007 Fax: +66 (2) 134 0010	rassmee@hotmail.com rassmee@tmd.go.th
	98.	Wg. Cdr. Apichart WATAWATTANA	Flight Instructor, Acting Director of Flight Training Division Civil Aviation Training Center 66/19 Petchkasem Rd., Hua Hin 2, Hua Hin Prachuabkhirikhan 77110	Tel: +66 (32) 520 337 Fax: +66 (32) 520 146	apichartwata@yahoo.com apichart_367@hotmail.com
	99.	Capt. Apilak PERMPHOL	Deputy Department Manager, International Flight Safety and Operations Development Department Thai Airways International Public Co., Ltd. 89 Vibhavadi Rangsit Road, Bangkok 10900	Tel: +66 (2) 545 2665 Fax: +66 (2) 535 3849	Apiluk.p@thaiairways.com Apiluk.p@gmail.com
	100.	Capt. Chul-chumnun SUWANNA-ATHA	A330-300 Pilot Instructor Flight Operation Dept. Thai Airways International Public Co., Ltd. 89 Vibhavadi Rangsit Road, Bangkok 10900	Tel: +66 (2) 545 2665 Fax: +66 (2) 535 3849	Chulchumnun.s@thaiairways.com chulchumnun@gmail.com
	101.	Ms. Rangsiya OCHAREON	Aircraft Engineer, Quality Standard and Aviation Safety Technical Department Thai Airways International Public Co., Ltd. 333/2 Moo 1, Nong Prue, Bangphli, Samutprakarn 10540	Tel: +66 (2) 137 5100 Fax: +66 (2) 137 6910	rangsiya.o@thaiairways.com
	102.	Mr. Suttipong KONGPOOL	Senior Director, Strategy and Organizational Development Bureau Aeronautical Radio of Thailand Ltd. 102 Soi Ngamduplee, Tungmahamek, Sathorn, Bangkok 10120	Tel: +66 (2) 287 8217 Fax: +66 (2)	suttipong.ko@aerothai.co.th

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	103.	Mr. Piyawut TANTIMEKABUT	Executive Officer, Systems Engineering Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 287 8616 Fax: +66 (2) 287 8424	piyawut@gmail.com piyawut@aerothai.com
	104.	Mr. Nuttawat SUPANUNDHA	Senior Director, Air Traffic Services Engineering Support Bureau Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 287 8707 Fax: +66 (2)	nuttawat.su@aerothai.co.th
	105.	Mr. Wudhichai SONGKHUNRIDHIKARN	Senior Director, Safety and Standard Bureau Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 287 8241 Fax: +66 (2)	wudhichai.so@aerothai.co.th
	106.	Ms. Pornnabpan CHOOTHAI	Expert, Senior Director Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 285 9680 Fax: +66 (2)	pornnabpan.ch@aerothai.co.th
	107.	Mr. Chainan CHAISOMPONG	Engineering Manager Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 287 8391 Fax: +66 (2)	chainan.ch@aerothai.co.th
	108.	Mr. Kittipong PONGSWASDI	Senior Administration Officer Corporate Relations Department Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 287 8650 Fax: +66 (2)	kittipong.po@aerothai.co.th
	109.	Ms. Siriluk VISALACHITRA	Director, Corporate Relations Department Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 285 9046 Fax: +66 (2) 285 8745	gade@aerothai.co.th
	110.	Ms. Piyajit PHANAPHAT	Executive Officer, Systems Engineering Air Traffic Management Planning Dept. Aeronautical Radio of Thailand Ltd	Tel: +66 (2) Fax: +66 (2)	piyajit.ph@aerothai.co.th
	111.	Mr. Visut DECHPOKKET	Engineering Manager, Policy, Planning and Project Management Dept. Aeronautical Radio of Thailand Ltd	Tel: +66 (2) 285 9764 Fax: +66 (2) 285 8731	visut.de@aerothai.co.th
23.	**UNITED STATES (5)**				
	112.	Mr. Brian BAGSTAD	FAA, Air Traffic Organization (ATO) Senior ATO Representative, Asia-Pacific Region Strategy and Performance Business Unit Singapore	Tel: +65 6476-9462 Fax: +65	brian.bagstad@faa.gov

List of Participants

	NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	113.	Mr. Braks ETTA	FAA, Air Traffic Organization (ATO) Manager, International Office, Asia-Pacific Group Strategy and Performance Business Unit Washington DC	Tel: +202 385-8971 Fax : +202	braks.etta@faa.gov
	114.	Mr. Patrick CASTELLO	United States Marine Forces Pacific Defense Policy Review Initiative Aviation Training Camp Smith, HI 96744	Tel: +843 597-1203 Fax: +843	patrick.c.castello.ctr@usmc.mil
	115.	Mr. Kenneth FORTIN	HQ Pacific Air Forces Acting Chief, Operations Division Directorate of Operations, Plans, Requirements and Programs Hickam AFB, HI, 96853	Tel: +808 448-1476 Fax: +808	kenneth.fortin@hickam.af.mil
	116.	Mr. Timothy ROBERT	United States Marine Forces Pacific Defense Policy Review Initiative Training Officer Camp Smith, HI 96744	Tel: +808 477-1874 Fax: +808	timothy.robert@usmc.mil
24.	**VIET NAM (4)**				
	117.	Mr. Nguyen The HUNG	Deputy Director, Air Navigation Department Civil Aviation Administration of Viet Nam 119 Nguyen Son Street Long Bien District, Ha Noi	Tel: +84 (4) 3872 3600 Fax: +84 (4) 3827 4194	hungand@caa.gov.vn hungand_caav@yahoo.com
	118.	Mr. Chu Minh Duoc	Deputy Director, ATS Department Civil Aviation Administration of Viet Nam	Tel: +84 (9) 7893 1669 Fax: +84 (9)	
	119.	Mr. Nguyen Duc Hieu	Deputy Director Northern ATS Company	Tel: +84 (9) 1327 0505 Fax: +84 (9)	
	120.	Mr. Pham Van Long	Deputy Director Southern ATS Company	Tel: +84 (3) 8644 5249 Fax: +84 (3) 8384 43705	

List of Participants

	NAME	TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
		INTERNATIONAL ORGANIZATION		
1.	**IACA (1)**			
	121. Mr. Manfred STRIERATH	ATC Coordination, Air Berlin International Air Carrier Association (IACA) Airberlin, Flughafen, Halle 8, 40474 Düsseldorf Germany	Tel: +49 211 9418 896 Fax: +49 211 9418 979	Manfred.Strierath@airberlin.com jane.ellis@iaca.be
2.	**IATA (4)**			
	122. Mr. Ken MCLEAN	Regional Director, Asia Pacific International Air Transport Association 111 Somerset Road, #14-05 Tripleone Somerset Singapore 238164	Tel: +65 6499 2250 Fax: +65 6233 9286	mcleank@iata.org
	123. Mr. Owen DELL	Manager International Relations International Air Transport Association International Affairs Department, 9/F Central Tower, Cathay City, Hong Kong Int'l Airport Lantau, Hong Kong	Tel: +852 2747 8829 Fax: +852 2141 3818	owen_dell@cathaypacific.com
	124. Mr. Andrew MADAR	Regional Director, Avionics China, GE Aviation 6/F West Wing, Hanwei Plaza, 7 Guanhua Road Chauyang District, Beijing 100004, China	Tel: +8610 6561 1166 ext. 435 Fax: +8610 6561 1533	andrew.madar@ge.com
	125. Captain KK GOH	Vice President Flight Operations Technical & Quality, Flight Operations Division Singapore Airlines SIA Training Centre 02-A 720 Upper Changi Road East, Singapore 486852	Tel: +65 6540 3410 Fax: +65 6490 0601	KK_goh@singaporeair.com.sg

List of Participants

	NAME	TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
3.	**IFALPA (1)**			
	126. Captain Korn MANSUMITCHAI	The EVP for Asia/Pacific International Federation of Air Line Pilots' Associations (IFALPA)	Tel: + Fax: +	
4.	**CANSO (1)**			
	127. Mr. Hai Eng CHIANG	Director Asia Pacific Affairs CANSO C/O PO Box 1 Singapore Changi Airport, Singapore 918141	Tel: +65 6541 2007 Fax: +65 6543 4995	hai.eng.chiang@canso.org
	ICAO Headquarters (2)			
	128. Mr. Saulo Da SILVA	Technical Officer, Air Traffic Management International Civil Aviation Organization 999 University Street, Montreal, Quebec, Canada	Tel: +1 (514) Fax: +1 (514)	sdasilva@icao.int
	129. Mr. H. SUDARSHAN	Regional Programme Officer International Civil Aviation Organization 999 University Street, Montreal, Quebec, Canada	Tel: +1 (514) 954 8219 Fax: +1 (514) 954 6077	hsudarshan@icao.int
	ICAO Regional Office (11)			
	130. Mr. Mokhtar A. AWAN	Regional Director International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int
	131. Mr. Yoshiki IMAWAKA	Deputy Regional Director International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int
	132. Mr. Li PENG	Regional Officer, Communications, Navigation and Surveillance International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int pli@bangkok.icao.int

List of Participants

	NAME	TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
133.	Mr. N. C. SEKHAR	Regional Officer, Aerodrome and Ground Aids International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int nsekhar@bangkok.icao.int
134.	Mr. Len WICKS	Regional Officer, Air Traffic Management International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int lwicks@bangkok.icao.int
135.	Dr. Manjit S.S. SINGH	Regional Officer, Technical Co-operation International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int msingh@bangkok.icao.int
136.	Mr. S. K. SARASWATI	Regional Officer, Communications, Navigation and Surveillance International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int ssaraswati@bangkok.icao.int
137.	Mr. John RICHARDSON	Air Traffic Management Expert International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int jrichardson@bangkok.icao.int
138.	Mr. F. A. SHAH	Flight Safety Expert International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int fshah@bangkok.icao.int
139.	Mr. Boon Hai SOON	Air Traffic Management Expert International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int bsoon@bangkok.icao.int
140.	Mr. Kamal RIMAL	CNS/MET Expert International Civil Aviation Organization	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int
COSCAP-SA (1)				
141.	Mr. Zahid Hussain KHAN	Regional ATS Safety Expert COSCAP-SA COSCAP-SA Office CAAB HQ IV Floor Dhaka, Bangladesh	Tel: +880 17329 53321 Fax: +880	ratse@sltnet.lk zhkjiap@hotmail.com

LIST OF INFORMATION AND WORKING PAPERS

Paper No.	Agenda Item	Title	Presented by
		Information Papers	
IP/1	-	Meeting Bulletin	Secretariat
IP/2	2	Review of the Proposed Revisions to the GASP	Secretariat-HQ
IP/3	2	Workshop and Global Air Navigation Industry Symposium (GANIS)	Secretariat-HQ
IP/4	2	Update on the Establishment of Regional Aviation Safety Group- APAC	Secretariat
IP/5	2	ICAO Air Navigation Panels/Study Groups	Secretariat-HQ
IP/6	3.1	Amendment Proposals to Annex 14, Volume II	Secretariat
IP/7	3.5	Update on Air Navigation Planning and Implementation	Maldives
IP/8	3.1	Wildlife Hazard Reduction Measures	India
IP/9	3.5	ATC Skill Development Programme	India
IP/10	3.5	New CNS and ATM System Initiatives	India
IP/11	3.2	Transition from AIS to AIM	India
IP/12	3.1	SMS and Aerodrome Licensing in India	India
IP/13	3.4	Cordon Cualle Eruptions- Lessons Learnt	IATA
IP/14	3.2	HMU Implementation in Japan	Japan
IP/15	3.2	Pacific Project Update	IATA
IP/16	3.2	Proposal for Establishment of ATS Route -DPRK	DPRK
IP/17	3.5	Introduction of CARATS	Japan
IP/18	2	Update on Implementation of ICAO Language Proficiency Requirements	Secretariat-HQ

Paper No.	Agenda Item	Title	Presented by
IP/19	3.2	Global Hawk Operations in the Pacific	USA
IP/20	3.5	Updates on Air Navigation Activities in Viet Nam and Main Required Coordination Activities	Viet Nam
IP/21	3.4	ADS B Implementation Plan	India
IP/22	3.3	RVSM Implementation in Mongolian Airspace	Mongolia
IP/23	3.4	Status of ATN Implementation in Mongolia	Mongolia
IP/24	3.2	Central Reporting Agency	Singapore
IP/25	3.5	Capacity Development for Transition to the New CNS/ATM Systems in Cambodia and Lao PDR	Cambodia and Lao PDR
IP/26	3.5	Updates on Improvement Activities in Civil Aviation Sector in Nepal	Nepal
IP/27	3.4	RNP AR APCH AND PBN Implementation Status	Nepal

Paper No.	Agenda Item	Title	Presented by
		Working Papers	
WP/1	-	Provisional Agenda	Secretariat/ RO
WP/2	1.1	Review of the Actions of the Air Navigation Commission on the Report of the 21st Meeting of the Asia/Pac Air Navigation Planning and Implementation Regional Group (APANPIRG/21)	Secretariat-HQ
WP/3	1.2	Status of Implementation of APANPIRG/21 Conclusions and Decisions	Secretariat
WP/4	1.3	Status of Implementation of Outstanding APANPIRG Conclusions and Decisions	Secretariat
WP/5	2	Review of the Outline and Objectives for Revised GANP	Secretariat-HQ
WP/6	3.4	ATN/AMHS Implementation Report - India	India
WP/7	3.2	Requirement of ATM Contingency Plan	India
WP/8	3.1	Update on the ICAO Runway Safety Programme	Secretariat-RO
WP/9	3.1	Aerodrome Maintenance Programme	Secretariat-RO
WP/10	3.0	Regional and National Performance Framework	Secretariat-RO
WP/11	3.1	Amendment Proposal to Annex 14, Volume I	Secretariat-RO
WP/12	3.2	Implementation of Phase 1 of BOB RHS 50NM	India
WP/13	3.2	Search & Rescue Agreements with the Neighboring Countries	India
WP/14	3.2	Review of ATM/AIS/SAR /SG/21 Report	Chairperson
WP/15	3.2	ATFM- India’s Initiative with Global Perspective	India
WP/16	3.2	ATC Enhancements through Improved Automation	India
WP/17	3.3	Report on the Activities of RASMAG	Secretariat-RO
WP/18	3.4	Report on the Fifteenth Meeting of the CNS/MET/SG/15	Chairperson

Paper No.	Agenda Item	Title	Presented by
WP/19	3.4	ADS-B Implementation over the South China Sea and Bay of Bengal	CANSO
WP/20	3.5	Measurement of Environment Benefits from Operational Improvements	Secretariat-HQ
WP/21	3.5	ICAO Fuel Saving Estimation Tool (IFSET)	Secretariat-HQ
WP/22	3.5	Traffic Forecast for Transpacific and Intra Asia/Pacific Regions	Secretariat
WP/23	3.5	Review of the Statement of Basic Operational Requirements and Planning Criteria (BORPC)	Secretariat-HQ
WP/24	3.5	CANSO IFSET Workshops for APAC	CANSO
WP/25	4	Air Navigation Deficiencies	Secretariat-RO
WP/26	5	Report of the First Meeting of APANPIRG Contributory Bodies Review Task Force (ABSRTF)	Secretariat RO
WP/27	5	APANPIRG Work Programme	Secretariat-RO
WP/28	6	Addressing Deficiencies and APANPIRG Conclusion Obligations through the ICAO Technical Cooperation Programme	Secretariat-TCB
WP/29	3.5	Indian Ocean Strategic Partnership to Reduce Emissions (INSPIRE)	India
WP/30	3.4	PBN Implementation Initiatives	India
WP/31	3.4	Regional SBAS Services through GAGAN	India
WP/32	3.5	Civil Aviation and the Environment	Secretariat-HQ
WP/33	3.4	Frequency Spectrum Management	Secretariat-RO
WP/34	3.2	Asia Pacific Air Space Concept of Operation	IATA
WP/35	3.2	ICAO Asia Pacific ATS Route Catalogue	IATA
WP/36	3.2	Safe Asian Skies	IATA

Paper No.	Agenda Item	Title	Presented by
WP/37	3.5	Status of the ASIA AND PACIFIC Initiatives to Reduce Emissions (ASPIRE) Partnership	Japan
WP/38	6	Update on the Next Generation of Aviation Professionals Initiatives	Secretariat-HQ
WP/39	5	Seamless ATM	Secretariat-RO
WP/40	3.4	Sub-Regional Initiatives to Improve Air Traffic Management (ATM) and Implement Interim Arrangements during Volcanic Incidents	Indonesia, Malaysia, Philippines, Singapore, Thailand and IATA
WP/41	5	Report of Coordination between Chairmen of Sub Groups	Chairman CNS/MET SG

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APANPIRG/22 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/1 **A &C**	**FPL 2012 Implementation Co-ordination**	That, ICAO be urged to emphasise inter-regional coordination by ensuring regular dialogue, information-sharing and meetings between key personnel and organisations managing the FPL 2012 implementation process.	ICAO HQ to consider ways of strengthening and facilitating inter-regional coordination	ICAO APAC Office ICAO HQ	IOM to ICAO HQ	30 September 2011
C 22/2 **A &C**	**AIM Transition Table**	That, the ICAO APAC Regional Office maintains the AIM Transition Table as a means of tracking State transition to AIM, and to provide current details on AIM capability for interoperability, by publishing the State AIS – AIM Transition Table at **Appendix B to the Report on Agenda Item 3.2** on the APAC web site.	Provision of Asia/Pacific Region AIS – AIM progress information	ICAO APAC Office	Publish the Transition Table on the APAC Office website and update as required	30 September 2011
D 22/3 **A &C**	**ATFMSG Terms of Reference**	That, the ATFMSG TOR at **Appendix C to the Report on Agenda Item 3.2** be adopted, noting that the ATFMSG was a forum that develops high-level regional guidance material and regional ATFM policies, which would meet in the future only when required.	Record the ATFMSG TOR	ICAO APAC Office	Update the APAC Office records	30 September 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/4 **A &C**	**APAC ATFM Regional Concept of Operations**	That, the APAC ATFM Regional Concept of Operations appended at **Appendix D to the Report on Agenda Item 3.2** be adopted and provided as reference material on the APAC web site as planning guidance.	Provision of Asia/Pacific Regional ATFM Concept of Operations information Notify States	ICAO APAC Office	Publish the Regional ATFM Concept of Operations on the APAC Office website State notified thro' State Letter	30 September 2011
C 22/5 **A &C**	**Major Traffic Flow (New)**	That, the traffic flow between the Middle East airports such as Dubai and Abu Dhabi to Australasian or South East Asian airports such as Sydney and Singapore be recognized as APAC Major Traffic Flow AR-10 and recommended as an amendment to the Global Air Navigation Plan (Doc 9750).	Establish the new Major Traffic Flow in the forthcoming updated GANP	ICAO APAC Office ICAO HQ	IOM to ICAO HQ	30 September 2011
D 22/6 **A &C**	**Establishment of SAIOACG**	That, the BBACG be renamed as the South Asia Indian Ocean ATM Coordination Group – SAIOACG to cover a geographical area which includes Major Traffic Flows AR-1, AR-4 and AR-10, and that the TOR as appended at **Appendix E to the Report on Agenda Item 3.2** be adopted**.**	Notify States	ICAO APAC Office	State Letter SAIOACG Established	30 September 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/7 **A &C**	**Asia/Pacific Air Navigation Concept of Operations**	That, the Asia/Pacific Air Navigation Concept of Operations provided in **Appendix F to the Report on Agenda Item 3.2** be adopted and published on the APAC website as regional guidance material for navigation facility, service and avionics equipage planning.	Provision of Asia/Pacific Air Navigation Concept of Operations information Notify States	ICAO APAC Office	Publish the Asia/Pacific Air Navigation Concept of Operations on the APAC Office website. State Letter	30 September 2011
C 22/8 **A &C**	**ADS-B Airspace Mandate**	That, States intending to implement ADS-B based surveillance services may designate portions of airspace within their area of responsibility: a) mandate the carriage and use of ADS-B equipment; or b) provide priority for access to such airspace for aircraft with operative ADS-B as equipment over those aircraft not operating ADS-B equipment.	Notify States	ICAO APAC Office	State Letter	30 September 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/9 **A &C**	**Regional ATM Contingency Plan Task Force**	That, a Regional ATM Contingency Plan Task Force (RACP/TF) be formed, reporting to APANPIRG through the ATM/AIS/SAR Sub-Group for planning, coordination and implementation of a regional ATM contingency plan, with a link to the METWARN/I Task Force, in accordance with the Terms of Reference as provided in **Appendix G to the Report on Agenda Item 3.2**.	Notify States	ICAO APAC Office	State Letter Establish RACP/TF	30 June 2012
C 22/10 **A &C**	**RVSM Approvals**	That, the States are urged to: a) ensure that they provide point of contact details and complete RVSM approval data to the appropriate RMA in a timely manner; b) encourage their ANSP to provide details to their RMA, on a monthly basis, of all flight plans filed showing RVSM approval; and c) take appropriate action regarding non-compliant aircraft, on the basis of the data provided by their RMA.	Notify States	ICAO APAC Office	State Letter	30 September 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/11 **A &C**	**Minimum Monitoring Requirements Amendment**	That, the updated Minimum Monitoring Requirements (MMR) Table attached in **Appendix B to the Report on Agenda Item 3.3** be endorsed for Regional application.	Notify States	ICAO APAC Office	State Letter Website update	30 September 2011
C 22/12 **A &C**	**Provision of Datalink Performance Data to CRA**	Noting the pre- and post-implementation system performance monitoring required by Annex 11, the Global Operational Data Link Document (GOLD) and the Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service Data Link Systems in the Asia/Pacific Region, States are urged to ensure that the appropriate data link performance monitoring is undertaken and reported to CRAs/FITs, as required, in a timely manner.	Notify States	ICAO APAC Office	State Letter	30 September 2011
D 22/13 **A &C**	**Datalink Performance Monitoring Body**	That, the FANS Implementation Team - Bay of Bengal (FIT-BOB) and Southeast Asia (FIT-SEA) be combined as a new body (FIT-Asia), reporting to RASMAG, in accordance with the Terms of Reference appended in Appendix D to the Report on Agenda Item 3.3.	Notify States	ICAO APAC Office	State Letter Establish FIT Asia	31 August 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
D 22/14 **A &C**	**Bay of Bengal and Arabian Sea Airspace Safety Monitoring Agency (BOBASMA) Endorsement**	That, the Bay of Bengal and Arabian Sea Airspace Safety Monitoring Agency (BOBASMA) be endorsed as an En-Route Monitoring Agency (EMA).	Establishment of the BOBASMA	APANPIRG	BOBASMA established	9 September 2011 CLOSED
D 22/15 **A &C**	**Japan Airspace Safety Monitoring Agency (JASMA) Endorsement**	That, the Japan Airspace Safety Monitoring Agency (JASMA) be endorsed as an En-Route Monitoring Agency (EMA), which will also undertake the current Japan Regional Monitoring Agency (RMA) functions.	Establishment of the JASMA	APANPIRG	JASMA established	9 September 2011 CLOSED
D 22/16 **A &C**	**Revised TOR and Subject/Tasks List of ATNICG**	That, the revised Terms of Reference and the updated Subject/Tasks List provided in **Appendix A** to the Report on Agenda Item 3.4 be adopted.	Notify ATNICG WG/10 and ATNICG	ICAO APAC Office	ATNICG informed. Paper Prepared	September 2011 May 2012
C 22/17 **A &C**	**Amendment to FASID Tables – CNS 1B, 1C and 1E**	That, FASID Tables CNS 1B – Aeronautical Telecommunication Network (ATN) router plan**,** Table CNS 1C – ATS Message Handling System (AMHS) routing plan and Table CNS 1E – ATS Inter-facility Data Communication (AIDC) routing plan be replaced with updated Tables provided in **Appendices B, C and D** to the report on Agenda Item 3.4 in accordance with the established procedures.	Prepare Proposal for Amendment	ICAO APAC Office	Proposal for Amendment processed	March 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/18 A &C	**ASIA/PAC AMHS Technical Specifications**	That, the ASIA/PAC AMHS Technical Specifications provided in the **Appendix E** to the report on Agenda Item 3.4 adopted.	Publish on website and notify States	ICAO APAC Office	Published on the website and States notified	November 2011
C 22/19 A &C	**Expedite ATN/AMHS Implementation**	That, States be urged to expedite the implementation of ATN/AMHS interconnection for compatible operation in accordance with ICAO APAC Regional Implementation Plan in a time bound manner.	Notify the States	ICAO APAC Office	State Letter	January 2011
C 22/20 A &C	**Second Satellite Data-link Operational Continuity meeting (SOCM/2) and Seminar on Satellite Data-link Communication**	That, States be urged to nominate suitably qualified personnel to participate in the Seminar on Satellite Data-link Communication and the Second Satellite data-link Operational Continuity Meeting (SOCM/2) scheduled from 15 to 18 November, 2011 in Bangkok, Thailand.	Encourage participation in SOCM/2 Meeting and conduct the meeting	ICAO APAC Office	State Letter SOCM/2 conducted	September 2011 & November 2011
C 22/21 A &C	**Identical SELCAL Codes**	That, ICAO be invited to conduct a survey to assess the instances (per annum) of two (or more) aircraft using identical SELCAL codes in the same HF area in the Asia/Pacific Region..	Conduct a survey on SELCAL codes	ICAO APAC Office	State Letter	March 2012
C 22/22 A &C	**GNSS minimum requirement for RNP Navigation Specifications**	That, GNSS-enabled area navigation systems for all RNP navigation specifications be adopted as minimum requirement in the Asia/Pacific Region.	Notify States and Int'l Organizations	ICAO APAC Office	State Letter	February 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/23 A &C	**Participation in the ASIA/PAC Flight Procedure Programme**	That, States in the ASIA/PAC Region be encouraged to take part in the regional cooperative effort to achieve the safety, access, capacity, efficiency and environmental benefits that are possible with PBN implementation, by joining the Asia-Pacific Flight Procedure Programme (FPP).	Encourage States to participate APAC FPP	ICAO APAC Office	State Letter	January 2012
C 22/24 A &C	**Regional RAIM Prediction System and Minimum Technical and Operational Requirements.**	That, the States in the Asia/Pacific Region be encouraged to participate in the Regional RAIM Prediction System and the Minimum Technical and Operational Requirements for ASIA/PAC Regional RAIM Prediction System provided in **Appendix F** to the Report on Agenda item 3.4 be adopted.	Notify States	ICAO APAC Office	State Letter	December 2011
C 22/25 A &C	**Regional PBN Plan Amendment**	That, the revised APAC Regional PBN Implementation Plan Version 3.0 provided in **Appendix G** to the Report on Agenda Item 3.4 be adopted and published.	Publish on the Website	ICAO APAC Office	-State Letter and Published on the website	September 2011
C 22/26 A &C	**Workshop on GNSS implementation**	That, ICAO be invited to organize a Workshop on GNSS implementation to address issues identified through the GNSS implementation survey conducted in 2010.	Organize GNSS implementation Workshop	ICAO APAC Office ICAO HQ	Workshop conducted	June 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/27 A &C	**Sharing of Ionospheric Data**	That, States be urged to coordinate with their relevant national organizations for sharing of available GNSS data with the relevant civil aviation agencies to facilitate characterization of ionosphere to support GNSS implementation in the region.	Urge States to share available GNSS data	ICAO APAC Office	State Letter	November 2011
C 22/28 A &C	**Protection of aviation utility of GNSS**	That, State aviation authorities in partnership with other agencies of the State prohibit malicious and unintentional interference to GNSS and regulate legitimate uses of technology to preserve aviation utility of GNSS.	Notify States	ICAO APAC Office	State Letter	November 2011
C 22/29 A &C	**Revised Navigation Strategy for the Asia/Pacific Region**	That, the revised Navigation Strategy for the Asia/Pacific Region provided in **Appendix H** to the Report on Agenda Item 3.4 be adopted.	Notify States	ICAO APAC Office	State Letter	October 2011
D 22/30 A &C	**Subject/Tasks List of ADS-B Study and Implementation**	That, the updated Subject/Tasks List of ADS-B Study and Implementation Task Force provided in **Appendix I** to the Report on Agenda Item 3.4 be adopted.	Notify ADS-B SITF	ICAO APAC Office	State Letter	April 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/31 **A &C**	**Development of Guidance Material on ADS-B**	That, the following regional guidance materials on ADS-B implementation be adopted and published on the APAC Website. a) Guidance Material on Building a safety case for the delivery of an ADS-B separation service provided in **Appendix J** to the report on Agenda Item 3.4 ; b) the revised Sample Agreement for Data Sharing contained in **Appendix K**; c) Amendments to the ADS-B Implementation Guidance Document (AIGD) as shown in the **Appendix L** consequential to amendment to the Flight Plan and **Appendix M** on the reliability and availability for ADS-B ground system.	Publish on website and notify States	ICAO APAC Office	Published on the website and States notified	December 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/32 **A &C**	**Coordination for VHF for sharing Voice Communication Capability**	That, a) States be urged to support provision of VHF radio voice air/ground communication infrastructure for use by adjacent States; and b) States sharing ADS-B data and providing VHF Voice air-ground communication infrastructure to adjacent States should co-ordinate with ICAO Regional Office and their national Telecommunication Regulatory Authority for assignment of specific VHF radio frequencies to be used by the adjacent States.	Notify States	ICAO APAC Office	State Letter	November 2011
C 22/33 **A &C**	**Support DO260B Compliant Avionics**	That, States providing ADS-B based surveillance services be urged to upgrade their ADS-B ground stations in time (2012-2015) to receive DO260B standard transmissions in addition to those aircraft transmitting ADS-B data compliant with DO260 and DO260A.	Notify States	ICAO APAC Office	State Letter	December 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
D 22/34 **A &C**	**Name and Terms of Cooperation of ADS-B Implementation WG**	That, Recognizing the need to expedite ADS-B implementation and surveillance data sharing in the Bay of Bengal area, the South East Asia Sub-regional ADS-B Implementation Working Group be renamed as "South East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group". Revised Terms of Cooperation and work programme based on the existing one for the SEA Sub-regional ADS-B Implementation Working Group be further developed by the new Working Group.	Notify SEA/BOB ADS-B WG	ICAO APAC Office	SEA/BOB ADS-B WG notified Paper prepared	November 2011
C 22/35 **A &C**	**Expedite ADS-B implementation project in South China Sea area**	That, States concerned with ADS-B implementation in the South China Sea area be urged to expedite required actions and coordination to achieve the implementation.	Notify States	ICAO APAC Office	State Letter	December 2011
C 22/36 **A &C**	**Amendment to Regional Supplementary Procedures on ADS-B**	That, the Regional Supplementary Procedure Doc7030 MID/ASIA Chapter 5 be amended in accordance with the established procedure to include regional requirements on ADS-B as provided in the A**ppendix N** to the report on Agenda Item 3.4.	Prepare and process PfA to SUPP	ICAO APAC Office	PfA processed	March 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/37 **A &C**	**ICAO Position on WRC-12 Agenda Items of critical interest to civil aviation**	That, States be urged to: a) coordinate with their communication administrations to ensure support for updated ICAO Position on WRC-12 Agenda Items of critical interest to civil aviation circulated through ICAO State Letter SL 2011/59 dated 22 July 2011 in the development of their national/regional position; b) actively and cooperatively participate in WRC-12 and preparatory meetings and encourage coordination between the focal contact points nominated by Administrations; and c) support ICAO position provided in the Table at **Appendix P** to the report on Agenda Item 3.4 on the preferred Methods in CPM-12 Report on WRC-12 Agenda Items.	Notify States	ICAO APAC Office	State Letter	October 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/38 **A &C**	**Frequency Spectrum Management**	That 1. States be urged to actively coordinate with their national radio regulator to consider: a) avoiding sharing of aeronautical frequency bands for safety services with non-aeronautical applications and requesting for deletion of their country footnote or have their country name deleted from footnotes under WRC-12 Agenda Item 1.1 in support of ICAO Position for this Agenda Item; b) developing technical and regulatory arrangements to ensure operating environment without harmful interference 2. States be urged to develop their spectrum management policy based on the guidance provided in 'Handbook on Radio Frequency Spectrum Requirements for Civil Aviation' (Doc 9718)	Notify States	ICAO APAC Office	State Letter	October 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/39 **A &C**	**Accessibility to WIFS and currency of WIFS User Guide and Administrative Messages**	That, a) States be advised to monitor administrative messages on WIFS and to periodically access the WIFS Advisories page for any interim updates to the WIFS Users Guide for changes in the operations of WIFS; and b) States be urged to use the single common URL (www.aviationweather.gov/wifs/data), and transit to the common URL as soon as possible as required	Draw attention of States for action	ICAO APAC Office	State Letter	December 2011
C 22/40 **A &C**	**Secure SADIS FTP download speed**	That, a)the WAFS/I TF survey APAC States to determine if an upgrade to Secure SADIS FTP download speed is considered beneficial; and b) SADISOPSG Member State, on behalf of WAFS/1 TF, submit a paper on the regional survey results to the SADISOPSG/17 meeting.	Conduct a survey Prepare a WP	ICAO APAC Office on behalf of WAFS/I Task Force	State Letter WP prepared	January 2012 May 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/41 A &C	**Improvement of WAFS SIGMET availability**	That, the SADIS and ISCS States be invited to participate in regional SIGMET monitoring exercises and/or regional SIGMET tests in the APAC Region in an effort to improve the availability of SIGMET.	Request SADIS and ISCS States to conduct monitoring of Regional SIGMET and to conduct tests	ICAO APAC Office	State Letter to SADIS and ISCS States	January 2012
C 22/42 A &C	**Improvement of WAFC SIGWX charts**	That, the WAFSOPSG be invited to request the WAFC Provider States to provide SIGWX chart verification results, if any, to illustrate the degree of accuracy of their SIGWX charts.	Invite WAFSOPSG to request WAFC provider States to improve SIGWX charts	ICAO APAC Office	Letter to Secretary WAFSOPG	February 2012
C 22/43 A &C	**SIGMET code**	That, ICAO invites WMO to consider the feasibility of developing a code form for SIGMET information.	ICAO to Invite WMO to consider the proposal.	ICAO HQ	Letter	February 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/44 A &C	**SIGMET template and example for no VA expected**	That, a) ICAO consider modifying the SIGMET template in Annex 3 to include an example to report a situation when no ash is expected in the forecast section of a SIGMET; and b) the Asia/Pacific SIGMET Guide be amended accordingly with an example of a SIGMET satisfying the condition in a).	ICAO to consider modification of Annex 3 provisions relating to SIGMET	ICAO HQ	Proposal for amendment to relevant provision of Annex 3	March 2012
C 22/45 **A &C**	**Improvement of timeliness, regularity and availability of OPMET data on the SADIS and ISCS broadcast**	That ICAO be invited, a) to request States to implement the standardized procedures for the issuance of OPMET data as specified in - the ROBEX Handbook ; and b) to inform States of the details provided in the IATA monitoring for the ASIA/PAC region.	Request States to implement procedure specified in ROBEX Handbook for OPMET exchanges	ICAO APAC Office	State Letter	March 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/46 **A &C**	**Amendment to Intro Text of Part IV of Asia/Pacific BANP**	That, the amendment proposed to Part IV – CNS of the Asia Pacific Regions Air Navigation Plan (Doc 9673), Volume 1, Basic ANP provided in **Appendix S** to the report on Agenda Item 3.4 be adopted and incorporated in the Plan in accordance with the established procedure.	Prepare and process PfA to BANP	ICAO APAC Office	PfA processed	March 2012
C 22/47 **A &C**	**Training Manual (Doc 7192) Part E-2**	That, States be urged to develop their training programme for the Air Traffic Safety Electronics Personnel (ATSEP) in line with the guidance provided in the Training Manual (Doc 7192) Part E-2.	Notify States	ICAO APAC Office	State Letter	January 2012
C 22/48 **A &C**	**Trials on XML based data over AMHS**	That, States be urged to identify the characteristics such as file size, target timeline and interface needed for exchange of OPMET and Digital NOTAM using XML code and conduct trials to promote early provision of a communication medium for exchange of MET and AIM data in XML format over AMHS.	Urge States to conduct trials and identify characteristics of XML data	ICAO APAC Office	State Letter	January 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/49 A &C	**Estimating environment benefits**	That: a) States are urged to use IFSET or an advanced tool/measurement capability available to estimate environment benefits accrued from operational improvements and the benefits should be reported on a quarterly basis to ICAO; b) States agree that all plans to implement operational improvements shall encompass an environment benefits analysis	IFSET available to States List of operational improvements to be measured	ICAO States	IFSET Environ benefits/fuel savings	December 2011 Every three months from December 2011
C 22/50 A &C	**Addition of the APANPIRG Air Navigation Deficiencies for non compliance with Annex 14 SARPs**	That, the AOP Air Navigation Deficiencies reported and identified in Attachment B1 to the Report on Agenda Item 4 be added to the APANPIRG Air Navigation Deficiencies List B.	Notify States	ICAO APAC Office	State Letter	February 2012

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 22/51 A &C	**Addition of the APANPIRG Air Navigation Deficiency for lack of SIGMET in equatorial region**	That, a) the lack of SIGMET for Port Moresby, Honiara, and Nauru FIRs be included in the list of air navigation deficiency; and b) States concerned be urged to take urgent action to seek assistance from State in a position to do so to provide the service until such time the States concerned can provide their own SIGMET.	Urge States concerned to take necessary action	ICAO APAC Office	State Letter	December 2011
D 22/52 A &C	**New APANPIRG Structure**	That, in consideration of optimizing the effectiveness and efficiency of the contributory bodies of APANPIRG and in accordance with the provisions of the APANPIRG Procedural Handbook the new APANPIRG Structure as shown in Appendix B to the Report on Agenda item 5 will become effective from 2013 meeting year and subject to a further review in 2016.	Notify States, Chairperson and Vice Chairperson of Sub Groups.	ICAO APAC Office	State letter	November 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
D 22/53 A &C	**Term for Chairperson/Vice Chairperson of Sub Groups**	That, the term of the Chairperson and Vice Chairperson of the sub groups shall be for a maximum period of four years. The incumbent may stand for re-election".	Notify States, Chairperson and Vice Chairperson of Sub Groups. Amendment to APANPIRG procedural Hand Book	ICAO APAC Office	State letter Presented to APANPIRG	November 2011 September 2012
D 22/54 A &C	**Revised Terms of Reference of APANPIRG Sub group and AOP Working Group**	That, the revised Terms of Reference of APANPIRG Sub Group and AOP Working Group as shown in **Attachment C to the Report on Agenda Item 5** be adopted and become effective from 2013 meeting year.	Notify States	ICAO APAC office	State Letter	November 2011
D 22/55 A &C	**Dissolution of ABSRTF**	That, the ABSRTF having completed its task as set out in its Terms of Reference, be dissolved.	Notify States	ICAO APAC office	State Letter	December 2011

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
D 22/56 A &C	**Establishment of Asia/Pacific Seamless ATM Planning Group**	That an Asia/Pacific Seamless ATM Planning Group (APSAPG) composed of high level officials/representatives nominated by the States in the Asia/ Pacific Region and International Organizations be established, reporting to APANPIRG, in accordance with the Terms of Reference as shown in **Appendix D to the Report on Agenda Item 5.**	Notify States Establish APS APG	ICAO APAC office	State Letter APS APG established	February 2012

*** Note:** ICAO has established the following Strategic Objectives for the period 2011-2013:

A: Safety - Enhance global civil aviation safety; **B: Security** - Enhance global civil aviation security; **C: Environmental Protection and Sustainable Development of Air Transport** – Foster harmonized and economic*ally viable development of international civil aviation that does not unduly harm the environment*