



INTERNATIONAL CIVIL AVIATION ORGANIZATION

FINAL REPORT

**REPORT OF THE TWENTY-THIRD MEETING OF THE
ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP
(APANPIRG/23)**

Bangkok, Thailand, 10 to 14 September 2012

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

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PART I — HISTORY OF THE MEETING

PART I - HISTORY OF THE MEETING

1.1 Introduction

1.1.1 The Twenty Third Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/23) was held at the Kotaite Wing of the ICAO Asia and Pacific Regional Office Bangkok, Thailand from 10 to 14 September 2012.

1.2 Attendance

1.2.1 The meeting was attended by 118 participants from 26 Member States, 2 Special Administrative Regions of China and 5 International Organizations (CANSO, IATA, ICCAIA, IFALPA and IFATCA).

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

1.3 Opening of the Meeting

*Welcome address by Mr. Yoshiki Imawaka, Deputy Regional Director,
ICAO Asia/Pacific Office and Acting Secretary of APANPIRG*

1.3.1 Mr. Imawaka welcomed the participants from the Member States, International Organizations and delivered the welcome address.

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

1.3.2 Mr. Norman Lo, Director General of Civil Aviation, Hong Kong, China, and Chairman of APANPIRG welcomed the members and delivered the opening address. He highlighted the progress achieved on the regional activities by the APAC States since the last meeting.

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. Y. Imawaka, ICAO Deputy Regional Director, Asia/Pacific Office, was the Acting 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, ICAO Headquarters, Mr, Len Wicks and Mr Shane Summer, Regional Officers/ATM, Mr Li Peng and Mr. S. Saraswati, Regional Officers/CNS, and Mr Peter Dunda, Regional Officer/MET.

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/22 Meeting

1.1 Review of the action taken by the ANC and the Council on the Report of APANPIRG/22

1.2	Review Status of Implementation of APANPIRG/22 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.

List of Conclusions

Conclusion 23/1	–	Transition to NEW FPL Format
Conclusion 23/2	–	FPL Guidance Material Version 5
Conclusion 23/5	–	Asia/Pacific Air Navigation Concept of Operations Mandates
Conclusion 23/6	–	Basic Air Navigation Plan Amendment Procedure Template
Conclusion 23/7	–	Asia/Pacific Region ATS Route Catalogue Update
Conclusion 23/8	–	Annex 15 Promulgation Requirements Compliance
Conclusion 23/9	–	AIS-AIM Transition State Plans
Conclusion 23/10	–	AIM Quality Assurance Seminar
Conclusion 23/11	–	Duplication and Amendment of 5LNC
Conclusion 23/13	–	Data-link Performance Monitoring Seminar
Conclusion 23/14	–	Asia/Pacific Regional RVSM Monitoring Statement
Conclusion 23/15	–	Long-Term Non- RVSM Approved Aircraft
Conclusion 23/16	–	Safety Monitoring Data Provision
Conclusion 23/17	–	Asia/Pacific IP SNDCE ICD
Conclusion 23/18	–	More Efficient Functioning of AMC
Conclusion 23/19	–	Sample TMC for ATN/AMHS Interconnection Trials
Conclusion 23/20	–	Inter-regional APAC/NAT AIDC Task Force
Conclusion 23/21	–	IMS Operational Concept
Conclusion 23/22	–	Support of AMSS in the new/replacement SATCOM System
Conclusion 23/23	–	FANS 1/A over Iridium (FOI) for ATS Communication
Conclusion 23/24	–	Workshop on RCP and RSP
Conclusion 23/25	–	Adoption of 1st Edition of Satellite Voice (SATVOICE) Guidance Material (SVGM)
Conclusion 23/26	–	Asia/Pacific GLS Seminar
Conclusion 23/28	–	Sharing of Ionospheric Data
Conclusion 23/29	–	Navigation Strategy for the Asia/Pacific Region

Conclusion 23/31	–	Guidance Materials on ASTERIX Category 21 Messages & Advice to Military Authorities regarding Sharing of ADS-B Data
Conclusion 23/32	–	Amendment to ADS-B Implementation Guidance Document (AIGD)
Conclusion 23/33	–	Database of Blacklist Airframe broadcasting misleading ADS-B Data
Conclusion 23/34	–	Sharing of ADS-B Data to Support ATC Operations and Safety Monitoring
Conclusion 23/35	–	Surveillance Strategy for the Asia/Pacific Region
Conclusion 23/36	–	Nomination of Contact Focal Point
Conclusion 23/37	–	Preparations for WRC-15
Conclusion 23/38	–	A SIP Workshop on Radio Spectrum Management
Conclusion 23/39	–	User Readiness for Transition from GRIB1 to GRIB2 Code form WAFS Forecasts
Conclusion 23/40	–	Update to the ASIA/PAC FASID Table MET 6
Conclusion 23/41	–	VAAC Backup Procedures in the ASIA/PAC Region
Conclusion 23/42	–	Improvement of OPMET Data Availability
Conclusion 23/43	–	Improvement of Timeliness, Regularity and Availability of OPMET
Conclusion 23/44	–	Improvement of OPMET Data Format
Conclusion 23/45	–	Implementation of Quality Management Systems for Meteorological Service Provision
Conclusion 23/47	–	Benefits of using ICAO Procurement Services
Conclusion 23/49	–	Asia/Pacific Position Statement on ASBU
Conclusion 23/50	–	States' Action Plan on Environment
Conclusion 23/51	–	ICAO Public Health Emergency related SARPs
Conclusion 23/52	–	Transition from five regional deficiency databases to single global database
Conclusion 23/53	–	Update of ATM/AIS/SAR Deficiency List

List of Decisions

Decision 23/3	– Dissolution of the Southeast Asia Route Review Task Force
Decision 23/4	– Dissolution of the BOB-RHS/TF
Decision 23/12	– Establishment of APSAR Task Force
Decision 23/27	– Revised PBN/TF Terms of Reference
Decision 23/30	– Revised Terms of Reference and Subject/Tasks List of ADS-B Study and Implementation Task Force
Decision 23/46	– Subjects and Task Lists for CNS and MET Sub-groups
Decision 23/48	– Aspect of Space Weather

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PART II — REPORT ON AGENDA ITEMS

AGENDA ITEM 1: FOLLOW-UP ON THE OUTCOME OF APANPIRG/22 MEETING

Agenda Item 1.1: Review of the action taken by the ANC and the Council on the Report of APANPIRG/22

Agenda Item 1.2: Review status of implementation of APANPIRG/22 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/22 Meeting

1.1 Review of the ANC Actions on the APANPIRG/22 Report

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 Second Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/22) which was held in Bangkok, Thailand from 5 to 9 September 2011. 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 APANPIRG/22 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 Commission.

1.1.2 Referring to Conclusion 22/5, the ANC acknowledged the significant traffic flow between Middle East airports, such as Dubai and Abu Dhabi, and Australasian or South East Asian airports, such as Sydney and Singapore, as a new Asia/Pacific (APAC) major traffic flow Air Route (AR)-10 and recommended that the Secretariat to include this new traffic flow APAC AR-10 in the upcoming revision to the Global Air Navigation Plan.

1.1.3 With regard to Conclusion 22/8, the ANC welcomed the initiative of APANPIRG in enhancing the regional air navigation infrastructure through the automatic dependent surveillance — broadcast (ADS-B) mandate. However, the Commission observed that to manage ADS-B implementation worldwide, there was a need for global coordination and thus requested the Secretariat to study the options available to facilitate effective information exchange on aircraft compliance for ADS-B.

1.1.4 On the subject of frequency spectrum, 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 requested the Secretary General to urge States to continue to participate at various levels in different forums to provide support to the ICAO position in the forthcoming WRC-15 Meeting (Conclusion 22/37 refers).

1.1.5 Confirming the request of APANPIRG in Conclusion 22/44 for modifying the SIGMET template in Annex 3, the ANC endorsed this Conclusion and noted that work is already in progress for amending the relevant provisions of Annex 3 with an expected applicability date of November 2013. Subsequent to this amendment, the Asia/Pacific SIGMET Guide would be revised accordingly.

1.1.6 The ANC noted that APANPIRG urged States to use the ICAO Fuel Saving Estimation Tool (IFSET) or an advanced tool/measurement capability that was available to estimate environment benefits accrued from operational improvements. The benefits should be reported on a quarterly basis to ICAO (Conclusion 22/49 refers).

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 on-going work programme of the region.

1.2 Review of Status of Implementation of APANPIRG/22 Conclusions and Decisions

1.2.1 The meeting reviewed the progress made on the APNPIRG/22 Conclusions and Decisions.

1.2.2 The actions taken by States and the Secretariat on the above mentioned 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 43 Conclusions and 13 Decisions action has been taken to close/complete 39 Conclusions and 13 Decisions. Action on the remaining 5 Conclusions is 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.

1.2.5 The Chairman APANPIRG noted with appreciation the work done by ICAO and the member States which resulted in completion of 90% of the action items developed by APANPIRG/22.

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APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 APANPIRG/22 Conclusions/Decisions – Action Plan

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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/1 A	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	IOM to ICAO HQ	30 September 2011	Completed	The AN-WG/SRP recommends that the ANC support the Secretariat efforts in ensuring interregional harmonization for FPL 2012 implementation
				ICAO HQ/ ANB/ATM	Interregional coordination through FITS and scheduling regional workshops.		FITS monitoring - on-going. More regional workshops planned in 2012.	
				ICAO HQ/ ANB/ATM	Convening global vendors' conference in December 2011 in Prestwick Scotland (UK), with a view to harmonizing the implementation of the FPL changes.		Completed	

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed	
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	Completed	

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/4 A	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	ICAO APAC Office	Publication of regional ATFM concept of operations on the APAC Office website.	30 September 2011	Completed	AN-WG/SRP recommends that the ANC note this conclusion.
			Notify States	ICAO APAC Office	States notified through State letter.		Completed	
C 22/5 A	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/ ANB/IIM	IOM to ICAO HQ Inclusion of new APAC TF AR-10 in the Revised Global Plan.	30 September 2011	Completed March 2012	AN-WG/SRP recommends that the ANC note this conclusion and request the Secretariat to include this new APAC TF AR-10 in the revised Global Plan.

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed	
C 22/7 A	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	Publication of the Asia/Pacific Air Navigation Concept of Operations on the APAC Office website.	30 September 2011	Completed	AN-WG/SRP recommends that the ANC note this conclusion.

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/8 A	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 ICAO HQ/ ANB/IIM	State Letter Global database of ADS-B equipped aircraft.	30 September 2011	Completed 2013	AN-WG/SRP recommends that the ANC note this conclusion and that the Secretariat should be tasked to explore global coordination solutions.
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	Completed RACP/TF established and first meeting held.	

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed	
C 22/11 A	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; and Website updated.	30 September 2011	Completed	AN-WG/SRP recommends that the ANC note this conclusion.

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed	
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	Completed FIT Asia met on 27 August 2012	

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
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 ATNIGG	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 ATNIGG WG/10 and ATNIGG	ICAO APAC Office	ATNIGG informed. Paper Prepared	May 2012	Completed ATNIGG/7 was notified in March 12	

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/17 A	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 (PfA) processed and submitted to HQ for approval.	March 2012	Completed AP042/043/044 issued on 5Apr.12	AN-WG/SRP recommends that the ANC note this conclusion.
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	Completed AP152/11 24 Nov. 11	
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	February 2012	Completed AP029/12 28 Feb.12	

APANPIRG/23
APPENDIX A to Report on Agenda Item 1.2
 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	Status as of 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	November 2011	Completed SOCM/2 conducted 8-10 Feb. 12 back to back with IRSVTF/3	
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	Completed Survey conducted	
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	Completed AP/127/11 27Sep.11	
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	Completed AP/128/11 27Sep.11	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed AP/127/11 27Sep.11	
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	Completed AP/128/11 27Sep.11	
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	Completed Workshop was conducted on 26Mar12	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed AP155/11 25Nov.11	
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	AP156/11 25Nov.11 Closed	
C 22/29 A	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	Completed AP133/11 20Oct.11	AN-WG/SRP recommends that the ANC note this conclusion.
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	Completed ADS-B SITF/11 was notified	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed SL AP153/11 issued on 24 Nov. 11	
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	Completed AP162/11 issued on 8 Dec. 2011	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed. SEA/BOB/7 held in Nov. 11. Revised Terms of Coop. was developed.	
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	Completed. SL AP163/11 issued on 8 Dec.2011	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/36 A	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 Appendix N to the report on Agenda Item 3.4.	Prepare and process PfA to SUPP	ICAO APAC Office ICAO HQ/ ANB/ATM	Proposal for amendment (PfA) processed and submitted to HQ. Sharing of APANPIRG's PfA for DOC 7030 related to ADS-B with other regions.	March 2012/rev May 2012 April 2012/ rev May 2012	On Going PfA slightly amended and processed in May. 12 Revised target date Oct. 2012	AN-WG/SRP, recommends that the ANC note this conclusion and request the Secretariat to share this PfA for DOC 7030 related to ADS-B with other regions.

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/37 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 ICAO APAC Office and ICAO HQ/ ANB/IIM	State Letter Enlist States' support for ICAO position at WRC-2012.	October 2011 February 2012	Completed AP132/11 issued on 19 Oct. 11	AN-WG/SRP recommends that the ANC note this conclusion and request the Secretariat to urge States to continue to participate at various levels in different forums to provide support to the ICAO position at WRC-2012 (Geneva, Switzerland, 23 January-17 February 2012).

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed AP132/11 issued on 19 Oct. 2011	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed AP040/12 (MET) issued 20/03/2012	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Conduct a survey	ICAO APAC Office on behalf of WAFS/I Task Force	State Letter	January 2012	Completed	
		b) SADISOPSG Member State, on behalf of WAFS/1 TF, submit a paper on the regional survey results to the SADISOPSG/17 meeting.	Prepare a WP		WP prepared	May 2012	WP/16 submitted to SADISOPSG /17 (May 2012).	
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 Revised date- June 2012	In progress	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	In progress The first opportunity to address this will be WAFSOPSG/7 (Sep 2012).	
C 22/43 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/ ANB/MET	Letter to WMO	February 2012 Revised date- May 2012	Completed Letter to WMO AN10/16.1-SSI/MET 44805 issued 23/05/2012 Reply from WMO 10904-12/WDS/AN/ ICAO dated 7/06/2012 No further action will be taken by HQ and WMO in respect of C22/43.	AN-WG/SRP recommends that the ANC note this conclusion and call upon the Secretariat to process the APANPIRG's request for developing an alphanumeric code form for SIGMET information in accordance with established practice.

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/44 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/ ANB/MET ICAO APAC Office	Amendment to relevant provision of Annex 3. Amendment to Asia/Pacific SIGMET guide.	March 2012	November 2013 In progress AN 10/1-12/8 issued 24/02/2012 December 2013 In progress	AN-WG/SRP, recommends that the ANC endorse this conclusion and note that work is already in progress for revising the SIGMET template in Annex 3.
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 2012	In progress	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	May 2012	Completed SL-AP113/12 Notified States on 04 Sept. 12.	
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	February 2012	Completed AP030/12 issued on 1 Mar. 12	
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	February 2012	Completed AP029/12 28 Feb. 12 (Trials on-going)	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
C 22/49 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 APAC Office	State letter accompanied by IFSET.	December 2011	Completed	AN-WG/SRP recommends that the ANC endorse this conclusion and note that a global report estimating environment benefits accrued from operational improvements will be available by the end of 2012.
				States	Quarterly reports on fuel savings and corresponding environmental benefits for operational improvements	Every three months from December 2011	Ongoing- every three months from March 2012	
				ICAO HQ/ ANB/ATM	Publication of IFSET on ICAO Public website.		Completed	
				ICAO HQ/ ANB/ATM	A global report estimating environment benefits accrued from operational improvements		December 2012	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed 31 January 2012	
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	Completed	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed SL dated 21/11/2011	
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	Completed SL dated 21/11/2011	

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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 10/09/ 2012	Action agreed by ANC 2 Feb 12
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	Completed SL dated 21/11/2011	
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	Completed SL dated 21/11/ 2011	
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	Completed	

* **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 economically viable development of international civil aviation that does not unduly harm the environment

1.3 Review of Status of Implementation of APANPIRG Outstanding Conclusions and Decisions

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

1.3.2 The actions taken by States and the Secretariat on the above mentioned 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 14 outstanding Conclusions and 2 Decisions, the follow-up actions on the 5 Conclusions and 1 Decision have been completed/closed. Actions on 9 Conclusions and 1 Decision are ongoing. The meeting acknowledged that significant 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) WAFS 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. <i>Note: The alternative training methods include computer based training products distributed to States and web-based training.</i>	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	Revised target date- Dec 2013 Revised target date Sep 2012	ON GOING Revised target date Dec 2013 (updated twice, the last target date 2011) ANC action-Noted and invited the Secretary General to invite WAFS provider States in coordination with ICAO and WMO to organize the required training. <u>WAFSOPSG/6 C 6/12:</u> develop guidance on the interpretation of the forecasts for WAFSOPSG/7 <u>WAFSOPSG/6 C 6/13:</u> will review training requirements based on guidance developed (Sep 2012) WAFSOPSG/7 (17 to 21 September 2012) will be reviewing the training needs/scope in light of the follow-up to WAFSOPSG Conclusions 6/12 and 6/13

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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 20/32	Second Satellite Data-link Operational Continuity Meeting	That, ICAO be invited to organize 2 nd 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 Revised target date Feb. 2012	Completed SOCM/2 was conducted on 8-10 February 2012
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 Revised target date July 2012	ON GOING Efforts suspended due to earthquake/Tsunami and accidental release of radioactive material
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	Completed ON GOING

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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 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	ON GOING The recent ICARD Seminar (13 March 2012) resulted in an increase of users from 14 to 22 administrations. These administrations were Cambodia, India, Indonesia, Macao China, Philippines, Sri Lanka, Solomon Islands and Vietnam.

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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
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
		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	Completed
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	Closed HQ assessed the proposal and is of the view that it is undesirable at the present time to implement moving the table (Ref: IOM 10/16.1 SWG17/1)

APPENDIX A to Report on Agenda Item 1.3

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
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	CLOSED
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
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	Closed Coordination was carried out. Temporary alternate routing established.

APPENDIX A to Report on Agenda Item 1.3

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 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. <i>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.</i> <i>Note 2: WIFS commenced operation in May 2010.</i>	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	Completed Completed (SL – 27Sep2010) Completed (SL – 27Sep2010)

APPENDIX A to Report on Agenda Item 1.3

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 21/46	Improvements to WAFS Implementation	That, the WAFSOPSG is invited to discuss and consider the following improvement measures in WAFS implementation: a) the WAFS 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. <i>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.</i>	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	ON GOING WAFSOPSG/6 C6/8 – provide guidance on requirement to onward-forward WAFS SIGWX forecast correction messages to users and report back to WAFSOPSG/7 (September 2012).
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	ON GOING will be brought to the attention of the IAVWOPSG/7 meeting (18 to 22 March 2013)

APPENDIX A to Report on Agenda Item 1.3

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 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) <i>Note: To achieve this, the following steps should be taken in time for the regional SIGMET advisory trial (1 April 2011)</i> a) <i>Regional amendment proposals on FASID Table MET 1B;</i> b) <i>Develop global database based on Regional requirements in a); and</i> c) <i>Consider global database on SIGMET requirements for use in SADIS and ISCS User Guides</i>	Amendment Proposals to Tables in the Regions, where necessary HQ IT develop global database of FASID Table MET 1B Incorporate SIGMET requirements in SADIS Users Guide (as a link to the global database)	ICAO APAC ICAO HQ WAFSOPSG/ 6 (March 2011) SADISOPSG/ 15 (May 2011)	Up-to-date FASID Tables MET 1B for all Regions Global MWO database Provide link to global database for SIGMET requirements	Dec 2010 Mar 2011 Apr 2011	Complete ON GOING (all regions submitted latest version table in excel format to HQ in Nov 2010, except for NAM) WAFSOPSG/6 noted development of database at HQ (but will not meet target date)

APPENDIX A to Report on Agenda Item 1.3

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 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	ON GOING Complete
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	Cost recovery guidance material has been drafted and will be included in 5 th Edition of Doc 9161	2012	COMPLETED

* **Note: 1)** 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.

Note: 2) ICAO has established the following Strategic Objectives for the period 2011 -13:

A: Safety - Enhance global civil aviation safety; **B: Security** - Enhance global civil aviation security; Strategic Objective C: Environmental Protection and Sustainable Development of Air Transport — Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment.

**AGENDA ITEM 2: GLOBAL AND INTER REGIONAL
ACTIVITIES**

Agenda Item 2: Flight Safety and RASG APAC Activities
Global and Inter Regional Activities

2.1 Global Air Navigation Capacity and Efficiency Plan and ASBU Methodology

2.1.1 The Meeting received draft fourth edition of Global Air Navigation Capacity and Efficiency Plan (*Global Plan-Doc 9750*) that includes a high-level summary of the new Aviation System Block Upgrade (ASBU) Methodology while establishing deeper policy and framework linkages with ICAO's Strategic Objectives. This revised edition of the *Global Plan*, at first, will be reviewed by ANConf/12 in November 2012 and then submitted to the Council of ICAO for approval, who will then present it to the ICAO Assembly in 2013 for endorsement as the future strategic direction for ICAO. The draft Global Plan and the Aviation System Block Upgrade (ASBU) Methodology, proposes that future air navigation technology and procedure improvements are organized and based on a consultative strategic approach that coordinates specific global performance capabilities and the flexible upgrade timelines associated with each element.

2.1.2 The draft *Global Plan* provides highlights of the work programmes, based on policy, standardization, implementation, monitoring, analysis and reporting stages, consistent with ICAO's proposed budget framework. Every three years the Global Plan will be reviewed more substantially and revised.

Aviation System Block Upgrade (ASBU) Methodology:

2.1.3 Following the 37th Session of the ICAO Assembly in 2010, ICAO increased its efforts to meet global needs for airspace interoperability while maintaining its focus on safety. To this end, a planning framework for global harmonization and interoperability named the Aviation System Block Upgrade (ASBU) is incorporated into the draft fourth edition of the *Global Plan*. The ASBU framework includes modules describing operational improvements over a series of blocks, supported by technology roadmaps, which serve to progressively enhance many aspects of civil aviation operations.

2.1.4 The ASBU modules are organized into flexible and scalable building blocks that can be implemented depending on the operational needs, while recognizing that implementation of a particular module is not mandatory in all areas or circumstances. The approach adopted is not limiting and recognizes that deployment in addition to the material described in the ASBUs may also take place or be necessary. The broad timescales associated with the ASBU framework (Block 0 = 2013, Block 1 = 2018, Block 2 = 2023, Block 3 = 2028) are intended only to depict the initial readiness of all components, including ICAO Standards and Recommended Practices (SARPs), needed for deployment and do not imply a mandated State or regional implementation timeframe. The ASBU framework with supporting technology roadmaps ensures that State and regional implementation planning and deployment activities can be undertaken with the confidence that all components necessary for a particular deployment will be available within the ASBU dates mentioned.

2.1.5 The Meeting, concluding discussions, noted the developments in revising the *Global Plan* and agreed to take the revised edition of the *Global Plan* into account in planning and implementation of regional and national air navigation systems.

2.2 Update of Runway Safety Enhancement Initiatives to APANPIRG

2.2.1 The meeting noted the work done by the Asia Pacific Regional Safety Team (APRAST) Sub Group on the development of Detailed Implementation Plans (DIPs) for improvements on runway excursions and incursions.

2.2.2 The meeting recognized the importance of establishing runway safety teams at airports to improve safety and urged States to establish runway safety teams at their airports. The meeting also urged States to implement:

- i) enhanced centerline taxiway marking and mandatory markings as specified in Section 5.2.8 of Annex 14, Volume I as a measure to prevent runway incursion.
- ii) Runway End Safety Areas (RESA) as specified in section 3.5 of Annex 14, Volume I as a mitigation measure for runway excursions.

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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

3.0.1 Regional Performance Framework – Planning Methodologies and Tools

3.0.1.1 The Meeting received the strategic planning principles and next steps needed to align the regional plans with the Global Air Navigation Capacity and Efficiency Plan (*Global Plan-Doc 9750*), including the Aviation System Block Upgrade (ASBU) methodology and associated technology roadmaps. It includes a new web-based format for all regional ANPs, called electronic ANPs (eANPs), which can be updated in real time, edited online, and readily viewed by all stakeholders. To ensure the continuing process of aligning the regional plans to *the Global Plan*, it is suggested that the States and PIRGs focus on initially implementing ASBU Block 0 modules and PIRGs to finalize the development of their regional plans consistent with ASBU methodology by May 2014. The collective regional plans will serve as the basis for the first Global Air Navigation Capacity and Efficiency Report, planned to be released in December 2014.

3.0.1.2 Electronic Tools to support the Planning and Implementation Process at the Global and Regional Levels.

3.0.1.3 The modern planning environment in general, and the ability to align the *Global Plan* and the regional plans specifically, requires the implementation of a data-based online format to ensure that all stakeholders are connected to the same up-to-date information. To that end, an online format of the regional ANPs, called eANPs, has been launched. ICAO has developed the eANPs as an online system for maintaining, storing and displaying information contained in the regional ANPs. While the structure and table of contents of eANPs are the same as that of paper-based ANPs salient features of the new eANPs system are: a) user-friendly, robust, web-based planning and editing tool for States, ICAO and, PIRGs to ensure centralization and currency of data; b) updated versions of the text/tables of ATS routes of Volume I, the Basic ANP; and c) the FASID tables in Volume II will be user friendly tables of CNS, AIM, AOP and MET. These FASID tables have now been standardized and harmonized across all regions and aligned with ASBU methodology.

3.0.1.4 To simplify its introduction, all procedures that apply to the current paper-based ANPs will continue for the eANPs. However, to make full use of the online system, ICAO will continue to simplify the workflows related to the amendment process and related data within the eANP. The draft final version of Regional eANPs will be sent to States in early 2014 for review and approval.

3.0.1.5 In addition to the ANPs in their electronic format, ICAO has been developing a wider range of safety tools with the regional air navigation planner in mind. These tools include GIS portal with a growing gallery of interactive maps that provides a high-level overview of the implementation status of global and regional priorities and an online tool for managing location indicators and other air navigation data not contained in the ANP. These ICAO tools will be demonstrated in the exhibition area during the AN-Conf/12. Each ICAO Regional Office will have these tools in place.

3.0.1.6 In conclusion, the Meeting noted that PIRGs need to finalize the development of their regional plans consistent with ASBU methodology by May 2014.

3.0.2 Regional and National Performance Framework Forms

3.0.2.1 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.

3.0.2.2 The meeting reviewed the updated status of the PFFs reported by the ATM/AIS/SAR SG/22 and CNS/MET/SG/16 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 3** to the Report on Agenda Item 3.

3.0.2.3 The meeting noted that as ICAO will be migrating to the ASBU Framework. Consequently, the Performance Framework Form will be modified to the Air Navigation Report Form (ANRF) effective from 2013.

3.0.3 Proposal for Revision of ICAO DOC 9673, Volume I - BANP

3.0.3.1 The meeting noted that ICAO is in the process of reviewing all Regional Air Navigation Plans and developing an online version of the Regional ANPs with the intention of presenting to the upcoming AN-Conf/12 in November 2012. This exercise includes reviewing the current text in Basic ANP (Doc 9673, Volume I).

3.0.3.2 The meeting took note of the time schedule for amendment to the Basic ANP (Doc 9673, Volume I) text as below:

- 1) APANPIRG/23 to endorse the ICAO proposal for revision of text to Doc 9673, Volume I - Basic ANP;
- 2) First version of Draft Basic ANP to be forwarded to ICAO HQ for presentation to AN Conf/12 by 30 October 2012;
- 3) 2nd draft version with HQ, AN Conf/12 and State comments circulated to APAC States for further review and comments - Early 2013; and
- 4) Final version of the Basic ANP forwarded to ICAO Council President for approval - May 2013.

3.0.3.3 APANPIRG/23 endorsed the ICAO proposal for revision of Basic ANP (Doc 9673) and presentation of the draft version to ANConf/12 in November 2012.

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APANPIRG/23
ATTACHMENT 1 to Report on Agenda Item 3.0

ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(15 June 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 1</u>				
AIRSPACE SAFETY MONITORING TO ACHIEVE REGIONAL TLS				
Benefits				
Safety	- Improved safety management, - Compliance with regional Target Level of Safety (TLS)			
Strategy				
Short term/medium term (2009-2015)				
ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
AOM <i>(Airspace Organization and Management)</i>	- Facilitate cooperative arrangements between States to undertake airspace safety assessments - Review airspace safety monitoring that supports reduction in vertical and horizontal aircraft separation standards	2009-2015	RASMAG	In progress
	- 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	2009-2015	RASMAG SEA RR/TF BOB RHS/TF ATM/AIS/SAR/SG ATM Coordination Groups FITs PBN/TF	In progress
GPIs	GPI/2 Reduced vertical separation minima, GPI/5 Performance based navigation, GPI/7 Dynamic and Flexible ATS route management			
References	<i>Asia/Pacific Guidance Material for ADS/CPDLC/AIDC Ground Systems Procurement and Implementation;</i> <i>Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region</i> <i>Asia/Pacific En-route Monitoring Agency (EMA) Handbook</i> <i>Regional Monitoring Agency (RMA) Manual</i> <i>Global Operational Data Link Document (GOLD).</i>			

ASIA/PACIFIC REGION PERFORMANCE FRAMEWORK FORM

(REGIONAL)

15 June 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 2</u>				
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 COMPONENT S	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) APSAPG ATM/AIS/SAR/SG ATM Coordination Groups	Implemented and reviewed regularly by the Bay of Bengal ATFM/TF ATM/AIS/SAR/SG/19 drafted Conclusion to establish regional ATFM steering group ATFM Concept of Operation completed and incorporated into draft global guidance material
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 APSAPG ATM/AIS/SAR/SG ATM Coordination Groups	ATM/AIS/SAR/SG/19 drafted Conclusion to establish regional ATFM steering group
DCB (Demand and capacity management)	Northeast Asia/Southeast Asia • Enhance and facilitate the orderly flow between Northeast Asia and Southeast Asia, and between the North and the South Pacific	2009/2015	IPACG, ISPACG, EATMCG SEA RR/TF (ATS routes) APSAPG ATM/AIS/SAR/SG ATM Coordination Groups	ATM/AIS/SAR/SG/19 drafted Conclusion to establish regional ATFM steering group
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)

(15 June 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 3</u>				
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 on board aircraft			
Strategy Short term (2010) Medium term (2011 - 2015)				
ATM OC COMPONENT S	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
AOM <i>(Airspace Organization and Management)</i>	• 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	2009 -2015	<u>Bay of Bengal and Arabian Sea</u> BBACC, FIT BOB, ~~Bay of Bengal Reduced Horizontal Separation Implementation Task Force (BOB-RHS/TF)~~ ~~(Informal Arabian Sea/Indian Ocean-ATS Coordination Group-ASIOACG)~~ APSAPG ATM/AIS/SAR/SG ATM Coordination Groups	Target for 50 NM longitudinal separation in Bay of Bengal is 2011 50NM horizontal separation implemented in 2012

	including Indian Ocean and the Arabian Sea, and prepare coordinated plans for actions for their resolution.	2009-2015	Southeast Asia AR9 Flow ~~SEACG,~~ ~~FIT SEA~~ ~~Southeast Asia Route Review Task Force (SEA RR/TF)~~ ~~APSAPG~~ ~~ATM/AIS/SAR/SG~~ ~~ATM Coordination Groups~~	~~ATM/AIS/SAR/SG/19 (2009) established the SEA Route Review Task Force (SEA RR/TF)~~
		2009-2015	Pacific Area ~~No APANPIRC regional working group established~~ ~~(Informal~~ ~~South Pacific ATS Coordination Group~~ ~~ISPACG,~~ ~~Pacific ATS Coordinating Group~~ ~~IPACG, and~~ ~~East Asia ATM Coordination Group (EATMG)~~ ~~APSAPG~~ ~~ATM/AIS/SAR/SG~~ ~~ATM Coordination Groups~~	50 NM longitudinal implemented North Pacific in 2008 30/30 NM (RNP4) implemented Honiara, Nauru, Brisbane, Nadi, Auckland Oceanic, Oakland Oceanic, Anchorage Oceanic, Fukuoka 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)~~ ~~APSAPG~~ ~~ATM/AIS/SAR/SG~~ ~~ATM Coordination Groups~~	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: <u>APAC Objective 4</u>				
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 on board aircraft			
Strategy				
Short term (2010)				
Medium term (2011 - 2015)				
ATM OC COMPONENT S	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
AOM <i>(Airspace Organization and Management)</i> AUO <i>(Airspace Users Operations)</i>	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	• <i>Asia/Pacific Regional Performance Based Navigation Implementation Plan</i> • <i>ICAO Performance Based Navigation Manual (Doc 9613)</i>			

ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(amended 15 June 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 5</u>				
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 COMPONENT S	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 <u>Interim Strategy for the Implementation of New ICAO Flight Plan Format and supporting ATS Messages 1</u> Regional Guidance Material Version 4 – 9 November 2011 is current
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 15 th 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 15 June 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 6</u>				
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 COMPONENT S	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	In progress TF has developed a detailed monitoring framework to track States implementation of AIM (AAITF Task List – Action Item 6 refers)
	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	• <i>Annex 4 – Aeronautical Charts</i> • <i>Annex 15 – Aeronautical Information Services</i> • <i>AIS Manual (Doc 8126)</i> • <i>Aeronautical Chart Manual (Doc 8697)</i> • <i>EUROCONTROL Operating Procedures for AIS Dynamic Data (OPADD)</i> • <i>APANPIRG Conclusion 20/16</i>			

ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(amended 15 June 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 7</u>				
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 COMPONENT S	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 ATM/AIS/SAR/SG/WP29 refers
GPIs	None applicable			
References	• Annex 12 – Search and Rescue • International Aeronautical and Maritime Search and Rescue Manual (IAMSAR, Doc 9731) • APANPIRG Conclusions 18/19, 18/20, 20/17 and 20/18			

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ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended in March 2012)

REGIONAL PERFORMANCE OBJECTIVE: - <u>APAC Objective 8</u>				
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			
	<u>Review the ATN Implementation Strategy</u>, revise it when necessary taking into account the current developments.	2013	ATNICG.	Strategy needs to be revised to take into account the emerging communication services like SWIM.
	<u>Review the Status of implementation of dual stack ATN at the Backbone Boundary Intermediate System hubs.</u>	2011	ATNICG	Completed 8/9
	<u>States hosting Backbone Boundary Intermediate Stations</u> to organize Testing of their system on bilateral basis	2012	States hosting Backbone Boundary Intermediate Systems	Planner has been developed to provide up to date implementation and testing status in the region.

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	• <u>Implementation of AMHS Off Line Directory Service.</u> 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.	Completed. Off line support by EUROCONTROL AMC established
	• <u>Update information by the States/Administrations in AMC</u>	Ongoing	States	Ongoing. 20 Administrations have registered as on the date of ATNICG/7
	• <u>Completion of Networking with the BIS States</u>	2013	Asia and Pacific Regions States	Some States started implementation and conducted operational trials
	• <u>Review if implementation objectives have been met.</u>	2009 - 2013	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	• <i>Annex 10, Aeronautical Telecommunications, Volume III (Part I – Digital Data Communication Systems)</i> • <i>Manual on Detailed Technical Specifications for the Aeronautical Telecommunications Network (ATN) using ISO/OSI (Doc 9880)</i> • <i>ICAO Aeronautical Telecommunication Network (ATN) Manual for ATN using IPS Standards and Protocols (Doc 9896)</i> • <i>Manual on Required Communication Performance (Doc 9869)</i> • <i>Manual of Technical Provisions for the Aeronautical Telecommunication Network (Doc 9705)</i> • <i>Regional Implementation guidance materials adopted by APANPIRG</i>			

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PERFORMANCE FRAMEWORK FORM
(REGIONAL)
ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended in July 2011)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 9</u>				
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 <i>(Airspace Organization and Management)</i> CM <i>(Conflict Management)</i> AUO <i>(Airspace Users Operations)</i>	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

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	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.	2012	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	2012	Regional ANSPs, operators, FITS, CRAs, CSP	SOCM/2 was held in Feb.12. Information has been incorporated in GOLD
	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 relevant meeting (FITASIA)
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	<i>Manual on Required Communication Performance (Doc 9869)</i> <i>RTCA DO-306/EUROCAE ED-122, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (the "Oceanic SPR")</i> <i>FANS-1/A Operations Manual (FOM)</i> <i>Global Operational Data Link Document (GOLD)</i> <i>Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region</i> <i>CEANS Report(2008) on ANS Infrastructure</i> <i>APANPIRG Conclusion 19/24, 20/31, 20/32/20/33, 20/34 and 20/73</i>			

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**ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)**

(Amended in April 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 10</u> 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 <i>radar-like</i> 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 <i>(Airspace Organization and Management)</i> CM <i>(Conflict Management)</i> AUO <i>(Airspace Users Operations)</i>	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

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	• 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

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	• 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 multilateration 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, EUROCAE, 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

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	• 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 and Bay of Bengal (SEA/BOB) Sub-Regional ADS-B Implementation Working Group	In progress	Terms of co-operation updated; 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	(SEA/BOB Sub-Regional ADS-B Implementation Working Group	In progress	Major traffic flow from Australia to Singapore through Indonesia and Singapore to Hong Kong along L642 and M771 in South China Sea being progressed. Milestones and timelines have been established. The WG was renamed into SEA/BOB ADS-B WG by APANPIRG/22

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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	• <i>Report of AN CONF/11;</i> • <i>Global ATM Operational Concept (Doc 9854);</i> • <i>Global Air Navigation Plan (Doc 9750);</i> • <i>Technical Provisions for Mode S Services and Extended Squitter (Doc 9871)</i> • <i>APANPIRG/16, 17, 19, 20,21 reports on ADS-B</i> • <i>ADS-B related regional guidance materials adopted by APANPIRG</i>

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	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	<i>Air Traffic Management</i> (Doc 4444) <i>Manual of Air Traffic Services Data Link Applications</i> (Doc 9694) <i>Manual of Technical Provisions for the Aeronautical Telecommunication Network</i> (Doc 9705) <i>Asia/Pacific Regional Interface Control Document (ICD) for ATS Inter-facility Data Communication (AIDC)</i>			

ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended July 2012)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 18</u>	
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.

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SAFETY COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
<u>APANPIRG Conclusion 18/52</u>	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 9th 27-29 Mar.2012 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

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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. Total 24 national PBN plans were received by TF/9. Status in Robust 14 (33%)
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/9, 18 Administrations have not submitted PBN plan.
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 TMA-Departure Approach	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	
	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	
	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	

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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+

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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	• <i>APANPIRG Decisions and Conclusions n</i> • <i>ICAO Guidance Material – Performance-Based Navigation Manual Doc 9613 AN/937 Third Edition – 2008</i> • <i>Assembly Resolution 36-23; Resolution A37-11</i>

**ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL – MET field)**

(Amended 22 July 2011)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 12</u>				
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

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	• 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	• <i>Annex 3</i> • <i>Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds (Doc 9691)</i> • <i>Handbook on the International Airways Volcano Watch (IAVW) Operational Procedures and Contact List (Doc 9766)</i> • <i>Manual on Low-level Wind Shear (Doc 9817)</i> • <i>Asia/Pacific Regional SIGMET Guide</i>			

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(Amended 23 August 2012)

REGIONAL PERFORMANCE OBJECTIVE: APAC Objective 13

IMPLEMENT WAFS AND ASSOCIATED DEVELOPMENTS

Benefits

Safety Efficiency

- Improve the regional **utilization of WAFS** weather forecasts (including upper-winds and upper-air temperatures, **humidity**, direction, speed and height of maximum winds and tropopause heights, as well as turbulence, icing, cumulonimbus **clouds**) used by airlines and ATM to optimize flight routes which will **enhance** efficiency and reduced carbon emissions

Strategy

Short term (2012-2013)/Medium term (2014 - 2017)

ATM OC COMPONENTS

TASKS

TIME FRAME

RESPONSIBILITY

STATUS

MET

- Facilitate the migration from GRIB1 to GRIB2 WAFS forecasts in the ASIA/PAC Region by November 2013
- Facilitate the implementation and utilization of WAFS gridded forecasts for icing, turbulence and CB clouds in the ASIA/PAC Region
- Establish training requirements in WAFS forecasts in the ASIA/PAC Region and provide this information to the WAFSOPSG
- Maintain and distribute WAFS service reference document to ASIA/PAC States
- Monitor the implementation and utilization of WAFS (including SADIS/Secure SADIS FTP/WIFS services) and training needs within the ASIA/PAC Region, and report to MET SG

2012-2013

2012-2016

2012-2017

2012-2017

2012-2017

WAFS TF

WAFS TF

WAFS TF

WAFS TF

WAFS TF

In progress

In progress

In progress

In progress

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 Task Force Work Plan

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ASIA/PACIFIC REGION-PERFORMANCE FRAMEWORK FORM
(REGIONAL)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 16</u> 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	RESPONSI BILITY	STATUS
AO (Aerodrome operations), CM (conflict management), TS (Traffic synchronization), AUO (Airspace user operations)	<u>AERODROME CERTIFICATION</u>			
	• 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

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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
	<u>SMS AT CERTIFIED AERODROMES</u>			
	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
	<u>WILDLIFE HAZARD CONTROL AND REDUCTION</u>			
	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

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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. - Land use management inside and in the vicinity of airport - States collect wildlife strike reports and forward to ICAO for inclusion in the ICAO IBIS (data base) - Seminar on wildlife assessment /reduction - Wildlife hazard management training for airport personnel <u>AERODROME SAFETY MEASURES</u> - Monitoring the height of buildings or structures within the boundaries of OLS; - Measurement and reporting of friction characteristics of wet paved runways - procurement of a friction measuring device - establishment of maintenance friction level below which corrective action should be initiated; and - establishment of minimum friction level below which information that a runway may be slippery when wet is made available.	2009-2012 2010 - 2015 2009-2012 2011 Continuous basis	State State State ICAO APAC Office State	In progress In progress In progress Completed in Dec 2010 In progress

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	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 2012
Linkage to GPIs	GPI/13 Aerodrome Design and Management and GPI/14 Runway operations			
References	<i>Annex 14, Volume I</i> <i>Doc 9774 – Manual on certification of Aerodromes</i> <i>Doc 9859 – Safety Management Manual</i> <i>Doc 7300 – convention on International civil Aviation</i> <i>Doc 9137 – Airport Services Manual, Part 3, bird control and reduction;</i> <i>Doc 9332 – Manual on the ICAO Bird Strike information System (IBIS)</i> <i>Doc 9184 – Airport Planning Manual Part 2, Land Use and Environmental Control.</i> <i>Doc 9157 – Aerodrome Design Manual, Part 1, Runways</i> <i>Doc 9157 – Aerodrome Design Manual, Part 3, Pavements</i> <i>Doc 9157 – Aerodrome Design Manual, Part 4, Visual Aids</i> <i>Doc 9137 – Airport Services Manual, Part 2, Pavement surface Conditions</i> <i>Doc 9137 – Airport Services Manual, Part 6, Control of Obstacles</i> <i>Doc 9137 – Airport Services Manual, Part 8, Airport Operational Services</i> <i>Doc 9137 – Airport Services Manual, Part 9, Airport Maintenance Practices</i>			

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ASIA/PACIFIC REGION-PERFORMANCE FRAMEWORK FORM
(REGIONAL)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 17</u>				
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)	<u>AERODROME EMERGENCY PLANNING</u>			
	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

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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 2014
Linkage to GPIs	GPI/13 Aerodrome Design and Management and GPI/14 Runway operations			
References	<i>Annex 14, Volume I</i> <i>Doc 9137 – Airport Services Manual, Airport emergency Planning, Part 7</i>			

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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 progress	yes
Establish a regulatory authority [CAA]	Yes	Yes	Yes	Yes	yes	Yes	Yes	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. Review ongoing	In progress	yes
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 progress	yes
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	Yes	
<u>SMS AT CERTIFIED AERODROMES</u>														
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 progress 2013	-	Yes Training ongoing	Yes	Yes	Yes.	In progress

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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 edition										
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 above	In progress	Yes	SSP manual in progress	In progress 2015	-	Yes Ongoing SSP organization	Yes	Yes	Yes	In process
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	yes
Establishment of a national bird control committee	Yes	Yes	YES. 2010	Yes	Yes 2008	Yes 2009	2012	Yes	Yes	In progress	Yes	Yes 2010	Yes	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	yes	In progress 2012	2012	Yes	In progress	On-going	Yes	Yes	In progress	yes
Land use management inside and in the vicinity of airport	Yes	Yes	Yes	Yes	pending	In progress 2013	2012-2015	Yes	-	On-going	Yes	Yes	In progress	yes
States collect wildlife strike reports and forward to ICAO for inclusion in the ICAO IBIS (data base)	Yes	Yes	In progress June 2010	On going	In progress	In progress 2012	Yes. In progress		In progress	On-going	yes	yes	yes	yes
Seminar on wildlife assessment/reduction														2010

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TASKS	Australia	Hong Kong, China	Fiji Islands	Japan	Maldives	Malaysia	Mongolia	New Zealand	Pakistan	Philippines	ROK	Singapore	Thailand	ICAO
Wildlife hazard management training for airport personnel	Yes	Yes	In progress	On going	On going	On going	-	Yes	In progress	On-going	Yes	On-going	Yes for 2012	yes
<u>AERODROME SAFETY MEASURES</u>														
Monitoring the height of buildings or structures within the boundaries of OLS;	Yes	Yes	Yes	Yes	In progress	Yes	Yes	Yes	In progress 2015	yes	Yes	On-going	Yes	yes
Measurement and reporting of friction characteristics of wet paved runways	Yes	Yes	Jan 2011	Yes	Regulation issued	Yes	yes	Yes	Yes	yes	Yes	On-going	In progress	yes
procurement of a friction measuring device	Yes	Yes	Jan 2011	Yes	In progress	Yes	yes	Yes	Yes	In progress	Yes	Yes	In progress	yes
establishment of maintenance friction level below which corrective action should be initiated	Yes	Yes	Jan 2011	Yes	In progress	Yes	In progress	Yes	-	In 2013	Yes	Yes	In progress	
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 progress	Yes	In progress	Yes	-	In progress 2013	Yes	Yes	In progress	
Provision of runway end safety area;	Yes	Yes	In progress	Yes	2014 Regulation issued	Yes	2011-2014	Yes	In progress	Yes	Yes	Yes	yes	2015
Provision of enhanced visual aids and markings to help prevent runway incursions	In progress	completed	In progress	Yes	In progress	Yes	2011-2014	Yes	In progress	Yes	Yes	Yes 2009	yes	yes
Seminar on runway surface friction measurement														2012
<u>APAC OBJECTIVE 17-AERODROME EMERGENCY PLANNING</u>														

APANPIRG/23
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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	-	yes	Yes	Yes	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	-	2011	Yes	Yes Every year	In progress	yes
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	Regulation issued	yes	2010-2012	Yes	-	On-going	Yes	Not Applicable	In progress	yes
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	-	To be implemented	Yes	Yes	In progress	yes
Conduct seminar on AEP														2014

AGENDA ITEM 3.1: AOP

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

3.1 Aerodrome Operations and Planning (AOP)

Aerodrome Obstacle Limitation Surfaces and Frangibility Requirements

3.1.1 The meeting recognized that airports were an important part of the aeronautical infrastructure, which had to meet high safety standards for the safe and efficient use of the aerodrome. The effective utilization of an aerodrome may be considerably influenced by natural features and manmade constructions both inside and outside its boundaries which may result in limitations on the distances available for take-off and landing and on the range of meteorological conditions in which take-off and landing can be undertaken.

3.1.2 To this end ICAO Regional Office circulated a State Letter to assess APAC States status concerning their management of obstacles both within and in close vicinity of airport. In all, 17 States [Australia, Brunei, DPRK, Fiji, India, Indonesia, Japan, Malaysia, Maldives, New Zealand, Palau, Philippines, PNG, Republic of Korea, Singapore, Thailand and USA], one other Territory (New Caledonia), and one Administration (Hong Kong, China) participated in the survey.

3.1.3. The meeting noted from the ICAO survey on the current status as follows:

- 18 Administrations have promulgated regulation for safe guarding the established aerodrome obstacle limitation surfaces at and around aerodromes as stated in Para 4.1 and 4.2 of ICAO Annex 14, Volume I;
- 18 Administrations have in place a procedure for establishing aerodrome obstacle limitation surfaces for runways (non-instrument, non-precision approach, precision approach and runways meant for take-off) as stated in Annex 14, Volume I, Para 4.2;
- 18 Administrations have in place an established procedure for objects to be marked and/or lighted as stated in Chapter 6 of Annex 14, Volume I;
- 18 Administrations have in place procedures and guidance material for monitoring the height of buildings or structures within the boundaries of OLS, controlling obstacles within the authority of the aerodrome operator, controlling new developments in the vicinity of aerodromes, monitoring the OLS and Type A Chart for obstacles in the take-off surface and notifying the CAA of the nature and location of obstacles and any subsequent addition or removal of obstacles for action as necessary; and
- 18 Administrations have in place a procedure and/or guidance material for Aerodrome operator to comply with the frangibility and height restriction requirements for equipment or installation near or on a runway, runway graded/non graded strip, as stated in Para 9.9 of Annex 14, Volume I.

3.1.4 The meeting urged States who have not done so far to establish Obstacle limitation Surfaces for their airports in accordance with Chapter 4 of Annex 14, Volume I and their national regulations.

3.1.5 The ICAO Regional Office will follow up with the concerned States who have not done so far to establish Obstacle limitation Surfaces for their airports in accordance with Chapter 4 of Annex 14, Volume I and their national regulations.

Airport Pavements - Design and Evaluation

3.1.6 The meeting noted that APANPIRG/22 had urged APAC States to establish a maintenance programme including preventive maintenance in order to maintain facilities in a condition which does not impair the safety, regularity or efficiency of air transportation.

3.1.7 ICAO convened a seminar on Airport Pavements - Design and Evaluation in partnership with the CAA Macau and FAA with the objective to promote good practice in airfield pavement engineering and capacity building. The workshop was attended by sixty four participants from fourteen states.

3.1.8 The meeting noted that the workshop had developed the following recommendations which are to be addressed by ICAO:

- 1) A need to define “unrestricted operations” in the ACN-PCN guidance material;
- 2) The need to clearly define the level of traffic for operation of an aircraft to be considered as “overload” or normal operations; and
- 3) These two items are clearly related and combining them into a single definition would provide valuable guidance to the airport operation’s community.

3.1.9 The meeting recognized the technical nature of the recommendation and decided to refer it to the AOP WG.

Regional Runway Safety Seminar, Bali 21 to 24 May 2012

3.1.10 The meeting noted that ICAO in partnership with DGCA Indonesia, flight safety foundation and Association of Asia Pacific Airlines convened the Regional Runway Safety Seminar (RRSS) in Bali from 21 to 24 May 2012. The objective of the seminar was to promote the establishment and enhancement of airport specific multidisciplinary runway safety team in an effort to improve runway safety. The seminar was attended by 273 participants from 17 APAC States, 7 States from other regions and 8 International Organizations.

3.1.11 The meeting noted that the RRSS was designed to provide information about runway safety and specifically provide strategies to mitigate the risks of runway excursions and incursions. The information was provided from three different perspectives - airport operator, air traffic control and the pilot.

3.1.12 The meeting noted the threats that could cause runway safety issues and the mitigating solutions to improve runway safety identified by the RRSS.

3.1.13 The meeting noted that with the establishment of RASG there will be overlap of certain functions of the AOP/WG with the RASG activities and requested ICAO to sort this to avoid duplication of efforts.

Implementation of “Dynamic Departure Slot Manager and TSAT Generator” at CSI Airport Mumbai

3.1.14 India presented the paper on the Dynamic Departure Slot Manager and TAST Generator which had been developed at CSI Airport Mumbai to reduce congestion at the holding point, reduce R/T congestion, enhance orderly flow of traffic, and transparency of slot management, save aviation fuel and reduce pollution. A dynamic website has been designed with the provision of inputs from Airlines Operators and ATC which will generate Target Start up Approval Time (TSAT). This can be used as a decision support tool by the controllers. The meeting noted the information provided.

AGENDA ITEM 3.2: ATM/AIS/SAR

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

3.2 Report of the 22nd Meeting of the ATM/AIS/SAR Sub-Group

ATM/AIS/SAR/SG

3.2.1 The Twenty-Second Meeting of the APANPIRG Air Traffic Management/Aeronautical Information Services/Search and Rescue Sub-Group (ATM/AIS/SAR/SG/22) was held at Bangkok, Thailand from 25 to 29 June 2012. The meeting was attended by 98 participants from 27 States, two Special Administrative Regions of China and three International Organizations.

3.2.2 ATM/AIS/SAR/SG/22 formulated eight (8) Draft Conclusions and five (5) Draft Decisions for consideration by APANPIRG/23.

Performance Metrics

3.2.3 Regarding APANPIRG Conclusion 20/4, the meeting noted that only one of the four Asia/Pacific Performance Metrics were within the scope of the Sub-Group (Metric 1-RASMAG, Metric 2 and 3 – PBN/TF):

APAC Metric 4 - Average delays for departures at State's primary international airports for the busiest hour on a weekly basis.

3.2.4 In this connection, APANPIRG was invited to provide direction and comment on whether APAC Metric 4 was still appropriate, given the difficulty of receiving data of this nature, considering the workload, different operating parameters and potential sensitivity of data. APANPIRG agreed that it was appropriate for the new AOP/WG, which reported to the new ATM Sub-Group, to discuss how to manage this metric in the future.

Flight Plan & ATS Messages Implementation Task Force Outcomes

3.2.5 Information regarding the Fifth Meeting of the Flight Plan & Air Traffic Services Messages Implementation Task Force and Seminar (FPL&AM/TF/5& Seminar, Manila, Philippines, 7 to 9 November 2011), and an update on current implementation issues was presented.

3.2.6 It was recognised that ANSPs would have to determine their required changeover process when PRESENT plans would not be accepted after coordination with neighbouring affected States. The meeting noted that the European IFPS (Integrated FPL System) would not accept flight plans with EOBT more than 24 hours in advance during the period 12-15 November 2012.

3.2.7 IATA was concerned about the filing of long-haul flight plans when the plan itself was complex and large. Generally this required a significant amount of information to be included and transmitted, so certain states lengthy flight plans were filed in two sections (two plans).

3.2.8 Responses to the agreed quarterly questionnaire had generally been poor. Questionnaire responses were used to update the ICAO Flight Plan Implementation Tracking System (FITS) website. There had been considerable schedule slippage within the region. While thirteen States planned to conduct Phase 2 activities in accordance with the agreed schedule (1 Apr – 30 Jun 2012), none had yet reported completing this work at the end of June.

3.2.9 In order to quantify the degree of concern about the Asia/Pacific Region's progress, and to prioritize any ICAO activities to assist States in their transition to NEW FPL and ATS message format, the Regional Office conducted a risk assessment to determine the level of risk to the regional

ATM network inherent in any administration's potential failure to transition to NEW format on or before 15 November 2012. The risk was assessed by using a simple likelihood and consequence risk analysis model. In the case of States and Administrations which have not provided quarterly questionnaire updates, the maximum level of likelihood assessment was applied.

3.2.10 A revised questionnaire was circulated for completion by 11 May 2012. The revised questionnaire included specific questions on the planned or achieved timing of each of the three implementation phases. Only nine replies were received by the due date, and as at 15 June 2012 only seventeen States/Administrations had responded. Seventeen administrations had not provided a response to any questionnaire in 2012, and were thus invited to update the ATM/AIS/SAR Sub-Group on progress. The meeting noted that Myanmar, previously identified as not having responded to questionnaires, had recently provided a response to the updated questionnaire.

3.2.11 A table of the results from the risk analysis and a chart of risk results updated during the APANPIRG/23 meeting are provided at **Appendix A** and **Appendix B** respectively to the Report on Agenda Item 3.2.

3.2.12 Information received in the updated questionnaire of April 2012 indicated that some States had been planning a 'hard' cutover from PRESENT to NEW format message processing on 15 November, without a transitional phase of operational mixed mode processing. This strategy would introduce a number of risks, including those associated with the volume of traffic being handled by Asia/Pacific States at the cutover time (0000 UTC on 15 November). It may also cause significant difficulty for airspace users in determining when all ANSPs along their planned routes had commenced accepting NEW format FPL.

3.2.13 In order to avoid the risks involved in a rapid cutover, and to align with strategies from other Regions, APANPIRG/23 agreed to the following Conclusion:

Conclusion 23/1 – Transition to NEW FPL Format

That, States are urged to commence operational acceptance and processing of both PRESENT and NEW format FPL and ATS messages as early as possible, and in any event no later than 0000 UTC on 12 November 2012, in order to avoid the risks involved in direct transition from PRESENT to NEW processing.

3.2.14 It was advised that FPL&AM/TF/5 agreed that a paragraph should be added to Section 5 (Software Coding Considerations) of the Asia/Pacific Guidance Material to ensure that the flight planning of RVSM capability was consistent. The Guidance Material stated that the preferred option for delaying a flight Expected Off-Block Time (EOBT) over midnight UTC was to use a CHG (Change) message; however the option to use a DLA (Delay) message was available. Currently the Guidance Material contained the option to use either a CHG or a DLA message to provide advice of delays across midnight UTC, so States would need to software code their systems to cater for the receipt of both messages types.

3.2.15 The meeting discussed the issue of DOF (Date of Flight) removal from item 18 of the flight plan when the EOBT was within 24 hours. New Zealand suggested removal of the first sentence in the Guidance Material, which was agreed.

3.2.16 Australia had identified an issue relating to the submission of CHG messages (with changes to Field 18) that required conversion. Any change messages generated from a NEW format that would be 'down' converted containing changes to either field 10 or 18 in the amendment field 22 needed to be constructed from the NEW format, considering the dependent relationships of these two fields. IATA did not support transition with converter systems if it could be avoided.

3.2.17 IATA's position was that converter systems should not be viewed as a long-term solution, and States with such systems should be encouraged to do so with a clear plan to implement capabilities to process NEW format as soon as practicable. The Guidance Material did not recommend the use of converters, especially 'up' conversion from PRESENT to NEW format.

3.2.18 French Polynesia described an issue with DOF regarding AIDC messages being received when Field 18 was filed with zero '0', then FPL Field 18 could be overwritten. Australia had elected not to translate any AIDC messages during the transition, as the only fields applicable to Amendment 1 changes were 10 and 18, which were optional in AIDC messages.

3.2.19 Amendment 1 required that RNAV5 en-route navigation capability was indicated by insertion of the letter 'R' in field 10 of the flight plan, and the following indicators after PBN/ in field 18. As LORAN was rarely used, this would require the flight plans of most RNAV 5 aircraft to file PBN/B2B3B4B5 in Field 18. When added to other combinations of PBN indicators applicable to Oceanic, Terminal and Final flight phases, this may exceed the 16 character limit specified in PANS/ATM.

3.2.20 The solution being considered was to use B1 to indicate all permitted sensors except LORAN. As ICAO HQ was currently considering a globally coordinated response, the Regional Guidance Material may need to be amended to address this issue.

3.2.21 Table 5.1 of the Regional Guidance Material states that the Field 18 Estimated Elapsed Time (EET) string should be constructed in a manner that could be misleading as it may be read to mean that the 4-digit elapsed time was only required if a LAT/LONG position was used. The following minor editorial amendment to the Regional Guidance Material was agreed:

One or more strings: Each string is:

2-5 alphanumeric characters or a LAT/LONG; followed by
a 4-digit elapsed time, from 0000 to 9959 (i.e. 0-99 hours followed by 0-59 minutes)

3.2.22 Table 5.1 also specified that Field 18 Route Information (RIF) information should be consistent with the format of a valid Field 15c. As Field 15c may also include oblique strokes, this contravenes the provisions of PANS/ATM, which precludes the use of oblique strokes in Field 18, other than as the final character in the indicator, e.g. STS/, PBN/, NAV/, RIF/. The purpose of the RIF/ element was to direct flight plan forwarding in the event of an in-flight re-file. It was therefore proposed that the Guidance Material was amended to reflect the requirements of PANS/ATM 11.4.2.2.2 for information following the Field 18 RIF/ indicator:

The route details to the revised destination aerodrome, followed by the ICAO four-letter location indicator of the aerodrome.
Examples: RIF/DTA HEC KLAX; RIF/ESP G94 CLA YPPH

3.2.23 APANPIRG/23 agreed to the following Conclusion:

Conclusion 23/2 – FPL Guidance Material Version 5

That, 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) is updated as Version 5 in accordance with excerpts contained in **Appendix C** to the Report on Agenda Item 3.2.

3.2.24 The meeting noted that successful implementation of the Amendment 1 changes were the highest priority ATM activity currently being undertaken in the Asia/Pacific Region. States were urged to ensure that all necessary resources are applied to this work, and to keep the ICAO Regional Office informed of progress and developments.

RACPTF Outcomes

3.2.25 ICAO presented information from the First Meeting of the Regional ATM Contingency Plan Task Force (RACP/TF/1, Bangkok, 17 to 19 April 2012). The link between the RACP/TF and METWARN/I TF was discussed, including the requirement for each of these Task Forces to develop an understanding of the other's needs. While primarily considered in response to Volcanic Ash Cloud (VAC), this link was also a necessary facilitator to the contingency response to other catalysts such as nuclear emergencies (radioactive cloud).

3.2.26 The RACP/TF/1 meeting discussed the proposed three-tiered arrangement of contingency plans, consisting of domestic plans (Level 1 plans, forming the lower tier), bi-lateral plans such as those already existing between several States (Level 2 plans) and Sub-Regional or Regional Plans (Level 3). Furthermore, categories of contingency plans were agreed as follows:

- a) Category A – Airspace Safe, but Restricted or No ATS, due to causal events such as industrial action, pandemic, earthquake, nuclear emergency affecting the provision of ATS, or ATM system failure or degradation;
- b) Category B – Airspace Not Safe, due to causal events such as VAC, nuclear emergency, military activity; and
- c) Category C – Airspace Not Available, due to causal events such as pandemic, national security – normally a political decision.

3.2.27 It was agreed that Level 1 (internal State) plans would not be part of the Regional ATM Contingency Plan, but could be referred to in that document. Level 2 (Inter-State) planning, was considered to be a priority for the RACP/TF analysis, as it was these that needed to be harmonised to allow a seamless Level 3 (Regional) Plan. Moreover, it was recognised that Level 1 and 2 plans needed to address all three categories of contingency response (A, B or C), even if the category B procedures were simple and of a tactical nature to deal with a changing situation. A proposed set of standardized Basic Plan Elements (BPE) were discussed, which would be further developed to assist assessment of Level 1 and 2 plans.

3.2.28 It was noted that ICAO Annex 11 Attachment C had requirements for the development of contingency arrangements, which should be based on Safety Management System (SMS) principles. States were urged to ensure that they complete a full threat assessment of their ATM systems, from deliberate acts to unplanned events such as fire, natural catastrophes or sub-contractor malpractice.

3.2.29 It was agreed by the meeting that a key part of the future Regional ATM Contingency Plan was the development of Principles and Practices that would further harmonise State Contingency responses as far as practical. The meeting considered a general scheme including such items as standardized minimum lateral and longitudinal spacing, Flight Level Allocation Scheme (FLAS), standardized ATS and pilot phraseologies and procedures, and a template for Inter-State and sub-Regional plans based on an updated version of the Regional Model Plan.

3.2.30 The meeting noted that temporary delegation of airspace in a contingency situation did not mean that full Air Traffic Control (ATC) services would be provided, and that there were possible legal, communication and ATS surveillance issues associated with this. In spite of this,

delegation where necessary was viewed by the meeting as a positive, especially if data sharing was instigated.

3.2.31 The meeting was provided with information on the status of contingency plans for Asia/Pacific States, which was updated and is appended at **Appendix D** to the Report on Agenda Item 3.2. The meeting agreed to a Review Team which, with the support of the Secretariat, would work via electronic communication to assess and analyse Level 1 and Level 2 Contingency Plans using a questionnaire to provide information related to the draft BPEs so sensitive material did not need to be disclosed. India, Indonesia, Singapore and Thailand offered to be members of the Contingency Task Force Review Team in accordance with the following Decision:

Decision RACP/TF/1-1 – ATM Contingency Plan Review Team Formation

That, an ATM Contingency Task Force Review Team be established from the Task Force, that reviewed relevant portions of Level 1 (internal State) and Level 2 (Inter-State) ATM Contingency Plans, and identified areas where ATM contingency planning required improvement, in order to support the development of a Level 3 (Regional) ATM Contingency Plan, based on Basic Planning Elements agreed by the Task Force.

South-East Asia Route Review Task Force Outcomes

3.2.32 The outcomes of the Sixth Meeting of the South-East Asia Route Review Task Force (SEA-RR/TF/6, Bangkok, 30 April 2012) were described. The meeting reviewed the Southeast Asia Implementation Plan developed at SEA-RR/TF/4. Of the 16 route proposals, five were completed; two would be managed by bilateral coordination between the States involved, seven were delegated to the SEACG, two to the Mekong ATM Coordination Group, and one to the East Asia Air Traffic Management Coordination Group (EATMACG).

3.2.33 The Task Force reviewed the task list and resolved all outstanding tasks. The meeting noted that any outstanding work would continue in other bodies, and an ‘empowered’ SEACG would be able to maintain a strategic view of the tasks as they progressed. APANPIRG agreed to the following Decision:

Decision 23/ 3 – Dissolution of the Southeast Asia Route Review Task Force

That, the South East Asia Route Review Task Force (SEARR/TF), be dissolved and any on-going tasks be delegated to existing bi-lateral or multilateral groups as identified in the South East Asia Implementation Plan.

South-East Asia ATM Coordination Group Outcomes

3.2.34 The Nineteenth Meeting of South-East Asia ATM Coordination Group (SEACG/19, Bangkok, 1 to 4 May 2012) noted the continued lack of compliance in the West Pacific/South China Sea and Indonesian airspace with the RVSM TLS. Recalling the importance of AIDC to minimize LHD, which constituted a major cause or factor of RVSM safety issues, a SEACG Capability Planning ad hoc survey was conducted of matters such as AIDC implementation status.

3.2.35 The survey revealed that no SEACG administrations were using AIDC operationally except for China (Sanya) and Hong Kong, China – partial implementation. Only two other trials (Singapore-Viet Nam and Malaysia-Indonesia) were taking place, despite APANPIRG *Conclusion 19/19*, urging administrations to expedite AIDC implementation.

3.2.36 It was also clear from the survey that all States except one had the capability of using a separation standard based on ATS surveillance. The survey indicated that those administrations which had airspace not served by radar, MLAT or ADS-B and Very High Frequency (VHF) communications had either already implemented 50NM separation using ADS-C and CPDLC, or planned to do so. Only Indonesia and Viet Nam had not planned to implement the 30NM standard based on RNP4.

3.2.37 Vietnam was ready to implement 30NM horizontal separation for suitably equipped aircraft in accordance with regional agreements. However, it was evident that none of these separation applications had been planned from a regional or sub-regional basis, which had led to a fragmented approach in the Southeast Asian and South China Sea area.

3.2.38 The inconsistency in approach in the AIDC, ATFM and ATS surveillance fields meant it was important to approach the planning, development and implementation of these areas in a much more disciplined and coordinated manner, with regular appraisal of the status of progress, barriers, and solutions that supported SEACG future planning. SEACG/19, which established three Small Working Groups (SWG) regarding AIDC, ATFM and ATS surveillance:

Decision SEACG/19-2 – Establishment of SEACG Small Working Groups

That, SEACG AIDC, ATFM/LSWD and ATS Surveillance Small Working Groups (SWG) be established to:

- a) assess the current status and planning of implementation;*
- b) identify barriers to implementation;*
- c) make recommendations to assist harmonized ATM procedures and applications;
and*
- d) make recommendations that assist implementation in accordance with the Asia/Pacific Air Navigation and ATFM Concepts of Operations, and the Asia/Pacific Seamless ATM initiatives, related to the AIDC, ATFM/LSWD and ATS Surveillance fields.*

3.2.39 Hong Kong, China highlighted good progress in aircraft equipage of ADS-B along two ATS routes, L642 and M771. Within the Hong Kong FIR for the same period, a total of 2,163 ADS-B airborne targets had been detected out of 3,041 aircraft (71% equipped), and 66% (2,008) of these had good NUC values. Hong Kong, China felt that ADS-B mandates provided a very clear message to aircraft operators to plan for retro-fitting and forward-fitting their fleets. IATA advised that they saw ADS-B as the key for long-term height keeping monitoring.

3.2.40 IATA acknowledged the extraordinary traffic growth in Asia, and stated that it was time to approach planning and start providing an ATC service like Europe using ATS surveillance as the basis. IATA further noted the increasing delays, so suggested that we needed to make major changes to the way ATM was conducted. The meeting was asked, as a first step to provide a more effective and seamless service to flights, to commit to providing surveillance separation where surveillance capability was available, and where areas with overlapping radar coverage existed, commit to providing seamless surveillance separation between the busy city pairs that they serve.

3.2.41 Singapore informed the meeting that there had been recurring instances of ad hoc air traffic flow restrictions which were not in accordance with expected Large Scale Weather Deviation (LSWD) procedures. The meeting noted the lack of a formalised ATFM system to respond to such events. During adverse weather conditions, many flights between Hong Kong and Ho Chi Minh were

diverted through the Manila FIR, even though they were not flight planned through this airspace; hence no flight plan details would be available to Manila ACC. The issue was satisfactorily resolved by the controlling ACCs providing the original flight plan information and the incorporation of the weather contingency route scheme into the Philippines AIP.

3.2.42 The SEACG meeting noted that although the Asia/Pacific Air Navigation Concept of Operations included reference to PBN airspace capabilities, there was no equivalent to *Conclusion 22/8 - ADS-B Airspace Mandate* in terms of airspace mandates and application of priorities. As some administrations were planning to mandate requirements within international airspace such as RNP4 and other PBN specifications, the SEACG developed a Draft Conclusion, which was later superseded by an amendment by the South Asia/Indian Ocean ATM Coordination Group.

Bay of Bengal Reduced Horizontal Separation Task Force Outcomes

3.2.43 The Bay of Bengal Reduced Horizontal Separation Task Force (BOB-RHS/TF/7), Bangkok, 21 May 2012) were apprised that the first phase of the BOB-RHS project was implemented on 30 June 2011. Due to operational issues, 50NM separation was only implemented on two ATS routes (N571 and P762) of the proposed four routes. The second phase was planned in three tranches: 15 December 2011, 12 January 2012 and 08 March 2012, on the majority of RNP10 routes transiting through Bay of Bengal, Arabian Sea and the Kabul FIR. However, 50NM separation was not implemented in accordance with the agreed schedule within the following FIRS: Chennai, Colombo, Jakarta, Kuala Lumpur, Mumbai, and Muscat.

3.2.44 India, Malaysia, and Indonesia were still finalizing the ATS Letter of Agreement (LOA) and date of 50NM implementation on four routes. The BOB-RHS/TF agreed that an ATS LOA could be signed before an ANSP was capable, as the usage could be described as conditional on availability.

3.2.45 The final phase of 50/50NM horizontal separation was partially implemented on 08 March 2012. However, there were some route connectivity problems, so a Special Coordination Meeting was held with Afghanistan, India (by telephone), and Pakistan at the ICAO Regional Office in Bangkok from 19 to 20 March 2012 to resolve these issues.

3.2.46 India identified the following problems for the post-implementation review:

- low percentage of data-link equipped aircraft and VHF coverage limitations;
- non-RNAV route segments within RNP 10 routes selected for 50NM;
- controllers in adjacent FIRs reluctant to accept aircraft with 50NM separation;
- staggered availability of route timings in different States due to military restrictions;
- different dates of implementation on same route; and
- commissioning of new ATM automation systems which had interoperability issues.

3.2.47 The Secretariat noted that the aircraft equipage, communications and non-RNAV issues should have been identified in the State safety assessment. The latter was not an issue as long as the route waypoints were able to be coded in RNAV databases. The meeting noted that the reluctance of controllers to use the standard could be improved with appropriate training, especially simulation, so States needed to have a stronger focus on human factors in future. Regarding the lack of ATM system inter-operability, this was a key area for Seamless ATM planning improvement,

which would focus on future collaborative design and procurement processes. Improved military cooperation was also a Seamless ATM focus area.

3.2.48 The Secretariat presented a review of the issues consequent to the implementation of 50/50NM horizontal separation in the Bay of Bengal and Indian Ocean related to both procedural and technical matters. These were regarding ATS LOA not being updated in a timely manner, misunderstandings pertaining to the appropriate Transfer of Control (TOC) points, and Direct Controller Pilot Communications (DCPC) capabilities of some ACC, whether via data-link or VHF voice.

3.2.49 The meeting noted that, despite the urging of the Regional Office, many States did not appear to have completed an adequate safety assessment, including a 'Know your Airspace' analysis that should have picked up many of the post-implementation review issues. While the experience will have improved knowledge in many States, more collaboration in developing assessments and the forwarding of safety assessments to the Regional Office may be necessary in the future.

3.2.50 India proposed to introduce reduced 30NM longitudinal minimum separation as a transition to the application 30/30NM and also suggested the need to modify the BOB-RHS/TF TOR. The Secretariat noted that the 30NM standard was not 'reduced' but a standard in itself, and supported the positive action by India to introduce more efficient standards. However, the meeting recognized that the emphasis should be on implementation by FIR or airspace instead of a route-by-route basis, and not a mixture like 50NM lateral and 30NM longitudinal for human factors reasons. Moreover, when a route was within ATS surveillance coverage, the separation should be based on surveillance.

3.2.51 It was advised that BOB-RHS/ TF had met six times, and deliberated over many ATM issues in the region, using a large amount of data was provided through the efforts of participating states, and the safety monitoring agencies. With the implementation of 50/50NM separation and the Post-Implementation Review at TF/7, the work of the Task Force had essentially been completed. Any residual tasks thereafter could be delegated to the South Asia/Indian Ocean ATM Coordination Group (SAIOACG) or other appropriate bodies. APANPIRG agreed to the following Decision:

Decision 23/4 – Dissolution of the BOB-RHS/TF

That, the Bay Of Bengal Reduced Horizontal Separation Task Force (BOB-RHS/TF) be dissolved and any outstanding tasks be delegated to South Asia/Indian Ocean ATM Coordination Group (SAIOACG).

South Asia/Indian Ocean ATM Coordination Group Outcomes

3.2.52 The Second Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOACG/2, Bangkok, 22 to 25 May 2012) noted there had been difficulty in completing safety data sharing LOA, as many States had administrative issues signing agreements with foreign entities. The meeting noted that MAAR had advised that the Bay of Bengal airspace RVSM risks were below TLS, however, since 1 July 2010, there had been no LLD or LLE report for the Bay of Bengal area. India suggested that air traffic controllers needed to be trained and directed to understand the importance of reporting correctly.

3.2.53 The SAIOACG/2 meeting agreed that the SEACG Draft Conclusion should include reference to ADS-C and CPDLC, and therefore needed some additional text and the removal of reference to safety nets. APANPIRG agreed to the following Conclusion:

Conclusion 23/5 – Asia/Pacific Air Navigation Concept of Operations Mandates

That, States intending to implement Performance-Based Navigation and Safety Nets may, after appropriate consultation with airspace users, designate portions of airspace within their area of responsibility:

- a) as providing priority for access to such airspace for aircraft with prescribed Performance-Based Navigation (PBN) specifications and supporting data-link equipage (ADS-C/CPDLC); and/or
- b) mandating the carriage and use of an operable Automatic Dependent Surveillance-Contract/ Controller Pilot Data-link Communications Systems (ADS-C/CPDLC) system, and mode A/C and/or mode S transponder.

3.2.54 IATA asked whether the Bay of Bengal, Arabian Sea and Indian Ocean Region (BOBASIO) and the SAIOACG meetings were duplicating the same tasks as they covered similar areas. The Secretariat suggested that the informal BOBASIO meeting was an appropriate forum for much of the detailed technical discussion for short to medium term issues. This was encouraged like other informal forums, as they could be held when needed, without the formality of ICAO meetings.

3.2.55 India was willing to share ADS-B data with neighbouring states. This was recognised by the meeting as a means of improving safety (through the use of safety nets such as conflict alerts), confidence/trust in adjacent operations, and overall efficiency in identifying impending traffic.

3.2.56 The meeting was advised that Oman was studying a proposal for a floating platform for ADS-B and VHF which is connected by fibre in the Arabian Sea, and stated the return on investment would be very positive. IATA stated that innovative solutions like a floating platform were required, and would assist Seamless ATM.

3.2.57 India advised that they had problems with convergence of ATS routes within the Delhi FIR that required a tactical handling of aircraft crossing or joining the MTF being managed by the Bay of Bengal Cooperative Air Traffic Flow Management System (BOBCAT). The short route lengths and requirement to hand off to Pakistan to meet their tactical requirements meant that adjustment to level allocations was regularly required. It was estimated that more than 50% of aircraft significantly differed from their allocated slots, and there were some overflying aircraft which do not participate in BOBCAT.

3.2.58 Analysis of the data during February – April 2012 indicated that the percentage of flights achieving preferred flight levels within the Kabul FIR had fallen from approximately 90% prior to RVSM and 50NM implementation to 65 – 76%, which was a major concern. Major causes of aircraft unable to achieve their preferred flight level included tactical ATC issues (38%) and departures punctuality (31%).

3.2.59 The meeting noted a more tactical approach should be taken than relying on more procedural restrictions, especially if this is able to take into account the actual ATM system capability. Thus the meeting did not initially support more rigid BOBCAT measures, at least until data had been properly analysed. Thailand suggested that more information (sharing of departure and flight plan messages) should be able to be provided to assist tactical decision-making.

3.2.60 India presented information on the coordination between Indian civil and military agencies and the future planning for Flexible Use Airspace (FUA). IATA placed on record the tremendous work done by India in improving the civil/military cooperation, however, it was noted that India still required an air defence number. India stated that the military had been given more monitoring tools, and would further discuss the number system with the military.

3.2.61 User Preferred Routes (UPR) in the Arabian Sea and Indian Ocean had been highlighted as one of the initiatives to reduce emissions during the enroute phase of flight. IATA predicted an average seven minute saving per flight with the use of UPRs and thus supported the UPR programme.

3.2.62 IATA proposed the establishment of a small working group to act as a steering group for ATFM, including BOBCAT, and the application of the correct service delivery. The SAIOCG/2 meeting agreed to the following Decision:

Decision SAIOACG2-2 – Establishment of SAIOACG Small Working Groups

That, SAIOACG Air Traffic Flow Management (ATFM), ATS Communications (COM) and ATS Surveillance (SUR) Small Working Groups be established to:

- a) Assess the current status and planning of implementation;*
- b) Identify barriers to implementation;*
- c) Make recommendations to assist harmonized ATM procedures and applications;*
- d) Make recommendations that assist implementation in accordance with the Asia/Pacific Air Navigation and ATFM Concepts of Operations, and the Asia/Pacific Seamless ATM initiatives, related to the ATFM, COM and SUR fields.*

3.2.63 The meeting noted that the Regional Office sometimes received Basic Air Navigation Plan amendment proposals from States without accurate data and appropriate supporting information. Additionally, there was often no information on whether the route had been coordinated with other affected FIRs. All these issues led to unnecessary delays while the Regional Office sought clarification, and increased workload. APANPIRG/23 agreed to the following Conclusion:

Conclusion 23/6 – Basic Air Navigation Plan Amendment Procedure Template

That, for ease of reference and reduction of submission errors, the ICAO Regional Office should provide the Doc 9673 Amendment Procedure appended as **Appendix E** to the Report on Agenda Item 3.2 on the Asia/Pacific website, including requirements to provide detailed and accurate information, an appropriate chart in the case of ATS route amendments, and information on prior consultation with any affected States.

Informal Pacific ATC Coordinating Group (IPACG) Outcomes

3.2.64 An update from IPACG/35 (Sapporo, Japan, 7-11 November, 2011) and IPACG/36 (San Diego, USA, 14-18 May, 2012) was presented. These meetings were held in conjunction with the Future Air Navigation System (FANS) Interoperability Team (FIT/22) and FIT/23 respectively, and focused on a 30/30NM separation trial, Climb Descend Procedures (CDP), which required ADS-C, CPDLC, and use of UPRs. The FAA reported that on 30 April 2011, the FAA and JCAB began an operational trial for Dynamic Airborne Reroute Procedures (DARP) for flights between Japan and Hawaii.

Informal South Pacific ATS Coordinating Group Outcomes

3.2.65 The outcomes from the 26th Meeting of the Informal South Pacific ATS Coordinating Group (ISPACG/26, Nadi, Fiji, 1-2 March 2012) were presented. The meeting noted the activities of the APSAPG and that activities to support seamless ATM within the South Pacific such as UPR, DARP, 30/30NM separations, AIDC, ADS-B, ADS-C, CDP, and ITP were already well established. To provide increased focus, the ISPACG Planning Team would develop a matrix of desired attributes against which each State would report and/ or develop plans where necessary.

BOBASIO/02 Meeting Review

3.2.66 The Second Bay Of Bengal, Arabian Sea and Indian Ocean Region meeting (BOBASIO/02) was held in Chennai, India from 11 to 13 April, 2012. The meeting also reviewed items from the First India-Myanmar-Thailand ATM Coordination Meeting (IMT-ATM/CM/1).

3.2.67 The Indian Ocean Strategic Partnership to Reduce Emissions (INSPIRE) Agreement was signed by Airservices Australia, Air Traffic and Navigation Services of South Africa and the Airports Authority of India on 07 March 2011. Seychelles, Maldives and Indonesia were urged to participate in this green initiative by India and IATA.

East Asia Air Traffic Management Coordination

3.2.68 IFATCA presented the outcomes from the 5th Meeting of the East Asia Air Traffic Management Coordination Group (EATMCG/5, 18 to 20 April 2012). EATMCG had been instrumental in developing routes and basic strategic ATFM involving Hong Kong, Japan and Taiwan.

3.2.69 The non-standard Flight Level Orientation System (FLOS) and the FLAS used between Manila FIR and Fukuoka FIR, Japan had been a cause for the inadvertent use of incorrect flight levels of some flights at the boundary. Japan requested the Philippines to utilise the standard ICAO FLOS or not to allocate non-standard flight levels. IFATCA proposed the adoption of the standard ICAO Single Alternate FLOS should be an item for consideration at APSAPG.

3.2.70 It was advised that Taipei ACC had reported that they experienced numerous occurrences of unknown traffic, believed to be military aircraft operating under 'due regard' procedures within their airspace, but without any flight plan, radio communication, or coordination. In recent months there had been four such events resulting in Traffic Collision Avoidance System Resolution Advisory (TCAS RA) events.

3.2.71 RVSM had been implemented on 17 Nov 2011 in Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russian Federation, Tajikistan, Turkmenistan and Uzbekistan, which had been managed by the Europe and Asia (EURASIA) RVSM project. There were a few implementation issues, some with initial filing of metric flight levels and not feet. The meeting noted that most transition areas were now gone, with the exception of areas adjoining China, the Democratic Republic of Korea, and Mongolia (which was planning to change to feet in 2013).

3.2.72 The Fifth Special ATS Co-ordination Meeting – China, Mongolia, the Russian Federation and IATA (CMRI/5) had been held in Bangkok on 20 – 21 June 2007. It was clear that a number of bodies had dealt with East Asia/trans-regional ATS route proposals, but there was no formal APANPIRG body. China, Japan the Republic of Korea and Mongolia met separately to discuss the formation of a body that could manage trans-regional ATM issues after some States indicated their support for the proposal. In noting that Russia was not present to discuss this, it was decided to correspond between the concerned States in order to present an agreed position if possible, to the next ATM Sub-Group meeting.

Asia/Pacific Region ATS Route Catalogue

3.2.73 The Asia/Pacific Region ATS Route Catalogue was reviewed by the meeting. It was noted that a number of States needed to update ICAO on Basic ANP amendments that either had not been implemented, or had not been implemented as approved, or were not formally approved. Chapter 1 was expected to become obsolete in the near future as the Basic ANP migrated to an electronic format provided by ICAO HQ. The remaining Chapters would be geographically referenced to allow easy review of the proposals.

3.2.74 Japan commented that it should be confirmed that the route proposals did not necessarily mean practicable or implementable. Japan also stated that there were unfeasible routes to implement in the near future. The Secretariat affirmed and clarified that the proposals did not require States to implement the proposals. Japan was also concerned that the process for submitting and incorporating route proposals in the Route Catalogue needed to be clarified.

3.2.75 APANPIRG/23 agreed to the following Conclusion:

Conclusion 23/7 – Asia/Pacific Region ATS Route Catalogue Update

That, ICAO should update the Asia/Pacific Region ATS Route Catalogue as Version 11 by:

- a) amending the administrative details as required;
- b) incorporating any ANS Deficiency changes approved by APANPIRG;
- c) incorporating new airspace user proposals presented at the ATM/AIS/SAR/SG/22 meeting;
- d) undertaking a review of existing routes within the Route Catalogue, in collaboration with affected States and administrations in order to update this information; and
- e) developing a new document structure organised by geographical reference that allows easy review.

AIS-AIM Implementation Task Force Outcomes

3.2.76 The Seventh Meeting of the Aeronautical Information Services – Aeronautical Information Management Implementation Task Force (AAITF/7) and the International Codes and Routes Designators (ICARD) Seminar were held at Hanoi, Viet Nam from 13 to 16 March 2012.

3.2.77 The ICARD Seminar was conducted in order to assist States to manage aeronautical data associated with Five Letter Name Codes (5LNC) and ATS Routes. The Seminar provided direct assistance to numerous Asia/Pacific States, and as a result, nine administrations successfully registered for ICARD, bringing the total number of Asia/Pacific users to 26 (in 2011 there were 12). These administrations were Cambodia, India, Indonesia, Macao China, Myanmar, the Philippines, Sri Lanka, the Solomon Islands and Viet Nam. States were urged to have a minimum of two ICARD users.

3.2.78 Regarding short-notice changes in aeronautical data, the APANPIRG/22 Chairman had noted that a small aeronautical data change could have a global effect on other systems, and urged States to comply with aeronautical promulgation standards. IATA reflected on several recent regional examples of non-adherence to ICAO standards and recommended procedures and/or quality and accuracy of information in respect of location indicator and ATS routes, noting the adverse effect this had on aviation systems. Japan noted that the purpose of Aeronautical Information Regulation and Control (AIRAC) cycle was to provide enough lead time so that all stakeholders could update their databases, including Flight Management Systems (FMS) and relevant manuals prior to the change. The meeting noted that aeronautical information should be published 28 days before the effective date for normal changes, but in the case of major changes such as airspace or airport changes, the lead time should be 56 days.

3.2.79 The AAITF/7 meeting discussed the possible reasons for the systemic issues and noted that project planning that took into account AIM issues should be an automatic part of a State's responsibilities under their Safety Management System (SMS) requirements. The main reasons for the failure of some administrations to adhere to Annex 15 lead times appeared to be:

- Poor planning and coordination between change originators such as Air Traffic Management (ATM), resulting in AIS units receiving information for promulgation less than the required time before its effective date; and
- AIS units not being empowered to decline to promulgate information which did not comply with Annex 15 requirements.

3.2.80 APANPIRG/23 agreed to the following Conclusion:

Conclusion 23/8 – Annex 15 Promulgation Requirements Compliance

That, States should be urged to recognise the importance of Annex 15 compliance in respect of aeronautical data affected by major projects, by:

- a) establishing formal coordination between change originators and Aeronautical Information Service (AIS) units to ensure appropriate planning and that promulgation requirements were taken into account; and
- b) creating a mechanism to allow AIS personnel to decline requests that did not comply with Annex 15, except for urgent corrections, emergencies, and matters of national security.

3.2.81 The meeting discussed appropriate procedures and associated policy for promulgating ATS route designators. Two Asia/Pacific States had designated domestic ATS routes using an inappropriate alphanumeric code that included a zero ('0') as the first number (V001-V029 and V10-V021). Given the problems that a leading zero before any one or two digit number presented to automated systems, the meeting noted that three route numbers should be used, not one or two, and that the use of a zero ('0') should not be used as the first number.

3.2.82 The meeting considered the progress of AIM implementation to date, noting that the AIM Transition Table (**Appendix F** to the Report on Agenda Item 3.2) indicated that implementation had been inconsistent, and that many administrations had not progressed beyond Phase 1. Australia commented that according to the AIS-AIM Roadmap, Phase 1 was intended to be complete by November 2010 (Phase 2 by November 2013 and Phase 3 November 2016). Of the 43 administrations indicated, only 10 had achieved the four Phase 1 elements, and only four had

indicated implementation of Phase 1 plus five of the nine Phase 2 elements, including P17-Electronic AIP (India, Japan, New Zealand and Singapore).

3.2.83 Given the slow progress of implementation in many States thus far, it was suggested that the Task Force place a much greater emphasis on individual State planning to achieve AIM transition as soon as practicable. The meeting noted that the State Letter could include guidance on what information was required, and a template for the plan. APANPIRG agreed to the following Conclusion:

Conclusion 23/9 – AIS-AIM Transition State Plans

That, States should develop a basic plan that identified the target completion dates of Transitional elements in the AIS-AIM Roadmap and submit these plans to the Asia/Pacific Regional Office by 1 January 2013.

3.2.84 The matter of data integrity quality assurance was discussed. It was clarified that the specific metrics had been removed from Annex 15, although it was emphasised that there was still a continuing need to ensure data integrity to an acceptable level. Of serious concern in terms of AIM implementation progress was the number of States that had not completed the Quality Assurance element of Phase 1 (P-17).

3.2.85 After the AAITF/7 meeting, further discussion between States indicated a worldwide need for more guidance on this subject, so an AIM Quality Assurance Seminar for Asia/Pacific States was considered just prior to the next AAITF meeting. APANPIRG agreed to the following Conclusion:

Conclusion 23/10 – AIM Quality Assurance Seminar

That, ICAO should conduct an AIM Quality Assurance Seminar in conjunction with the Aeronautical Information Services – Aeronautical Information Management Implementation Task Force (AAITF)

3.2.86 It was noted that many Asia/Pacific States did not have the resources to engage in high technology solutions for Electronic Terrain Obstacle Databases, or the regulations requiring construction reporting. In these cases the primary means of ensuring the provision of relevant construction activity information was considered to be the development of strong relationships between airports and the local planning and construction authorities.

3.2.87 There was considerable discussion regarding duplicated 5LNCs and amendment procedures, which clarified that Annex 11 required that each code had to be unique. Notwithstanding this, the United States advised that there were many duplicated codes within their system and worldwide, so logic checks were written into their software to ensure there were no safety issues and to bring the pilot into the decision-making process. The Seminar noted that there was worldwide pressure on the number of waypoint codes available, especially with the implementation of PBN.

3.2.88 The meeting noted that some FMS had logic which enabled identification of duplicated codes, but this was not universal. In addition, the meeting noted that the strict requirement to change a code even if, for example, the amendment was only a very minor nature en-route was not how many States interpreted this requirement. It was agreed that when an ATS route designation was amended, this should not affect the 5LNCs unless the route was amended in terms of its geographical disposition. APANPIRG agreed to the following Conclusion:

Conclusion 23/11 – Duplication and Amendment of 5LNC

Recognising that with the increasing use of Five Letter Name Codes (5LNC), it was not practical to avoid any duplication of 5LNC worldwide, and that States often used discretion in managing both duplications and minor changes of waypoint position that may not strictly be in accordance with the provisions of Annex 11, Appendix 1; ICAO is requested to consider:

- a) reviewing and updating Annex 11 to ensure its provisions related to 5LNC are appropriate; and
- b) standards for Flight Management Systems (FMS) that ensure logic checks on duplicated waypoint entries are highlighted to pilots.

Search and Rescue Capability

3.2.89 APANPIRG/22 had no specific discussion in relation to SAR matters apart from a Secretariat update. As a measure towards addressing the lack of discussion in relation to SAR matters and lack of conclusions related to SAR, Australia proposed the establishment of an Asia/Pacific Regional SAR Workgroup (APSAR/WG) reporting to the ATM/AIS/SAR/SG.

3.2.90 Australia noted that cooperation between, and collaboration with, neighbouring and regional Rescue Coordination Centres (RCCs) was essential to ensure that the best possible SAR response to persons in distress regardless of State boundaries. This included the activation of SAR assets for cross-boundary responses, and preparatory measures (sharing of SAR expertise, knowledge and experience amongst neighbouring and regional SAR Coordination personnel). Papers were also presented by French Polynesia and the USA supporting strengthened SAR coordination.

3.2.91 The current List of SAR Agreements is presented in **Appendix G** to the Report on Agenda Item 3.2. The SAR Capability Matrix Table is appended as **Appendix H** to the Report on Agenda Item 3.2. This data indicated that only eight Asia/Pacific administrations had full SAR capability in all elements.

3.2.92 One particular area of concern and challenge to the Asia/Pacific that was highlighted was oceanic SAR capability. Considering that the Asia/Pacific Region had responsibility to provide a SAR service over vast oceanic areas, including three of the world's five oceans, combined with identified gaps for States with oceanic SAR responsibility, cooperation and collaboration between neighbouring and regional RCCs was essential.

3.2.93 It was reported that ATM/AIS/SAR/SG/22 discussed a proposal by Australia to establish a SAR workgroup to promote the enhancement and improvement of Regional SAR capability, address regional SAR issues, promote SAR best practice, make recommendations for improvements and raise the profile of SAR issues within APANPIRG. It was proposed that membership of the workgroup be open to States and administrations that had the responsibility for the provision of SAR services and facilities within the Asia/Pacific Region, SAR related international organizations, ICAO and the International Maritime Organization (IMO).

3.2.94 There was considerable discussion of this proposal, including the workload involved in monitoring the outcomes of the ICAO/IMO Joint Working Group on Harmonization of Aeronautical and Maritime Search and Rescue (JWG), the effectiveness of the APSAR/WG in assisting the region in aligning the States' SAR capabilities, bilateral and sub-Regional SAR agreements, and the capacity of States to conduct SAR exercises.

3.2.95 APANPIRG/23 also had considerable discussion on this matter, with concerns being raised regarding the possible tenure of the proposed workgroup, perceptions of cross-over with the JWG, and whether existing ATM coordination groups or the JWG itself could conduct regional SAR implementation activity. The ATM/AIS/SAR/SG Chairperson stated that these matters had been discussed at the SG meeting and agreed. The Secretariat noted that ATM coordination groups did not necessarily have SAR experts from RCCs present, and the JWG was not tasked to deal with regional SAR issues. APANPIRG concurred to the establishment of a short-term Task Force to deliver a plan within two years of establishment for enhancement of SAR capability within the Asia/Pacific Region, including enhancement of SAR services with neighboring States, and agreed to the following Decision:

Decision 23/12 – Establishment of APSAR Task Force

That, an Asia/Pacific Regional SAR Task Force (APSAR/TF) be established, reporting to the ATM Sub-Group of APANPIRG, in accordance with the Terms of Reference as shown in **Appendix I** to the Report on Agenda Item 3.2.

Election of ATM Sub-Group Chairperson and Vice-Chairperson

3.2.96 Mr. Colman Ng, Chairman of the ATM/AIS/SAR/SG, had announced that he would step down from the Chair of the Sub-Group at the end of the SG meeting. The meeting acknowledged the long and significant contribution of Mr. Ng. IATA stated that the users were very grateful for the manner in which Mr. Ng had guided the Sub-Group through many difficult areas in order to make progress.

3.2.97 Hong Kong, China nominated Mr. Kuah Kong Beng, Director of Air Traffic Services, Civil Aviation Authority of Singapore, to chair the ATM Sub-Group. Thailand seconded the nomination. No other nominations were made, and Mr. Kuah Kong Beng was duly elected as Chairperson of the ATM Sub-Group.

3.2.98 Thailand nominated Mr. Mukesh Chand Dangi, General Manager (ATM), Airports Authority of India, as Vice-Chairperson. Sri Lanka seconded the nomination. No other nominations were made, and Mr. M.C. Dangi was duly elected as Vice-Chairperson of the ATM Sub-Group.

Pre-tactical Air Traffic Flow Management Mechanism in Hong Kong, China (WP14)

3.2.99 Hong Kong, China apprised the meeting about the implementation of a pre-tactical ATFM mechanism in Hong Kong. As there was a lack of regional ATFM, capacity management measures relied solely on arrival/departure slot allocation and ad hoc tactical ATC flow measures. Recognizing that these would not be sufficient, Hong Kong Civil Aviation Department (CAD) took the initiative to implement a pre-tactical flow management mechanism since October 2011.

3.2.100 The mechanism incorporated a package of enhancement items, including the provision of ATM - focused weather briefing to ATC supervisors by the Hong Kong Observatory, determination of arrival acceptance rate at HKIA through scientific calculation and declaration of expected Airport Acceptance Rate for up to 8 hours ahead to over 100 airline operators, Hong Kong Airport Authority and upstream ACCs. The initiative gained wide support from aviation stakeholders, who in turn, could better adjust their daily operational plan and benefit from the improved awareness of operational important information.

ATM Contingency Plan – India (WP15)

3.2.101 India presented a paper on the requirement for coordination among States to develop harmonized ATM Contingency Plans for safe and orderly flow of international air traffic through upper Indian airspace during ATM contingencies. The Airports Authority of India (AAI) had updated their ATM Contingency Plan to include a revised route structure and the latest contact details for all Indian FIRs. The ATM Contingency Plan was developed for safe and orderly flow of international air traffic through upper Indian airspace in case of disruption of Air Traffic Services. India urged States and the Region to develop Interstate/Bilateral Contingency plans (Level 2) and a Regional ATM Contingency Plan (Level 3).

ATM Improvement Initiatives in the Indian Ocean and Arabian Sea of Indian FIRs (WP16)

3.2.102 India provided information regarding the initiatives by AAI for enhancing safety and efficiency of flights in Arabian Sea-Indian Ocean region of Indian FIRs. The four significant initiatives discussed were:

- a) implementation of reduced horizontal separation;
- b) connector routes in the southern part of Mumbai FIR to support Flex Tracks in Male FIR;
- c) INSPIRE User Preferred Route trials; and
- d) SATCOM WPR services within the Mumbai FIR.

Doc 4444 Amendment 1 Implementation Risk Assessment

Very High Risk	Afghanistan*
	Philippines
	Vietnam
	China
High Risk	Indonesia
	Myanmar
	India
	Australia
Medium Risk	Papua New Guinea
	Maldives
	Pakistan
	Brunei Darassulam*
	Macao China
	Malaysia
	Sri Lanka
	Cambodia
	Nauru*
	Solomon Islands*
	Japan
	Lao PDR
	USA
	Thailand
Low Risk	New Zealand
	Rep. of Korea
	Bangladesh
	Nepal
	Mongolia
	Hong Kong China
	Singapore
	DPR Korea
Very Low Risk	French Polynesia
	Fiji

* No data received

Now accepting NEW

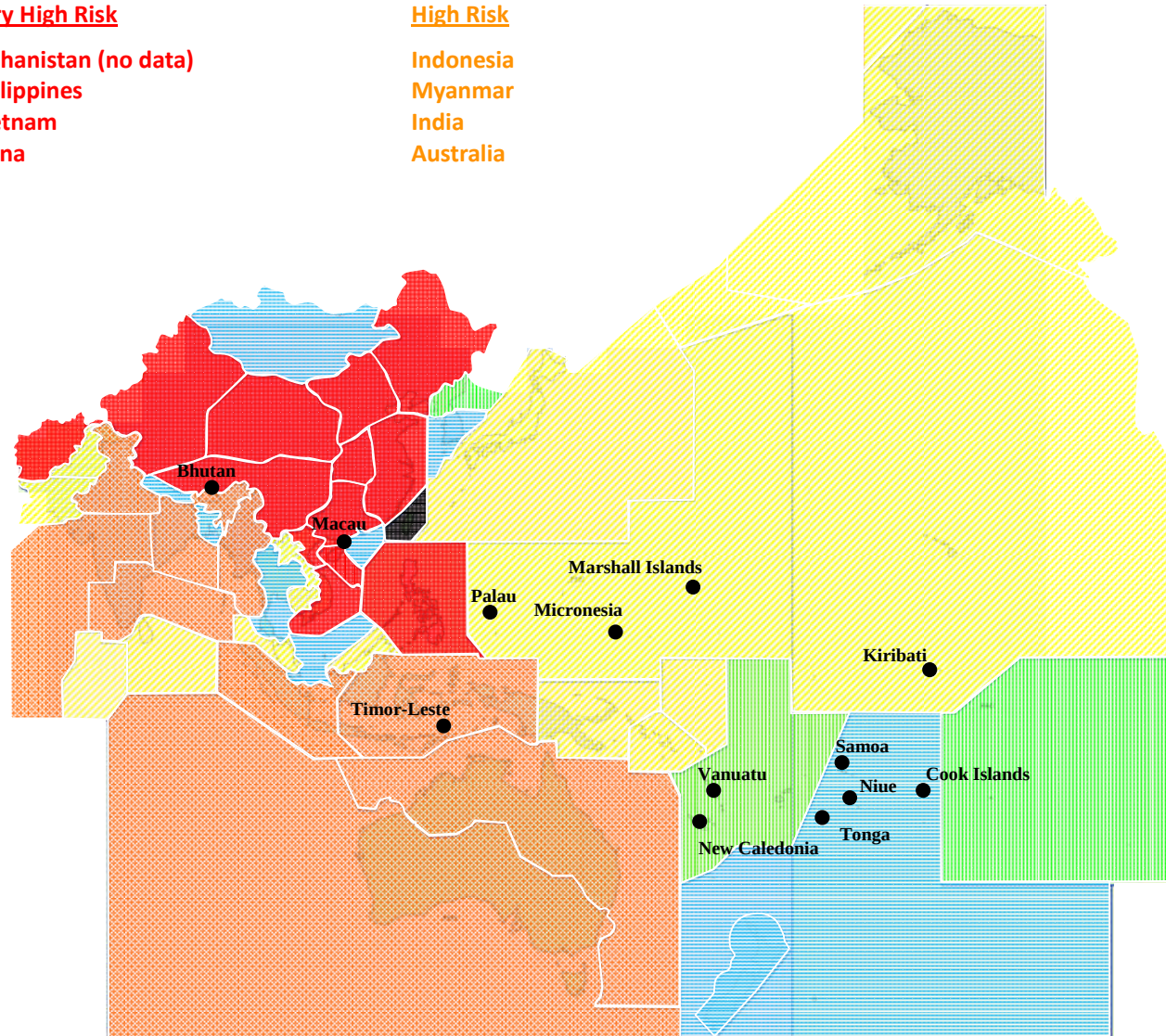
Doc 4444 Amendment 1 Implementation Risk Assessment

Very High Risk

Afghanistan (no data)
Philippines
Vietnam
China

High Risk

Indonesia
Myanmar
India
Australia



Very High Risk

High Risk

Medium Risk

Low Risk

Very Low Risk

No assessment

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE



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)

Version 5, 29 June 2012

ISSUED BY THE ICAO ASIA/PACIFIC REGIONAL OFFICE, BANGKOK

Indicator	Contents
STS/	One or more of the approved specified entries, separated by spaces
PBN/	A single string containing up to 8 of the approved alphanumeric descriptors No embedded spaces
NAV/	Free text field
COM/	Free text field
DAT/	Free text field
SUR/	Free text field
DEP/	Free text field
DEST/	Free text field
DOF/	A single string in the specified date format (YYMMDD). No embedded spaces
REG/	A single string. No embedded spaces
EET/	One or more strings. Each string is: 2-5 alphanumeric characters; or a LAT/LONG followed by a 4-digit elapsed time, from 0000 to 9959 (i.e., 0-99 hours followed by 0-59 minutes) One or more strings. Each string is: 2-5 alphanumeric characters, or a LAT/LONG; followed by A 4-digit elapsed time, from 0000 to 9959 (ie. 0-99 hours followed by 0-59 minutes)
SEL/	A single string of four letters
TYP/	Free text <i>Note: Although the entry is structured when used for formation flights, it is also used when no designator is assigned and, therefore, may be any text description.</i>
CODE/	A single string of 6 hexadecimal characters
DLE/	One or more strings Each string consists of a valid Significant Point followed by a 4-digit elapsed time
OPR/	Free text field
ORGN/	Free text field

Indicator	Contents
PER/	A single letter The letter must be one of those specified in PANS-OPS (Doc 8168), as below: • <i>Category A</i>: less than 169 km/h (91 kt) indicated airspeed (IAS) • <i>Category B</i>: 169 km/h (91 kt) or more but less than 224 km/h (121 kt) IAS • <i>Category C</i>: 224 km/h (121 kt) or more but less than 261 km/h (141 kt) IAS • <i>Category D</i>: 261 km/h (141 kt) or more but less than 307 km/h (166 kt) IAS • <i>Category E</i>: 307 km/h (166 kt) or more but less than 391 km/h (211 kt) IAS • <i>Category H</i>: Specific procedures for helicopters.
ALTN/	Free text field
RALT/	Free text field
TALT/	Free text field
RIF/	~~Route information consistent with the format of a valid Field 15c~~ The route details to the revised destination aerodrome, followed by the ICAO four-letter location indicator of the aerodrome. Examples: RIF/DTA HEC KLAX RIF/ESP G94 CLA YPPH
RMK/	Free text field

Table 5-1: Item 18 Indicator Validity Check

9.2 States are urged to commence operational acceptance and processing of PRESENT and NEW format FPL and ATS messages as early as possible, and in any event no later than 0000 UTC on 12 November 2012.

APANPIRG/23
Appendix D to the Report on Agenda Item 3.2

APAC State Contingency Plan Status (last updated: 4 May 2012)

Territory	Plan	APAC Version	Web-site	Contact Details	Info Updated	Notes
Afghanistan						
Australia	Yes	22 July 2010				
Bangladesh	Yes	11 May 2009	No	Azad Zahirul Islam datsaero@caab.gov.bd ncusapcaab@yahoo.com	19/4/2012	
Bhutan						
Brunei Darussalam						No FIR
Cambodia						
China	Yes					
Hong Kong, China	Yes	TBA	No	Benjamin Fong bysfong@cad.gov.hk	17/4/2012	
Macau, China	No					No FIR
Cook Islands						Cook Sector (Auckland)
Fiji	Yes	23 October 2008				
French Polynesia	Yes					Tahiti FIR and Noumea Sector
India	Yes	June 2011	No	A K Jain –GM (ATM) Airports Authority of India. 'ARUN KUMAR JAIN' <akjaincra@gmail.com>	17/4/2012	Delhi, Chennai, Mumbai, Kolkata FIRs
Indonesia	Yes	01 August 2007	No	1. Wisnu Darjono, Deputy Director of ATM, DGCA Indonesia Email: wdu@indosat.net.id 2. Saeful Bahri, Chief of ATS Section Email : saeful21@hotmail.com 3. Indra Gunawan Ind124gunawan@yahoo.com		To be updated 2012

APANPIRG/23
Appendix D to the Report on Agenda Item 3.2

Territory	Plan	APAC Version	Web-site	Contact Details	Info Updated	Notes
				Ind124gunawan@dephub.go.id		
Japan	Yes					
Kiribati						No FIR
Korea, DPR						
Korea, Republic of	Yes	2012.2	No	Hyung Hoon Jung <늑대1마리 <hlwolf@naver.com>	18/4/2012	
Lao PDR						
Malaysia	Yes	April 2005	No	Airspace Unit Air Traffic Management Sector Department of Civil Aviation Level 4 Podium Block B No. 27 Persiaran Perdana Federal Government Administration Centre 62618 Putrajaya MALAYSIA Mr. Muddatstir Bin Mashor muddatstir@dgca.gov.my	18/4/2012	Paper version. Subject to review
Maldives	Yes	August 2005				Paper version
Marshal Islands						No FIR (Oakland)
Nauru						
Micronesia, Fed States of						No FIR (Oakland)
Mongolia						
Myanmar	Yes	2009				
Nepal	Yes	July 2008				Paper version
New Zealand	Yes					
Pakistan	Yes	24 October 2011				Paper/scanned

Appendix D to the Report on Agenda Item 3.2

Territory	Plan	APAC Version	Web-site	Contact Details	Info Updated	Notes
Palau						No FIR (Oakland)
Papua New Guinea						
Philippines	Working Draft	Draft	No	1. Director General, Civil Aviation Authority of the Philippines director_gen@caap.gov.ph 2. Directorate, Air Traffic Service, Civil Aviation Authority of the Philippines chief_ats@caap.gov.ph	18/4/2012	
Samoa						Samoa Sector (Auckland)
Singapore	Yes	TBA	No	Harrison LIM : harrison_lim@caas.gov.sg	18/4/2012	Contingency plan information shared with Malaysia, Indonesia, Philippines, Thailand.
Solomon Islands						
Sri Lanka	Yes	September 2011		C Mahesh D Silva, Air Navigation Services Inspector ansi@caa.lk	17/4/2012	Level 1 Plan. Copies distributed to India and Indonesia.
Thailand	Yes	January 1999				Paper version
Tonga	Yes					Samoa Sector (Auckland)
U.S.A.	Yes					
Vanuatu	No					
Viet Nam	Yes	11 Apr 2012	No	buivanvo@caa.gov.vn hungand@caa.gov.vn	17/4/2012	Requires coordination and agreement with neighbouring States.

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**PROPOSAL FOR AMENDMENT OF THE
ASIA/PACIFIC BASIC AIR NAVIGATION PLAN
(Doc 9673)**

(Serial No.: APAC 11/X – ATS)

a) **Plan:**

Doc 9673

b) **Proposed by:**

(Name of State or Organisation)

c) **Proposed amendment:**

Editorial Note: Amendments are arranged to show deleted text using strikeout (~~text to be deleted~~), and added text with grey shading (text to be inserted)

Amend requirement for ATS routes as follows:

d) **Date when proposal received:**

xxxxxx

e) **Proposers reason for amendment:**

xxxxxx

Note: Where the amendment affects adjacent FIRs, the proposer should provide information on consultation and agreement.

f) **Proposed implementation date of the amendment:**

Upon approval by the Council.

g) **Action by the Regional Office:**

The proposal is circulated to the following States.

(i) xxxx, (ii) xxxx, (iii) xxxx, (iv) xxxxxxxx,

Note: The list should include the States or organisations affected by the route change. The proposal for amendment may also be circulated to some interested states, for information.

h) **Secretariat's comments:**

1. xxxxxxxxxxxxxxxxxxxx
2. xxxxxxxxxxxxxxxxxxxx

Note: States should ensure that-

- a) detailed and accurate information with regard to the route is provided;
- b) an appropriate chart be provided for reference; and
- c) prior consultation and agreement is sought with the affected FIRs, and information on such consultation and agreement be provided (joint proposals are recommended).

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: 23 May 2012

	Phase 1 Consolidation (Am. 36 November 2010)				Phase 2 Going Digital (Amendment 37 November 2013)									Phase 3 Information Management (Amendment 38 November 2016)							
	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										Link											
Australia	√	√	√	90%	80%	√	√	√	60%	Link	√	75%				10%	60%			90%	5%
Bangladesh	√	√	25%							Link											
Bhutan										Link											
Brunei Darussalam																					
Cambodia	√	√	√																		
China	√	√	√	√													√			√	
Hong Kong, China	√	√	√	√	√	√				Link	10%	10%					20%				
Macao, China	√	√	√	√						Link											
Cook Islands																					
DPR Korea			√																		
Fiji	√	√	√				√	√				√	√		√	√	√				
India	√	√	√	√	√	√	√	√	√	Link		√									
Indonesia	√	√	√		50%	50%	20%			50%					80%		60%	20%	10%	20%	
Japan	√	√	√	√	80%	80%	√	√	√	Link	20%	20%		20%	20%	60%	80%	√		20%	20%
Kiribati																					
Lao PDR	√	√	25%																		
Malaysia	√	√	√	10%						Link											
Maldives										Link											
Marshall Islands																					
Micronesia																					
Mongolia	√	√	√	√	80%	80%	30%	√	√	Link	10%	10%		60%	10%	50%	90%	√			
Myanmar	√	√	√				20%			Link	20%	20%				10%				25%	
Nauru																					
Nepal																					
New Zealand	√	√	√	√	√	√	√	√	75%	Link	√	80%	15%	80%							
Niue (NZ)																					
Pakistan	√	√	√									√		√	√	√		√			√
Palau										Link											
Papua New Guinea	√	√	√	90%				√								10%					
Philippines	√	√	40%	√	√	√	√	√	√	Link											
Republic of Korea	√	√	√	√	80%					Link										40%	90%
Samoa																					
Singapore	√	√	√	√	√	√	√	√		Link				√	√	√	√	√		√	
Solomon Islands			√																		
Sri Lanka	√	√	90%	90%						Link					10%	25%	15%	25%			
Thailand	√	√	80%	10%						Link											
Timor Leste			√							Link											
Tonga																					
Vanuatu										Link											
Viet Nam	√	√	√	25%	50%	50%	50%		√					√	√		70%	50%			
USA ¹	√			√	√		√	√	√	Link	√	√	√	√	√					√	√
France ²										Link											

% 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

E-AIP Internet Addresses

Afghanistan	http://www.motca.gov.af/
Australia	http://www.airservicesaustralia.com/
Bangladesh	http://www.caab.gov.bd/adinfo/adinfo0.html
Bhutan	http://www.dca.gov.bt/aip
Brunei Darussalam	
Cambodia	
China	
Hong Kong, China	http://www.hkatc.gov.hk
Macao, China	http://www.aacm.gov.mo
Cook Islands	
DPR Korea	
Fiji	
India	http://www.aai.aero/public_notices/AIP_INDIA_MAIN.jsp
Indonesia	
Japan	https://aisjapan.mlit.go.jp
Kiribati	
Lao PDR	
Malaysia	http://aip.dca.gov.my/
Maldives	http://www.aviainfo.gov.mv
Marshall Islands	
Micronesia	
Mongolia	http://ais.mcaa.gov.mn/index.php?lang=en
Myanmar	http://www.ais.gov.mm
Nauru	
Nepal	
New Zealand	http://www.aip.net.nz/
Niue (NZ)	
Pakistan	
Palau	http://www.faa.gov/air_traffic/publications/atpubs/AIP/aip.pdf
Papua New Guinea	
Philippines	http://ats.caap.gov.ph
Republic of Korea	E-AIP Republic of Korea http://ais.casa.go.kr/eAIPRoot/Operations/history-en-GB.html
Samoa	
Singapore	http://www.caas.gov.sg/caas/en/Regulations/Aeronautical_Information/AIP/index.html
Solomon Islands	
Sri Lanka	http://www.airport.lk/AIS/AIP%20frameset.htm
Thailand	http://www.aisthai.go.th/webais/download_aip.php
Timor Leste	http://www.gov.east-timor.org/CAA/index.html
Tonga	
Vanuatu	http://www.airports.vu/Pilots%20&%20Aircraft%20Operators/aip.htm
Viet Nam	
USA	http://www.faa.gov/air_traffic/publications/atpubs/AIP/aip.pdf
France (Wallis et Futuna, Iles) (French Polynesia)	E-AIP France

SAR AGREEMENTS

Updated: 22 Jun 2011

ID NO.	DATE	STATES	REMARKS
1	14 April 1972	ASEAN States - Indonesia, Malaysia, Philippines, Singapore and Thailand	Multilateral agreement
2	March 1997	ASEAN - Viet Nam	Viet Nam accession to 1972 ASEAN Agreement (as above)
13	November 1990	Australia / Indonesia	Updated 5 April 2004
30	April 2006	Australia / Maldives	Letter of Arrangement
28	notified 2005	Australia / New Zealand	Updated April 2009
20	February 2001	Australia / Papua New Guinea	Updated 12 August 2007
17	16 December 1998	Brunei Darussalam / Malaysia	
19	February 1999	Cambodia / Viet Nam	
33, 41	1 June 2009	Chile / New Zealand	SAR services coordination
37	16 May 2007	China / Republic of Korea	
26	notified 2003	China / United States	
32	notified July 2007	Cook Islands / New Zealand	
35	notified July 2007	French Polynesia (Tahiti) / New Zealand	Final draft agreement being considered by FP authorities
3	June 1982	Indonesia / Singapore	
12	1990	Indonesia / Papua New Guinea	JBC MOU signed
9	August 1986	Indonesia / Philippines	
11, 31	1988, July 2006	Indonesia / United States	SAR Services Agreement
42	17 March 2010	Japan/Philippines	SAR Agreement
38	30 April 2008	Japan / Republic of Korea	
10	1986	Japan / United States	
18	1998	Lao PDR / Vietnam	LOA for provision of assistance
5	29 August 1985	Malaysia / Indonesia	
8	9 December 1985	Malaysia / Philippines	
4	11 August 1984	Malaysia / Singapore	
7	9 September 1985	Malaysia / Thailand	
21	September 2002	New Caledonia / New Zealand	
34	notified July 2007	New Zealand/Niue	Government aid agreement
29	notified 2005	New Zealand / Samoa	
36	notified July 2007	New Zealand/Tokelau	Government aid agreement
27	June 2005	New Zealand / Tonga	
14	July 1996	Philippines / Singapore	
16	September 1996	Philippines / Viet Nam	
6	September 1985	Singapore / Thailand	Updated July 1996
15	July 1996	Singapore / Viet Nam	
24	notified 2003	United States / Marshall Islands	
25	notified 2003	United States / Micronesia	
23	2003	United States / New Zealand	
22	November 2002	United States / Palau	
39	March 2009	Viet Nam / Lao PDR	SAR Agreement
40	March 2009	Viet Nam / Cambodia	SAR Agreement

SAR Capability Matrix (Last Update: 27 June 2012)

	Training	Alerting	Legislative	SAR Committee	SAR Agreements	Relationships	Communications	Quality Control	Civil Military	Resources	SAREX	Library	Computerisation	SAR Programme	Supply Dropping	Special Equipment	SAR aircraft	Navigation	ELTs	COSPAS-SARSAT Alerts
Afghanistan																				
Australia	E	E	E	E	E	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Bangladesh	B	C	D	A	A	C	C	A	D	A	A	C	A	A	C	C	D	A	D	C
Bhutan																				
Brunei	E	E	E	E	E	E	E	E	E	E	E	E	E	E	D	D	E	E	E	A
Cambodia	D	D	C	D	C	D	C	A	D	C	C	C	B	C	A	A	B	B	A	D
China	E	E	E	E	E	E	D	D	E	D	D	C	B	A	E	E	E	E	E	A
Cook Islands	A	B	B	A	A	C	C	C	B	A	B	A	A	A	A	B	B	A	E	A
DPR Korea	B	D	B	D	A	B	D	D	D	C	B	A	A	A	B	A	C	C	A	A
Fiji	B	C	C	C	C	C	C	B	D	C	D	C	A	C	B	A	C	C	C	A
Fr. Polynesia	C	D	D	D	C	D	E	A	E	C	C	B	A	A	E	D	E	E	E	A
Hong Kong, C	E	E	E	E	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
India	D	C	C	B	B	C	C	A	C	C	C	C	C	D	D	D	C	A	E	E
Indonesia	E	D	E	E	E	D	D	D	E	D	E	D	D	D	C	D	D	D	D	E
Japan	E	E	E	E	D	E	E	E	E	E	E	E	D	E	E	E	E	E	E	E
Kiribati																				
Lao PDR	B	A	B	B	B	A	B	A	B	B	A	C	A	A	A	A	A	A	A	A
Macau, China	E					E	E				E						E			
Malaysia	E	E	C	E	D	E	E	E	E	E	E	D	E	E	E	D	E	E	E	B
Maldives	B	A	A	A	A	A	A	A	D	A	C	A	A	A	A	A	A	A	A	A
Marshall Is																				
Micronesia	C	B		A	A	B	C					A		B	B					
Mongolia	A	C	C	A	B	B	B	A	B	B	B	C	B	B	A	A	A	A	B	A
Myanmar	B	A	B	C	A	D	C	C	D	A	A	A	A	A	C	A	D	C	A	A
Nauru																				
Nepal	D	D	C	B	A	C	C	B	D	B	A	B	A	D	D	C	D	D	D	B
New Caledonia	C	D	D	D	C	D	E	A	E	C	C	B	A	A	E	D	E	E	E	E
New Zealand	E	E	E	E	A	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Pakistan	C	C	D	D	A	D	D	C	D	C	A	A	A	A	D	A	D	D	C	E
Palau																				
PNG	D	E	D	C	D	D	C	C	D	C	C	D	C	C	C	A	A	A	E	A
Philippines	D	C	E	D	D	C	D	D	E	C	C	C	C	C	C	B	C	E	C	A

APANPIRG/23
Appendix H to the Report on Agenda Item 3.2

ROK	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
Samoa																				
Solomon Is.																				
Singapore	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
Sri Lanka	D	A	C	D	B	C	C	D	E	D	B	C	A	A	D	D	C	A	C	A
Thailand	E	E	E	E	D	E	E	E	E	E	E	D	D	D	E	E	E	E	E	E
Timor Leste																				
Tonga	C	B	A	A	B	C	C	A	D	A	A	A	A	A	A	A	C	A	E	A
United States	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Vanuatu																				
Viet Nam	D	D	D	E	D	D	D	C	E	D	D	C	B	D	C	D	D	D	D	E

A = Not implemented

B = Initial implementation

C = Meets Annex 12 requirements in some areas

D = Meets Annex 12 requirements in most areas

E = Fully meets Annex 12 requirements

Blank = No response

Draft Terms of Reference

Asia/Pacific Search and Rescue Task Force (APSAR/TF)

Objective

1 In collaboration with affected stakeholders and in close cooperation with the International Maritime Organization (IMO), the objective of the Asia/Pacific Search and Rescue Workgroup is to promote the enhancement and improvement of SAR facilities and services within the Asia/Pacific Region and adjacent regions, in accordance with:

- a) Annex 12 to the Convention on International Civil Aviation; and
- b) the International Aeronautical and Maritime SAR Manual (IAMSAR).

2 The APSAR/TF will be expected to deliver a plan within two years of establishment for enhancement of SAR capability within the Asia/Pacific Region, including enhancement of SAR services with neighboring States.

Tasks

3 To meet its objectives, the Task Force shall:

- a) review the current status of SAR preparedness of Asia and Pacific Region States;
- b) review State SAR Arrangements for commonality with those of neighbouring States to facilitate SAR coordination and cooperation across regional boundaries;
- c) monitor outcomes from APANPIRG ATM/AIS/SAR/SG, other ICAO Region SAR groups, ICAO/IMO Joint Working Group (JWG) and related forums for issues that may affect the APAC Region;
- d) 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) identify areas where SAR planning and preparedness requires improvement in terms of compliance with Annex 12, the IAMSAR Manual and accepted best practice;
- f) make recommendations for improvement of SAR systems;
- ~~g) plan and review an international SAREX between TF meetings in areas within the Asia/Pacific region that require priority; and~~
- ~~h) organize seminars and workshops associated with Workgroup meetings to educate, update and transfer information about SAR facilities and best practices.~~

~~4 The Workgroup is expected to meet on a biennial (once every two years) basis.~~

Reporting

4 The APSAR/TF reports to the ATM Sub-group of APANPIRG. A line of communication will be provided to the IMO on APSAR/WG outcomes.

Membership

5 The membership of the APSAR/TF is open to States and administrations that have the responsibility for the provision of SAR services and facilities within the Asia/Pacific, SAR related international organizations, IMO and ICAO. The membership is also open to participants from

outside the Asia/Pacific or organizations that can contribute to APSAR/TF by invitation from APSAR/TF (such as military organizations that can facilitate SAR operations).

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AGENDA ITEM 3.3: RASMAG

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.3 Regional Airspace Safety Monitoring Advisory Group (RASMAG)

3.3.1 The meeting reviewed a consolidated report of the 16th and the 17th Meetings of the Regional Airspace Safety Monitoring Advisory Group.

Regional Airspace Safety Monitoring Advisory Group Outcomes

3.3.2 The Sixteenth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/16) was held in Bangkok, Thailand from 20 to 23 February 2012. The meeting was attended by 52 participants from Australia, Bangladesh, China, India, Indonesia, Japan, Lao PDR, Malaysia, Mongolia, Nepal, New Zealand, Philippines, Republic of Korea, Singapore, Thailand, United States and IFALPA.

3.3.3 The First Meeting of the Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia) was held at Bangkok on 27 August 2012. FIT-Asia was constituted as a result of PANPIRG Decision 22/13, combining the previous FIT-BOB (Bay of Bengal) and FIT-SEA (Southeast Asia). Subsequently, the Seventeenth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/17) was held from 28 to 30 August 2012 at the same venue.

3.3.4 Fifty-nine (59) participants attended the meetings from Australia, Bangladesh, China, India, Indonesia, Japan, Lao PDR, Nepal, New Zealand, Philippines, Republic of Korea, Singapore, Thailand, United States, Viet Nam, IATA, IFALPA, and SITA. Apologies were received from the BOEING Central Reporting Agency (CRA). Apologies were received from the BOEING Central Reporting Agency (CRA).

3.3.5 RASMAG/16 considered 27 working papers (WP), 6 information papers (IP) and 1 flimsy. The meeting developed:

- 1 Draft Conclusion (*Draft Conclusion 16/1 – Long-Term Non-RVSM Approved Aircraft*); and
- 1 Decision (*RASMAG Meeting Schedule*).

3.3.6 FIT-Asia considered 7 WPs and 5 IPs. RASMAG/17 considered 27 WPs and 6 IPs. FIT-Asia and RASMAG/17 developed:

- 3 Draft Conclusions (*FIT-Asia/1-1: Data-link Performance Monitoring Seminar, RASMAG/17-1: Asia/Pacific Regional RVSM Monitoring Statement and RASMAG/17-2: Safety Monitoring Data Provision*); and
- 1 Decision (*FIT-Asia/1-2: Data-Link Performance Monitoring Information*).

FIT-Asia CRA Problem Reporting

3.3.7 On behalf of the Boeing CRA, the Secretariat presented a summary of the results of sixteen Problem Report (PR) investigations undertaken by the CRA since the last report to the FIT-BOB and FIT-SEA. The CRA Problem Report analysis was a service provided by Boeing, under contract with IATA, to support data link operations in the Bay of Bengal (Boeing CRA also provides this service to other South East Asia States under contract to Singapore).

3.3.8 Flight crew issues: Several ‘unable to connect’ reports were received from an aircraft operator. Analysis showed that in all cases the Air Navigation Service Provider (ANSP) rejected the logon request due to the logon information in the downlink request (i.e. flight number, tail number)

not matching the data in the filed flight plan. Typically these rejections were caused by the flight crew not entering the correct flight number as required by the Global Operational Data-link Document (GOLD), which was an airline training issue.

3.3.9 There were also several PRs filed by ANSPs indicating that messages could not be delivered to several different aircraft types. Analysis showed that in all cases the aircraft lost the Satellite Communication (SATCOM) connection for a period of time, which should have precipitated a notification to ATC in accordance with Section five of the GOLD (crew procedures).

3.3.10 The United States noted that there had been several instances when flight crew had not noticed that data-link was inoperative and as a consequence, had not advised ATC. It was noted that there would not be any indication to the pilots that the data-link was not working unless the FANS 1/A Communications page was opened. It was stressed that States should remind pilots of the importance to check that a logon was completed correctly and to periodically check to ensure the data-link connection was maintained.

3.3.11 ANSP Issues: An ANSP reported two problems with duplicate Automatic Dependent Surveillance-Contract (ADS-C) reports for the same waypoint, involving route waypoints that were in close proximity and in different positions when the waypoints were sequenced. The CRA noted that ADS-C reported latitude/longitude position data and not waypoint names in waypoint change event contracts, and some ground automation systems used a filter to match ADS-C latitude/longitude information to named waypoints. In this case, ANSPs should review the distance value used in position filters to ensure the distance value used does not cause ADS-C waypoint change events received in close proximity to one another to be displayed as duplicate ADS reports from the aircraft.

3.3.12 CSP Issues: Several problems were reported regarding intermittent ground connections with one Air Navigation Service Provider's (ANSPs) connection to an Aircraft Communications Addressing and Reporting System (ACARS). These problems were not associated with air/ground communication. ANSPs experiencing ACARS network connection issues should work directly with their Communications Service Provider (CSP) to identify and implement corrective actions.

3.3.13 There were some reports of SATCOM working 'intermittently'. CRA analysis correlated these reports with outage reports received from CSPs. All ANSPs in the region should ensure they were receiving planned maintenance or outage reports from their CSPs.

Performance Monitoring Reports

3.3.14 Australia provided observed performance measures as specified in the GOLD from Controller Pilot Data-link Communication (CPDLC) and ADS-C operational data collected in the Brisbane FIR from May 2011 until April 2012, and Melbourne FIR from July 2011 until May 2012. This data indicated that data-link messages sent via VHF and satellite met the 95% Actual Communications Technical Performance (ACTP) criteria. The Actual Communications Performance (ACP) for CPDLC messages sent via satellite and VHF met the 95% criteria but fell just below the 99.9% criteria.

3.3.15 China stated that L888 was the first designated Communications Navigation Surveillance/Air Traffic Management (CNS/ATM) route over land, and compared with the infrastructure for other air routes to India and the Middle East, it was very cost-effective. All Air Traffic Control (ATC) CPDLC/ADS-C workstations were connected to ARINC and ADCC (CSPs), and the data link services supported operational capabilities such as 10 minute longitudinal separation. China noted that their CPDLC/ADS-C workstations had been affected by some ground system, software, work flow, and maintenance problems, with a resultant delay of data-link messages. In early 2012, all hardware and software for the four CPDLC/ADS-C workstations were updated by

ADCC and ATMB. The system in Lanzhou had been used as the primary system, and the systems in the other three regions were now under test, with the former ARINC workstations still in operation, and the new systems were expected to be in service before early 2013. Data-link transfers between Urumqi, Lanzhou and Chengdu were taking place smoothly.

3.3.16 India summarized the present status of ATS Inter-facility Data-link Communications (AIDC) implementation in India and related issues with adjacent ATS Units (ATSUs). India was currently using AIDC ICD version 3 for a range of ATS systems, including Raytheon, Selex and Indra. Though India was ready for early AIDC implementation, the plans and readiness of other States were not known for certain. There was a need for guidance material in the form of a standardised Interconnection Document (ICD) version to achieve global harmonised implementation. The meeting was informed of the planned inter-Regional AIDC Task Force proposed for endorsement by APANPIRG, which would develop an inter-Regional AIDC ICD.

3.3.17 Japan presented information on data-link performance monitoring within the Fukuoka Flight Information Region (FIR) between September 2011 and February 2012. The average CPDLC uplink success rate (completed within two minutes) was 99.13%.

3.3.18 New Zealand reviewed results of data-link performance monitoring within the Auckland Oceanic FIR. A failure of the INMARSAT Network over 15 hours (910 minutes) was recorded on 22 October 2011 due to a Single Event Upset on the Inmarsat 3F3 satellite that caused a total payload outage. The recovery was slow because of a lack of telemetry on the satellite and included temporarily switching some services to two I2 satellites (which required physical realignment of the ground earth station antennas). Two further outages, of 58 minutes and 22 minutes, also contributed to the cumulative 12-month total.

3.3.19 There had been insufficient Iridium traffic within the Auckland FIR to provide useful performance data. However, two degradations of the Iridium network were reported in 2012, in May (307 minutes) and in June (29 minutes); both were attributed to weather conditions.

3.3.20 CPDLC ACP and ATCP were well above the Required Communications Performance (RCP) 240 and RCP400 communication transaction time (TT) targets of 95%, but only the expiration time (ET, maximum time for the completion of the operational communication transaction) for ACTP 400 consistently reached the efficiency target of 99.9%. The ADS-C downlink performance for Required Surveillance Performance (RSP) 180 and RSP400 were reviewed. The ADS-C continuity performance was well above the 95% delivery time (DT) target.

3.3.21 New Zealand noted that while the safety targets for network availability were being achieved at present, it is clear that considerable improvement is necessary if the efficiency target was to be met. Moreover, the nominal times for CPDLC and ADS-C continuity were also being achieved, but some improvement was necessary to reach the target for CPDLC ET and ADS-C DT.

3.3.22 The meeting discussed the fact that several parties had responsibility for the overall data-link performance, including ANSPs, CSPs, Satellite Providers, and Ground Earth Stations (GES). The meeting noted that these could cause single points of failure and in particular the satellite portion could cause delays in messages, but this was a reality of SATCOM systems that the aviation system relied on. New Zealand noted however that there were plans to upgrade INMARSAT systems, Iridium was installing a second GES, and that besides INMARSAT and Iridium, the Japanese MTSAT was also available. ICAO had recommended more than one air ground system be provided.

3.3.23 Singapore provided a presentation on behalf of Boeing CRA regarding their data-link performance monitoring. Participating States in South East Asia were urged to provide performance and problem reports. The data indicated that the aggregate data link performance within the Singapore FIR met the 95% RCP240 performance requirements.

3.3.24 Viet Nam had provided data-link services within the oceanic area of the Ho Chi Minh FIR since 10 April 2008. As 95% of Ho Chi Minh FIR had VHF coverage, pilots preferred using voice to data-link, although 60% of aircraft had ADS/CPDLC capability. Viet Nam reported that CPDLC uplink messages had a 95% average duration of 01:07 minute and 99% duration of 02:17 minutes.

3.3.25 Viet Nam advised that CPDLC downlink messages had a 95% average duration of 00:56 minutes and 99% duration of 01:37 minutes. Data link transfers between Ho Chi Minh and Singapore Area Control Centres (ACCs) had been taking place successfully, with a success rate of more than 90.2%. Viet Nam recommended the enhancement of cooperation amongst ICAO, IATA, Vietnam, Japan, the Philippines, Singapore and other States to support the expansion of ADS/CPDLC within Southeast Asian FIRs.

Data-link Performance Monitoring Process

3.3.26 The meeting agreed that there was a need for a template for the provision of data-link performance data, such as ACTP, ACP, PORT and surveillance latency information. Singapore stated that they still noted some States using FANS Operational Manual (FOM) criteria, and that these States needed to move to GOLD reporting. The meeting agreed that a standard reporting process in conformance with the GOLD would help to reduce this problem.

3.3.27 IATA stated that the function of the CRA was important, and would continue to support the CRA until 2013 at least. The meeting discussed the future possibility of forming a CRA for Asia with a direct link to the Boeing CRA, and supported collaboratively by several Asia/Pacific States.

3.3.28 The meeting discussed the need for a seminar to improve State understanding of data-link performance data collection, analysis, and formatting and presentation of such data. In addition the important work of CRAs and FITs needed discussion, with a view to creating an Asian Region CRA that could be a collaborative effort among Asian States. APANPIRG agreed to the following Conclusion:

Conclusion 23/13 - Data-link Performance Monitoring Seminar

That, recognising the key role data-link performance had in supporting PBN implementation; ICAO should conduct a Data-Link Performance Monitoring Seminar in conjunction with a Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia) meeting.

3.3.29 New Zealand presented an overview of the Informal South Pacific Air Traffic Services ATS Coordinating Group (ISPACG) CRA website. This website provided stakeholders with on-line FANS1/A data link problem reporting and enabled CRA feedback via the website to the originator. The website also provided stakeholders with information on FANS1/A performance by displaying the communications and surveillance performance observed during post-implementation monitoring.

3.3.30 The problem reporting section of the website was also used by the North Atlantic and a number of other FANS1/A global stakeholders, and was available for use by FIT-ASIA participants. To help standardize problem reporting between regions and to facilitate sharing of information, FIT-Asia stakeholders were encouraged to use the ISPACG CRA website to file all FANS-related PRs. APANPIRG/23 noted the decision below developed and agreed at the FIT-Asia/1 meeting:-

Decision FIT-Asia/1-2 - Data-Link Performance Monitoring Information

That, States should collect, process and present data-link performance information:

- in accordance with Global Operational Data-Link Document (GOLD) requirements, and for consistency, with any FIT-Asia template;
- where possible, by utilising an appropriate automated tool for processing (such as that available from the United States' Federal Aviation Administration); and
- utilising the Informal South Pacific Air Traffic Services (ATS) Coordinating Group Central Reporting Agency (ISPACG CRA) website Problem Reporting and analysis process.

RASMAG Vertical Safety Assessments

Australian Airspace Monitoring Agency

3.3.31 Australia presented the results of safety assessments undertaken by the Australian Airspace Monitoring Agency (AAMA) for the twelve month period ending May 2012. The AAMA report confirmed that the Australian, Nauru, Papua New Guinea and Solomon Islands airspace exceeded the 5.0×10^{-9} Target Level of Safety (TLS) at 7.18×10^{-9} (RASMAG/16: 3.93×10^{-9}). For Indonesian airspace, the risk improved to be below TLS at 4.07×10^{-9} (RASMAG/16: 5.47×10^{-9}). Monthly collision risk estimate trends using Large Height Deviations (LHD) reports since 1 May 2011 of Australian, Nauru, Papua New Guinea and Solomon Islands airspace are indicated in **Figure 1**.

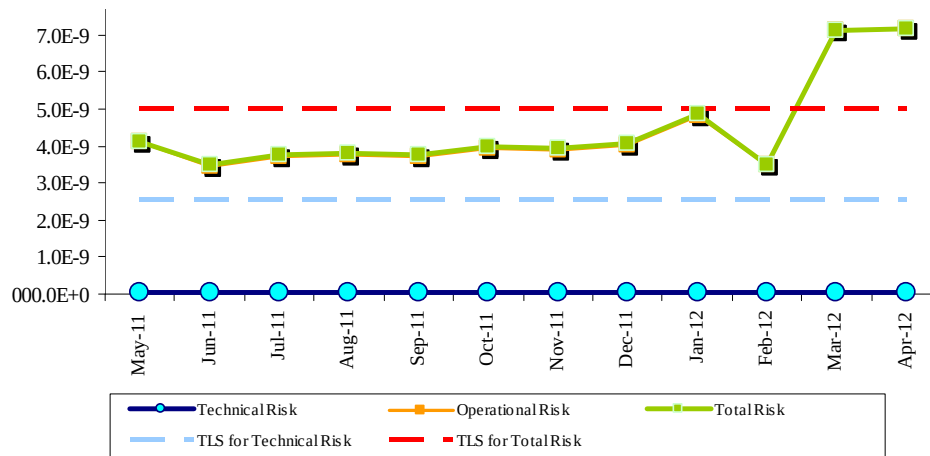


Figure 1: RVSM risk estimates for Australian, Nauru, Papua New Guinea and Solomon Islands airspace

3.3.32 The meeting noted the increase in Australian, Nauru, Papua New Guinea and Solomon Islands Airspace risk and were advised that a subsequent risk assessment in July had also included a long duration LHD in the data sample, taking the risk estimate to 9.35×10^{-9} . Australia noted that the significant increase in risk since March 2012 was the result of a single long duration LHD and was confident that the above-TLS result was of a temporary nature.

3.3.33 **Figure 2** provides the geographic location of all risk bearing LHD reports in the Indonesian Airspace during the assessment period.

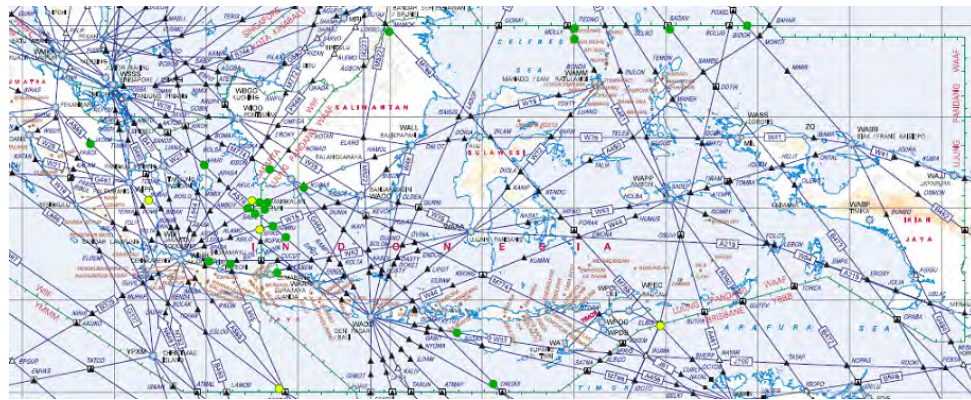


Figure 2: Indonesian Airspace – Risk Bearing LHD (green), current month (yellow)

3.3.34 Indonesia was collaborating with the AAMA and ANSPs to reduce the number of Category E LHDs, which were mainly clustered on the Ujung Pandang/Manila FIR boundary and in the vicinity of Jakarta. However, there were plans for the AIDC implementation between Australia and Indonesia in 2013. The meeting discussed this and noted that there were no immediate plans for the implementation of AIDC between Indonesia and the Philippines (noting that the APSAPG and SEACG meeting would follow-up).

3.3.35 Australia was experiencing a higher proportion of Category A/B LHDs, which the Pacific Approvals Registry and Monitoring Organization (PARMO) also noted in the Pacific. The United States stated that confusion with FANS 1/A ‘AT’ and ‘BY’ messages could have been a causal factor with the increasing number of FANS 1/A aircraft. Australia stated that they had noted that the issuance of block levels was often a factor leading to LHDs, especially in the Indian Ocean.

China RMA

3.3.36 China provided the results of RVSM safety oversight for the Chinese FIRs and Pyongyang FIR, from May 2011 until April 2012. The total risk estimate for Chinese airspace was 3.58×10^{-9} (RASMAG/16: 1.67×10^{-9}), and for the Pyongyang FIR was 3.39×10^{-9} (RASMAG/16: 1.95×10^{-9}).

3.3.37 China continued to assume a conservative risk level for the Democratic People’s Republic of Korea (DPRK), as the DPRK had not reported any NON-nil LHD for the Pyongyang FIR due to the small traffic volume in this area. To make a conservative estimate of operational risk, China RMA applied the same operational risk value of the Chinese airspace for the Pyongyang FIR.

Japan Airspace Safety Monitoring Agency

3.3.38 The Japan Airspace Safety Monitoring Agency (JASMA) presented the results of the Fukuoka FIR safety assessment for the period from May 2011 until April 2012. Japanese airspace RVSM estimated total risk was 4.87×10^{-9} (RASMAG/16: 4.85×10^{-9}).

3.3.39 The RASMAG/16 meeting was apprised of how the implementation of AIDC, ADS-C and/or radar along the boundary of the Fukuoka FIR had effectively minimised the incidence of LHD. Three transfer errors occurred at the FIR boundary where both AIDC and ADS-C/radar were not introduced. One transfer error occurred at the FIR boundary where AIDC and ADS-C had been implemented, but the AIDC was inoperative due to the 11 March 2011 earthquake.

Kabul FIR RVSM Post-Implementation Study

3.3.40 The United States Air Forces Central (AFCENT) presented a Kabul FIR RVSM Post-Implementation Study on behalf of the Ministry of Transport and Civil Aviation (MoTCA) of the Government of the Islamic Republic of Afghanistan. The post-implementation RVSM safety assessment yielded a technical risk estimate of 1.94×10^{-9} , within the TLS of 2.5×10^{-9} .

3.3.41 The reporting of LHDs was not able to support an evaluation of operational risk. In the absence of ATS surveillance systems, there was an abnormally high reliance on self-reporting of deviations and it was expected that continued action needed to be taken to remedy this situation. In the near future, multilateration (MLAT) implementation should facilitate the collection of Traffic Sample Data (TSD) and aid the monitoring of aircraft that deviate from cleared altitude or ATS route.

3.3.42 The meeting discussed the reporting issues and noted that a side meeting between AFCENT and the Monitoring Agency for Asia Region (MAAR) would occur in the near future to coordinate handover issues.

3.3.43 An analysis of the significant change that occurred after RVSM implementation on 17 November 2011 was provided (**Figure 3**). The pre-implementation TSD reflected a spike in traffic congestion during BOBCAT (Bay of Bengal Cooperative Air Traffic Flow Management System) hours, while the congestion was mitigated by the addition of flight levels post-implementation.

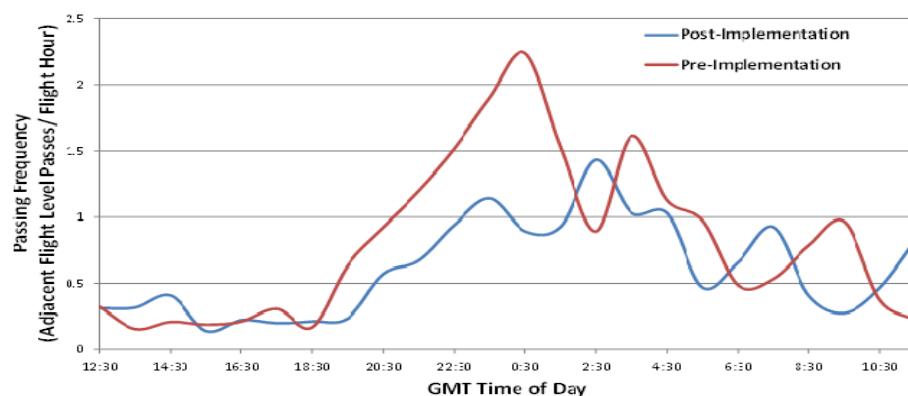


Figure 3: Passing Frequency by Hour of Day

Monitoring Agency for Asia Region (MAAR) RVSM Report

3.3.44 MAAR provided the results of the RVSM airspace safety oversight in the Asia Region, which included Bay of Bengal (BOB) and Western Pacific/South China Sea (WPAC/SCS) airspace. The BOB airspace RVSM total risk estimate was 1.59×10^{-9} (RASMAG/16: 1.16×10^{-9}), while the WPAC/SCS estimate was 5.30×10^{-9} (RASMAG/16: 5.28×10^{-9}). **Figure 4** present collision risk estimate trends from May 2011 until April 2012 for WPAC/SCS airspace.

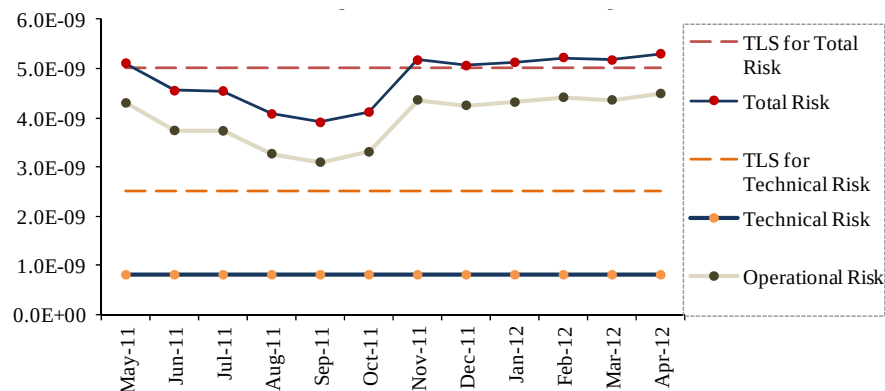


Figure 4: WPAC/SCS Airspace RVSM Risk Estimate Trends

3.3.45 BOB LHD occurrences slightly decreased from 30 to 29 occurrences, but the 12-month cumulative duration increased from 53 to 68 minutes. Most Category E LHDs occurred at the Chennai FIR and Kuala Lumpur FIR boundary. MAAR had coordinated with India and Malaysia to encourage direct communications between supervisors immediately after such events, as post-event analysis revealed that one ACC had not been aware of the LHD in some cases. The meeting discussed whether there were plans to implement AIDC between India and Malaysia. India advised that there had been coordination with Malaysia and would be happy to assist Malaysia if necessary.

3.3.46 Compared to the November 2011 assessment, the number of 12-month cumulative SCS LHD occurrences increased from 82 to 112 occurrences. A significant portion of occurrences (89 of 112) as well as duration (80 of 127 minutes) was attributable to Category E causes. There was no significant change in the overall risk, mainly as a result of no sizeable change in the 12-month cumulative LHD duration. The continuing prevalence of Category E LHD remained a major concern.

3.3.47 The Secretariat stated that the SCS was a key focus area for the APSAPG, and the resolution of safety concerns and inefficiencies in the area would require a multi-faceted approach, including, *inter alia*, communications, ATS surveillance and data-sharing improvements. **Table 1** presents a summary of LHD causes within WPAC/SEA airspace.

A	Flight crew fails to climb or descend the aircraft as cleared	2
B	Flight crew climbing or descending without ATC clearance	7
D	ATC system loop error	6
E	ATC transfer of control coordination errors due to human factors	89
F	ATC transfer of control coordination errors due to technical issues	1
G	Aircraft contingency leading to sudden inability to maintain level	1
H	Airborne equipment failure and unintentional or undetected level change	1
I	Turbulence or other weather related cause	2
J	TCAS resolution advisory and flight crew correctly responds	1
M	Other	2
Total		112

Table 1: Summary of LHD Causes within WPAC/SCS Airspace

3.3.48 **Figure 5** presents the geographical location of reported LHD within the WPAC/SCS.

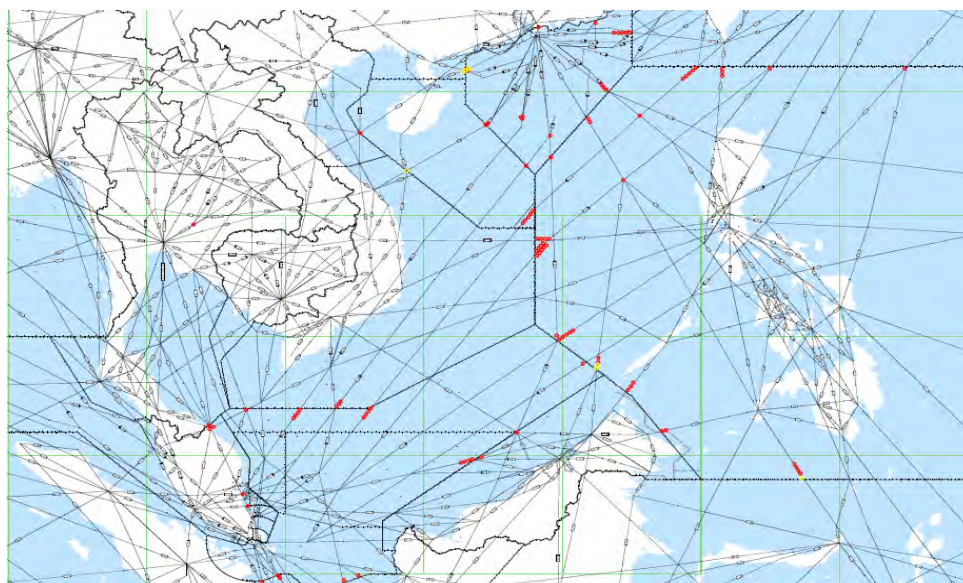


Figure 5: SCS Airspace – Risk Bearing LHD

3.3.49 MAAR presented a Mongolian Airspace RVSM safety report. RVSM was implemented on 17 November 2011, and RVSM total risk was estimated at 1.47×10^{-9} (RASMAG 16: 1.16×10^{-9}).

3.3.50 The number of 12-month LHD duration was reduced from 37 minutes to 11 minutes compared to the last assessment period. The Chairman stated that this was an example of a successful effort to reduce the safety risks, principally as a result of the implementation of ATS surveillance. **Figure 6** provides the location of Mongolian airspace risk bearing LHD reports, which were mainly on the FIR boundary with the Russian Federation.

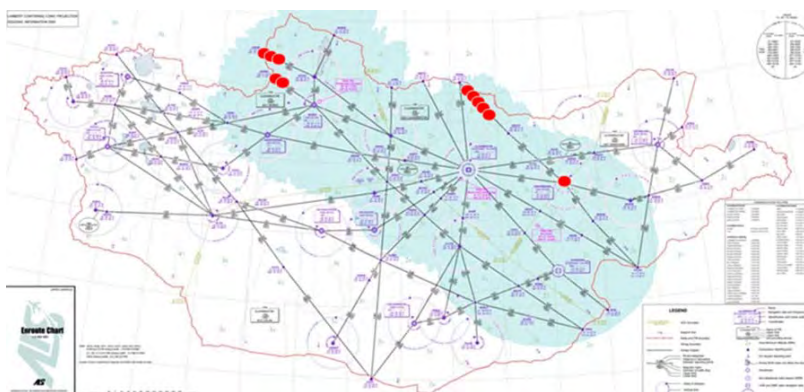


Figure 6: Mongolian Airspace – Risk Bearing LHD

Pacific Approvals Registry and Monitoring Organization (PARMO) RVSM Report

3.3.51 PARMO presented an update of the vertical collision risk assessment for Pacific airspace and the Incheon FIR. Pacific airspace RVSM total risk was estimated at 3.93×10^{-9} (RASMAG 16: 3.32×10^{-9}), while for the Incheon FIR the estimate was 0.22×10^{-9} (RASMAG/16: 1.63×10^{-9}).

3.3.52 There were no LHD within the Incheon FIR during the monitoring period from May 2011 until April 2012, despite the fact that it was a busy airspace. The Secretariat recalled that there had been numerous LHD between the ROK and Japan until AIDC had been implemented, so it was

possible that this was still the case on the FIR crossing points that did not have AIDC. PARMO agreed to follow up with the ROK to ensure that the reporting was correct.

3.3.53 At RASMAG/16 PARMO examined aircraft ADS-C archived periodic reports and identified overdue cases. A special analysis was completed of overdue reports from RNP4 approved aircraft with assigned 14-minute reporting rates, indicating the average proportion of missing ADS-C reports in the Anchorage FIR was 0.36%, and for the Oakland FIR was 0.22%.

Regional Safety Monitoring Assessment

3.3.54 The Secretariat presented an overall assessment of Asia/Pacific RVSM TLS Compliance using an FIR chart (**Figure 7**). On the basis of FIRs, the compliance as at April 2012 was 73.1% (36 of 52 FIRs); whereas in 2011 it was 73%. On the basis on the nine RMA sub-regions (APAC Metric 4), the compliance was the same as in 2010 (77.8%), compared to 66.7% in 2011.

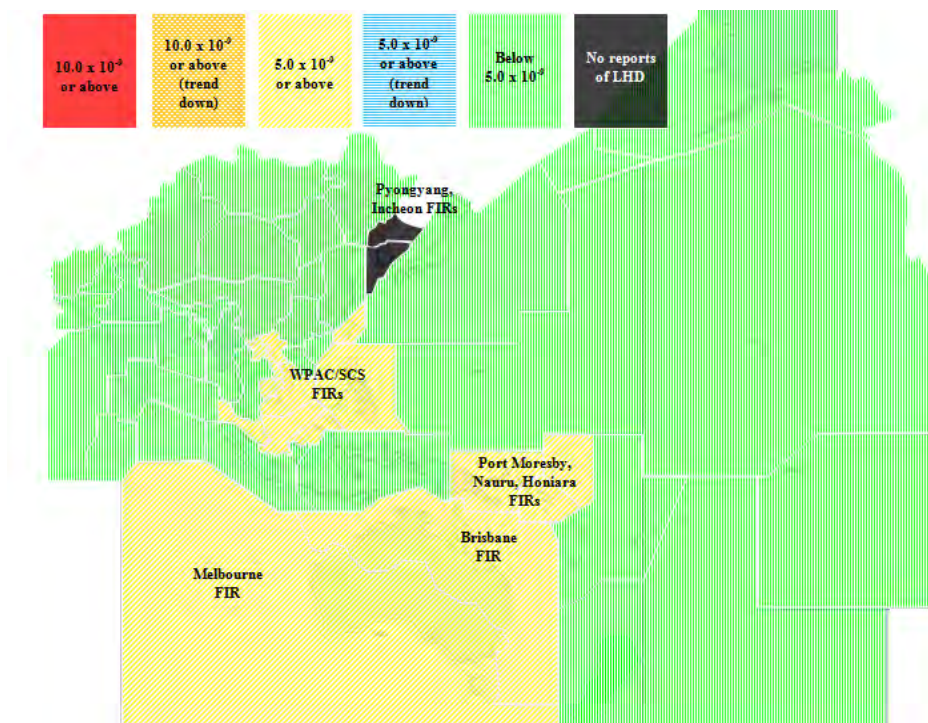


Figure 7: Asia/Pacific TLS achievement reported to RASMAG/17

3.3.55 The United States stated that the overall view of sub-regional regional trends was useful. However it was emphasised that decisions should not be based simply on this overview, without cognisance of the detail.

- **South Asia** continued to operate below the TLS, although there were concerns regarding the interface between Indian and Malaysian airspace. RASMAG/17 again noted instances of inconsistent LHD reporting by ATC units, primarily between the Chennai and Kuala Lumpur ACCs. In addition, RASMAG/17 noted possible under-reporting of LHDs within the Kabul FIR.
- **Southeast Asia** had been persistently above the TLS, indicating that the corrective and preventive actions taken had either not been effective or were taking time to have some effect. Of particular note was the prevalence of LHD on the Manila FIR boundary with adjacent FIRs. An LHD cluster was evident near Jakarta, especially on the interface between the Jakarta and Ujung Pandang FIRs.

- **East Asia** (particularly Mongolia and Japan) had made major improvements, probably as a result of concerted action by the agencies involved such as the Japan Civil Aviation Bureau, and the implementation of AIDC between Japan and the Republic of Korea, as well as the implementation of ATS surveillance in Mongolia.
- **North Pacific** had been consistently below TLS, although there were some temporary short duration periods when the TLS had been breached.
- **Southwest Pacific** had exhibited a recent upwards trend above the TLS which, as reported elsewhere in this report, was being monitored closely by Australia for corrective action. Australia stated that it was important to understand that the increase in risk above the TLS was primarily the result from a single long duration LHD within the 12 month data sample used for calculating risk. This airspace had previously been above TLS in 2010.
- **South Pacific** had been consistently below TLS. In view the RVSM safety assessments for the South China Sea area revealed that the results were persistently above the Target Level of Safety (TLS), Hong Kong, China enquired if actions could be taken to address the persistent failure. The meeting noted the issue and ICAO would follow up with States concerned.

Bay of Bengal, Arabian Sea and Indian Ocean Monitoring Agency (BOBASMA) Report

3.3.56 India presented a safety assessment from the BOBASMA in support of 50NM horizontal separation on ATS routes. The assessment had been peer reviewed by AAMA and the SEASMA.

Table 2 provides the South Asian airspace horizontal risk estimates.

South Asian Airspace			
Source of Risk	Risk Estimation	TLS	Remarks
RASMAG 16 Lateral Risk	1.04×10^{-9}	5.0×10^{-9}	Below TLS
RASMAG 16 Longitudinal Risk	0.67×10^{-9}	5.0×10^{-9}	Below TLS
Lateral Risk	0.74×10^{-9}	5.0×10^{-9}	Below TLS
Longitudinal Risk	1.06×10^{-9}	5.0×10^{-9}	Below TLS

Table 2: South Asian Airspace Horizontal Risk Estimates

3.3.57 There was no reported Large Lateral Deviations (LLD) or Large Longitudinal Errors (LLE) in the 12 month data assessed, which was collected from the Chennai, Kolkata and Mumbai FIRs. The Chairman asked why only data from these FIRs was used. India advised that they had experienced difficulties receiving TSD other than December from other States. However India intended to expand the data sample during December 2012.

Japan Airspace Safety Monitoring Agency (JASMA) Horizontal Safety Assessment

3.3.58 Japan presented the JASMA en-route monitoring agency (EMA) technical longitudinal safety assessment regarding ATS route R220 (Fukuoka FIR), which was estimated at 1.80×10^{-13} , below the TLS of 2.5×10^{-9} .

PARMO Horizontal Safety Monitoring Report

3.3.59 PARMO presented a horizontal separation safety report for the time period 1 May 2011 to 30 April 2012. The 50NM lateral separation standard was applied to RNP10 aircraft, while the 30NM lateral separation standard was able to be applied to suitably equipped RNP4 operations. **Table 3** provides the Pacific airspace horizontal risk estimates.

Anchorage and Oakland Airspace – estimated annual flying hours =773,519 hours			
Risk	Risk Estimation	TLS	Remarks
RASMAG 16 Lateral Risk	0.96×10^{-9}	5.0×10^{-9}	Below TLS
Lateral Risk 50NM	3.44×10^{-9}	5.0×10^{-9}	Below TLS
Lateral Risk 30NM	1.02×10^{-9}	5.0×10^{-9}	Below TLS
Longitudinal Risk 50NM	2.33×10^{-9}	5.0×10^{-9}	Below TLS
Longitudinal Risk 30NM	3.77×10^{-9}	5.0×10^{-9}	Below TLS

Table 3: Pacific Airspace Horizontal Risk Estimates

Republic of Korea Safety Assessment of RNAV ATS Routes Y71 and Y72

3.3.60 The Republic of Korea provided a safety assessment analysis using a TSD covering January 2012 to May 2012 for the newly implemented RNAV (Area Navigation) routes Y71 and Y72, which were both within ATS surveillance. This pre-implementation analysis confirmed that a lateral separation distance of 8NM between Y71 and Y72 had satisfied the TLS of 5×10^{-9} fatal accidents per flight hour. The safety estimate using TSD from 28 June 2012 to 31 July 2012 for portions of Y71 was 6.27×10^{-12} and for portions of Y72 was 3.24×10^{-12} for post implementation. The result of the safety assessment with data covering a longer period would be presented at RASMAG/18.

Southeast Asia Monitoring Agency (SEASMA) Report

3.3.61 SEASMA examined the safety of six major SCS ATS routes from 1 May 2011 until 30 April 2012. The lateral separation standard applied on these routes (L642, M771, N892, L625, N884 and M767) was 50NM. The longitudinal separation minimum applied was 50NM on L642 and M771, and 10 minutes with Mach number technique applied, or 80NM on the other four routes.

3.3.62 **Table 4** provides the SCS airspace horizontal risk estimates.

South China Sea Airspace			
Source of Risk	Risk Estimation	TLS	Remarks
RASMAG 16 Lateral Risk	0.68×10^{-9}	5.0×10^{-9}	Below TLS
RASMAG 16 Longitudinal Risk	1.18×10^{-9}	5.0×10^{-9}	Below TLS
Lateral Risk	1.23×10^{-9}	5.0×10^{-9}	Below TLS
Longitudinal Risk	0.43×10^{-9}	5.0×10^{-9}	Below TLS

Table 4: SCS Airspace Horizontal Risk Estimates

3.3.63 SEASMA provided an analysis of RNP4 equipage on SCS RNAV ATS routes L642, M771, N892, L625, N884 and M767, based on December 2010 and December 2011 TSD from the Ho Chi Minh, Hong Kong, Kuala Lumpur, Manila, Sanya and Singapore FIRs. In 2010 a total of 11,033 flights operated on the six RNAV routes. The average proportion of aircraft filing RNP4 on all routes sampled in 2010 was 28.1%, and in 2011 was 27.8%. IATA noted that one of the barriers to RNP4 equipage was the approval process and that Hong Kong, China was planning to mandate RNP4 within their airspace in 2014.

Update of Regional LTHM Impact Statement

3.3.64 Australia presented a draft that updated and was intended to replace the Asia/Pacific Regional Long-Term Height Monitoring (LTHM) Impact Statement for RVSM. A small working group was formed to complete the drafting process. APANPIRG/23 agreed to the following Conclusion:

Conclusion 23/14 - Asia/Pacific Regional RVSM Monitoring Statement

That, the Asia/Pacific Regional RVSM Monitoring Statement attached as **Appendix A** to the Report on Agenda Item 3.3 be endorsed.

Non-Approved Aircraft Operating with RVSM Approval Status

3.3.65 In total, the AAMA comparison for June 2012 identified 105 individual airframes in the data set, with airframes from India showing the highest number (24). A number of Pacific Island States had aircraft in the list that had also been identified in 2010 (Fiji, New Caledonia, Vanuatu). The information on airframes had been forwarded to the responsible RMAs or State authorities for follow-up action.

3.3.66 China RMA advised that total of 389 suspected non-approved aircraft were identified from the preliminary analysis. The largest group of aircraft were Chinese registered, although all but three were later confirmed to have had RVSM approval.

3.3.67 Japan provided a list of operator-aircraft combinations operating within the RVSM airspace of Fukuoka FIR with no registration of RVSM approval in the KSN approval databases for the period of April 2012 until July 2012. JASMA compared more than 70,000 plans of RVSM flights with the global RMA's latest approval databases uploaded to the KSN website every month. JASMA identified 74 non-approved airframes that were flying within Fukuoka FIR RVSM airspace with 'W' on their flight plans. Asia/Pacific States that were evident in all four months sampled were aircraft from the Philippines and the Republic of Korea.

3.3.68 MAAR presented an assessment of aircraft operating in WPAC/SCS and BOB airspace without proof of RVSM approval during December 2011. The following States did not provide RVSM data during this assessment: Bhutan, Cambodia, India, Lao PDR, Myanmar and Nepal. A total of 193 non-approved aircraft were observed in the RVSM stratum, of which 65 were from India. MAAR acknowledged that they had subsequently received the data from India so the number of non-approved aircraft was reduced to 129.

3.3.69 The meeting noted that the continued and evidently increasing incidence of non-approved aircraft had been previously discussed with reference to the RMA's role. However concerns remained regarding the role ATSUs should take in minimising the incidence of non-approved aircraft operating within the RVSM stratum.

3.3.70 In considering the information from the AAMA, China RMA, and MAAR in relation to potentially non-approved operations in RVSM airspace, RASMAG/16 endorsed the following Conclusion, which was agreed by APANPIRG/23:

Conclusion 23/15 - Long-Term Non- RVSM Approved Aircraft

That, States are urged in a timely manner to:

- a) update Regional Monitoring Agency data on RVSM approved aircraft; and
- b) respond to, and take action regarding RMA queries on long-term data indicating that aircraft were not approved.

3.3.71 The meeting discussed the fact that ANSPs may not wish to 'police' non-approved aircraft; however as air traffic controllers were responsible for ensuring safe separation of aircraft, it was arguable that ANSPs had a role in confirming aircraft performance capability when there was any doubt.

3.3.72 The meeting noted that there were several matters that needed clarification before a position could be recommended to APANPIRG, including the education necessary between regulators, aircraft operators and ANSPs regarding a compliance-based approach, establishment of appropriate communication and data sharing between RMAs and ANSPs, and deciding how long an aircraft could appear on non-approved lists before taking 'black list' action. The meeting agreed that a small group led

by the Chairman would develop a WP for the next ATM Sub-Group meeting for endorsement of a more interventionist approach, which would be presented to RASMAG/18 and ultimately to APANPIRG/24.

Use of ADS-B Data to Monitor ASE

3.3.73 Australia provided RASMAG/16 with examples of the height-keeping monitoring result reports that AAMA generates to inform other RMAs, State regulators and operators. A typical scatter result for a well-performing airframe was in the order of +/- 25 feet and the ASE average value of 8ft. This could be compared to an abnormal performing airframe (which may be due to the airframe having split pilot/co-pilot pitot-static systems that give different ASE values). Australia was happy to assist other RMAs in the generation of such reports and make the reports available to State regulators and aircraft operators on request.

3.3.74 Potentially with all aircraft being monitored by multiple systems such ADS-B on a regular basis in the future, the meeting noted that it was conceivable that Annex 6 minimum monitoring requirements may become redundant.

3.3.75 Australia presented an update to RASMAG/17 on Altimetry System Error (ASE) calculations using ADS-B data collected from January 2010 until July 2012 and processed by AAMA. Previous papers had dealt with details of the method and analysis, in particular the height assumption of the GNSS system as Height Above Mean Sea Level (HAMSL) or Height Above Ellipsoid (HAE). The difference between HAE and HAMSL varied over the Earth's surface by +/- 200ft.

3.3.76 Key data were as follows:

- 1883 aircraft were in the AAMA data (1045 of these were also seen in MAAR data);
- 1230 aircraft used the HAMSL geometric height reference; and
- 290 aircraft used the HAE geometric height reference (the standard reference for RTCA DO 260B compliant aircraft).

3.3.77 MAAR presented information on a collaborative program with AAMA to use ADS-B data to monitor ASE collected from one ADS-B station located in Bangkok during a period from November 2011 to June 2012. The calculation assessed the ASE results of 2,412 airframes, 1,045 of which also appeared in AAMA's data. A comparison of AAMA and MAAR's results indicated that MAAR's data was consistent with the data from AAMA. Calculations based on the combination of data sets provided both RMAs with an improved capability to identify the correct height reference used by each airframe. The latter reinforced the importance of regional sharing of ADS-B data.

RVSM LTHM Burden Estimate Update

3.3.78 RASMAG/16 had tasked all RMAs to present the monitoring burden for the next RASMAG meetings to anticipate monitoring burden for each State within the region. China advised that by the end of July 2012, there were 46 operators with 1,939 aircraft. Therefore the biennial monitoring number was about 250 aircraft. China RMA used two sets of Enhanced Global Navigation Satellite System Monitoring Units (EGMU) to conduct the on-board monitoring for Chinese Airlines. The monitoring data obtained from other RMAs (especially ground-based monitoring) would also be considered in the monitoring plan. Regarding the DPRK, there was no change from the last report, so the monitoring burden remained the same (7 airframes).

3.3.79 The total number of RVSM approved aircraft sourced from the most recent MAAR RVSM approvals database was 1,787. When applying the minimum monitoring requirements (MMR), the monitoring burden to be achieved by November 2012 was 505 aircraft. Since November 2010, 617 (28%) aircraft had been successfully monitored; however only 279 could be counted

towards the fulfilment of the monitoring burden. The outstanding monitoring burden for the Asia Region was 226 aircraft, of which 90 were general aviation aircraft.

3.3.80 JASMA submitted information on the current expected LTHM burden for aircraft registered and operated by Japan to complete the first round of monitoring to meet Annex 6 requirements by the target of 30 November 2012. A review of the JASMA RVSM approvals databases as at August 2012 determined that the total number of RVSM approved airframes was 523. Applying the MMR to the total of approved aircraft results in a monitoring burden of 97 airframes and taking into account the aircraft already successfully monitored, the current outstanding burden was 35 airframes.

3.3.81 MAAR had scheduled monitoring for 49 airframes, lowering the monitoring burden to 177 aircraft. In addition, to fulfil the monitoring requirement, MAAR planned to use the ADS-B system to monitor aircraft transiting the Bangkok FIR, thereby reducing the monitoring burden by an additional 31 aircraft. A number of States had airframes that were not scheduled for monitoring and may not operate through the Bangkok FIR, including: Afghanistan, Bangladesh, Maldives, Pakistan, Philippines, Sri Lanka and Viet Nam.

3.3.82 PARMO provided an assessment of the monitoring burden associated with the LTHM requirements for airframes in the PARMO approval database as of 31 July 2012. A total of 435 unique airframes were estimated with a resultant monitoring burden of 114. Of these, approximately 47%, or 54 airframes had been monitored as of July 2012, leaving 60 airframes (including 28 registered in New Zealand and 22 registered in the Republic of Korea) that required monitoring prior to November 2012. However, some of the New Zealand airframes may have been monitored by AAMA using ADS-B.

3.3.83 The estimated Asia/Pacific RVSM approved airframes was 5,540. The resultant monitoring burden was some 22% of the approved number or approximately 1,222 airframes. The current number of airframes still to be monitored by November 2012 to meet the Annex 6 requirement was 546, which equated to 10% of the approved fleet in the region.

Setouchi HMU Post Implementation Report

3.3.84 Japan presented a summary of the height monitoring service and the scrutiny process regarding the Setouchi Height Monitoring Unit (HMU) which had been operational since 30 March 2012. The result of successful height monitoring was periodically uploaded to JASMA website (<http://www.jasma.jp>) and the KSN website. A total of 15,387 monitored data were obtained from Setouchi HMU for the period between 30 March and 31 July 2012. The mean Total Vertical Error (TVE) value was 19ft and the TVE standard deviation was 66ft. Japan Civil Aviation Bureau (JCAB) was planning to build two more HMUs by March 2013 in the Niigata and Sendai regions.

Provision of Safety Data

3.3.85 Singapore discussed the means by which data provision to the relevant safety monitoring agencies should be provided by States to support the activities of those agencies. The meeting recalled that some States had difficulty in enacting a formal ATS Letter of Agreement (LOA) for data provision, so agreed that a formal LOA was not necessary if an informal agreement was as effective. Thus there was no specific requirement for a formal agreement, although it was important that some agreed process was in place to facilitate the provision of data.

3.3.86 After considering on-going problems that monitoring agencies had with the collection of data, RASMAG discussed ways that could improve the situation. RASMAG noted that the content of the EMA Handbook contained a sample data provision agreement template that could be referenced.

3.3.87 The meeting discussed the increasing importance of ADS-B data availability to RMAs in monitoring ASE. It was agreed that States should provide ADS-B data when available and requested by the RMAs for safety monitoring purposes. APANPIRG agreed to the following Conclusion:

Conclusion 23/16 - Safety Monitoring Data Provision

That, recognising the importance of data collection for safety monitoring purposes, States be urged to:

- a) provide data as requested by Regional and En-Route Monitoring Agencies (RMA/EMA) in accordance with the RMA Manual (Doc 9937) and EMA Manual (either through a formal agreement or an informal understanding as appropriate); and
- b) provide available ADS-B data for height-keeping monitoring to RMAs when requested.

Operational Error Focus

3.3.88 The meeting discussed the effort being put into technical performance monitoring, compared to operational error minimization, considering the latter had a disproportionate effect on the overall safety outcomes.

3.3.89 The United States noted that it was important to consider an emphasis on risk mitigation procedures such as Strategic Lateral Offset Procedure (SLOP), which had been inconsistently applied in the Asia/Pacific. The Secretariat stated that this would be considered as part of the Seamless ATM development. He emphasized the need for RASMAG to support key infrastructure Seamless ATM improvements such as AIDC, ATS surveillance (particularly ADS-B), and data sharing.

3.3.90 IATA expressed support for the operational emphasis and requested RMAs to provide material that could be used to assist pilot education. The meeting noted that ANSP education and information on detailed recommended operational responses was also necessary to reduce this form of risk. The meeting agreed that a strengthened focus on the minimization of operational risk was appropriate. AAMA and PARMO agreed to undertake an analysis on this matter and report to RASMAG.

Competent Airspace Safety Monitoring Organizations

3.3.91 The Secretariat provided a copy of the *RASMAG List of Competent Airspace Safety Monitoring Organizations* (**Appendix B** to the Report on Agenda item 3.3) for review and update by the meeting. **Appendix C** to the Report on Agenda Item 3.3 also provided a summary of the area of responsibility of Monitoring Agencies in pictorial form.

3.3.92 Australia proposed a change in responsible RMA for the States of Brunei Darussalam and Vanuatu from PARMO to MAAR and the AAMA respectively. Doc 9937 *Manual of Operating Procedures and Practices for Regional Monitoring Agencies* Appendix A currently identified MAAR as the RMA for the Kota Kinabalu FIR, while Appendix B identified PARMO as the RMA for Brunei Darussalam, which lay within the Kota Kinabalu FIR. Given the high frequency of Brunei Darussalam approved aircraft operating in FIRs for which MAAR was responsible, the meeting agreed that MAAR was in a more appropriate position to act as the RMA for Brunei Darussalam.

3.3.93 Doc 9937 also identified PARMO as the responsible RMA for Vanuatu and the overlying Nadi FIR, with services provided by Fiji. In the last year, the AAMA had identified that aircraft registered in Vanuatu were operating within Australian and other airspace monitored by the AAMA without any confirmation of the RVSM approval status. In discussing this issue with PARMO, it was considered that the AAMA was in the best position to initiate direct contact with the Vanuatu

authorities, and as such should take responsibility as the RMA for the State approvals reporting. The meeting agreed with this and requested the Secretariat to request an amendment to Annex B of Doc 9937 regarding Brunei Darussalam and Vanuatu.

Frequency of RASMAG Meetings

3.3.94 RASMAG/15 had briefly discussed the matter of 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. The United States noted that regular meetings were important to maintain momentum for improvements, but acknowledged that the RMAs had annual coordination meetings to supplement RASMAG's work. There was general agreement by the meeting to reduce the RASMAG schedule to one meeting a year. 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. The meeting agreed that informal meetings were possible to address in-between meeting issues, especially for the RMAs. APANPIRG/23 noted that the following Decision was agreed by RASMAG/16:

Decision RASMAG/16-2 – RASMAG Meeting Schedule

That, RASMAG meetings would normally be scheduled once a year, between 4-8 weeks before APANPIRG meetings in Bangkok, Thailand.

That RASMAG sponsored coordination meetings between RMAs and EMAs should be scheduled as required by the Chairman. A venue for the meeting would be determined by the hosting monitoring agency.

**INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE**



**ASIA/PACIFIC REGIONAL
RVSM MONITORING STATEMENT**

***REDUCED VERTICAL SEPARATION MINIMUM (RVSM)
GLOBAL LONG TERM HEIGHT MONITORING REQUIREMENTS
EFFECTIVE FROM NOVEMBER 2010***

Version 1.0 – August 2012

Issued by the ICAO Asia/Pacific Regional Office, Bangkok

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FOREWORD

Since the initial operational implementation of Reduced Vertical Separation Minimum (RVSM) in the North Atlantic in 1997, implementation of RVSM in all global airspace has been completed. In the Asia/Pacific Region, implementation commenced as a result of the output of the Third Asia/Pacific Regional Air Navigation Meeting (RAN/3, Bangkok, Thailand, 19 April – 7 May 1993) which called for an ICAO RVSM Task Force to progress RVSM implementation in the Pacific. The Ninth meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG 9, August 1998) established the Asia/Pacific RVSM Implementation Task Force (RVSM/TF) under the terms of Decision 9/4 and simultaneously adopted Conclusion 9/3 requiring actions to establish an RVSM implementation schedule for the Asia region, in addition to the programme for the Pacific region.

Under the capable stewardship of the RVSM/TF, Asia/Pacific RVSM implementations went forward smoothly commencing with the Pacific area in 2000 and followed by the Western Pacific and South China Sea area during 2002, the Bay of Bengal area in 2003, Japan and the Republic of Korea during 2005, China in 2007, DPR Korea in 2009 and Mongolia and Afghanistan in 2011.

Recognising the significance of the step from a 2000 ft vertical separation minimum to a 1000 ft vertical separation minimum, intensive monitoring arrangements were put in place to ensure the continued safety of RVSM operations. Such monitoring considers RVSM safety performance in terms of two components. Technical risk relates to the technical performance of equipment, including altimetry systems. Operational risk relates to human performance error and, in simple terms, considers errors made by pilots and air traffic controllers.

To be approved for operation in RVSM airspace, States must ensure that aircraft comply with technical requirements that enable the actual height cleared by air traffic services to be accurately maintained. The RVSM monitoring programmes around the world have collected extensive height keeping data to determine the stability of Altimetry System Error (ASE) in airframes used for RVSM operations. The results show that ASE drift is worse than anticipated. Accordingly, provisions have been included in Annex 6 – *Operation of Aircraft* that require the global long term monitoring of altimetry systems used for RVSM operations.

APANPIRG/20 (September 2009) adopted an Asia/Pacific Regional Impact Statement, prepared by the Regional Airspace Safety Monitoring Advisory Group (RASMAG), under the terms of Conclusion 20/23 to provide general guidance to States. Additionally, specific guidance was provided to assist in identifying the ground-based monitoring infrastructure necessary for the regional RVSM monitoring programme.

This Implementation Statement provides an update to the Impact Statement of 2009, specifically identifying the activities undertaken by States and RMAs in establishing monitoring infrastructure and implementing monitoring activity to meet the Annex 6 long-term height-keeping monitoring requirements.

1. Introduction

1.1 At the broadest level, Annex 11 – *Air Traffic Services* requires States to establish a safety programme in order to achieve an acceptable level of safety in the provision of Air Traffic Services (ATS). More specific requirements exist for the implementation of safety management systems by Air Navigation Services Providers (ANSPs) that identify hazards, ensure remedial action and provide for the continuous monitoring and regular assessment of the safety level achieved.

1.2 In the specific case of the implementation and on-going operation of reduced vertical separation minimum (RVSM), Annex 11 requires that for all airspace where a RVSM of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the implementation and continued application of this reduced vertical separation minimum meets the safety objectives. Annex 11 also requires that the coverage of the height-monitoring facilities provided under this programme shall be adequate to permit monitoring of the relevant aircraft types of all operators that operate in RVSM airspace. Arrangements shall be put in place, through interregional agreement, for the sharing between regions of data from RVSM monitoring programmes.

1.3 The increasing complexity of requirements and the necessary State interactions led the Fourteenth meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/14, August 2003) to establish the Regional Airspace Safety Monitoring Advisory Group (RASMAG) to provide oversight of airspace safety monitoring requirements, including the monitoring of the height keeping performance of the airframes used in RVSM operations, thereby providing a regional basis for RVSM monitoring in Asia/Pacific. In further addressing its responsibilities in this regard, APANPIRG adopted a Target Level of Safety (TLS) for en-route airspace in the Asia/Pacific region of 5×10^{-9} fatal accidents per flight hour in each dimension i.e. vertical, lateral and longitudinal. APANPIRG also continues to encourage cooperative arrangements between States to undertake airspace safety assessments and to provide airspace safety assessment and monitoring for the introduction of airspace changes and reduction in aircraft separation minima (vertical and horizontal), as well as for on-going operations.

2. The need for RVSM Monitoring

2.1 Aircraft use a barometric altimeter to determine height and follow common pressure levels (flight levels) using a QNH of 1013 in RVSM airspace. The errors in the aircraft altimetry sensing systems are not apparent during routine operations as the altimeter displays to the aircrew and air traffic services (ATS) a level that includes these altimetry system errors (ASE). As such, the presentation to the pilot and/or ATS is often different to the actual height of the aircraft. During routine calibration the aircraft systems are maintained on the ground while at rest, so the dynamic nature of ASE is not able to be seen. Aircraft altimetry systems also utilize parts that:

- wear over time (such as the pitot-static probe and portions of internal plumbing); and/or
- are subject to damage (such as skin flexing/deformation during operations); and/or
- are affected by modification of airframes (such as the application of paint, decals and branding marks or mounting of accessories or repairs such as boiler plating in the vicinity of the static pressure ports).

2.2 All these activities are capable of producing significant error in true height. Other factors seen in normal operations of high-speed flight such as aerodynamic loading and exposure to ranges of temperature, moisture and contaminants, are also capable of producing significant variation in the sensed pressure.

2.3 ASE can vary over the population of operational aircraft of the same type and within

each specific aircraft this error can vary with time in service. **Figure 1** below details the variations observed in true altitude over a period of five years for a single airframe. Note the increased rate of deterioration in the last 10 months of the sample period.

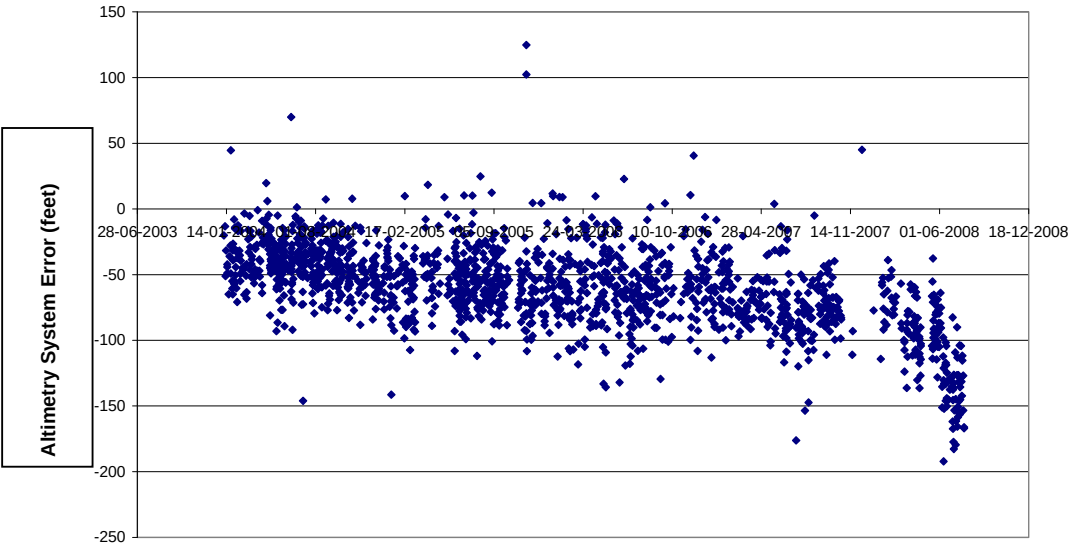


Figure 1: Example of single airframe Altimetry System Error (ASE) degradation over 5 years.

2.4 As well as the ASE variations that occur within a single airframe (as shown above), **Figure 2** below demonstrates the variation in ASE over a fleet of 15 airframes of the same type at a similar point in time.

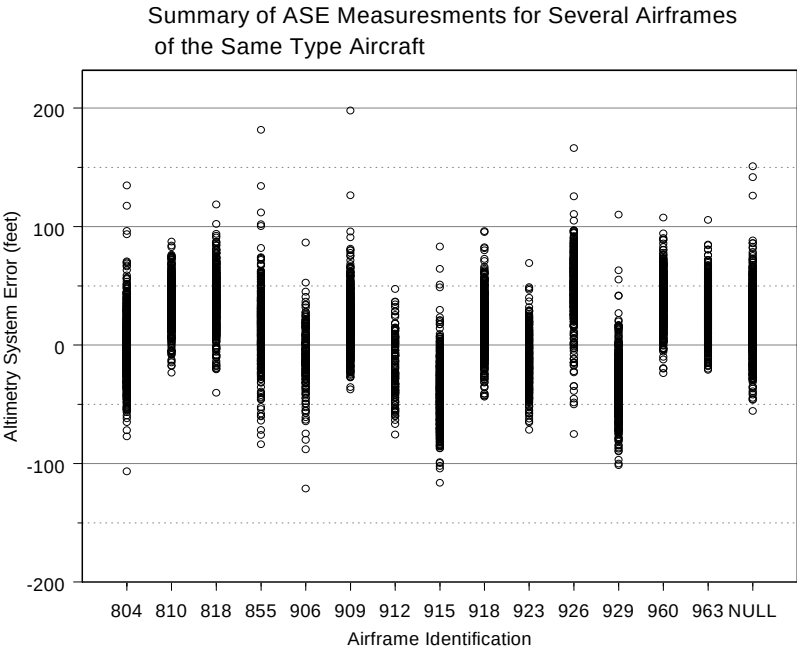


Figure 2: Variation of ASE over 15 airframes of same type at a similar point in time.

2.5 The collision risk model applied for RVSM is globally recognized by ICAO and uses an empirical basis coupled with robust mathematical methodologies to exclude height deviations of less than 300 feet for the assessment of operational errors (i.e. pilot and air traffic controller errors). However, the technical risk component of the collision risk model considers all errors in its assessment and therefore any adverse performance of individual altimetry systems must be included in the model. In an attempt to balance the need, on the one hand, for continuous assessment of the altimetry system performance of each airframe to meet mathematical principles with, on the other hand, the real-world pragmatic difficulties in actually achieving monitoring at this rate, the Annex 6 provision have been drafted accordingly. As such, in generic terms Annex 6 essentially provides for a monitoring rate of two airframes per type per operator per two years in the expectation that this will provide adequate data whilst not imposing excessively onerous requirements on operators.

2.6 Continued safe RVSM operations demand continuous high accuracy from altimetry systems, however RVSM Regional Monitoring Agencies (RMAs) globally have evidence that ASE can vary within a population of the same aircraft type at any point in time and by individual aircraft over any period of time. These concerns were identified early on in the global RVSM implementation programme and, as a consequence, monitoring requirements were incorporated in the RVSM Manual (*Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive- Doc 9574*) and Annex 11. Subsequently, because the data that became available from the monitoring clearly identified the technical problems in altimetry systems and lack of ASE stability, additional provisions were included in Annex 6 effective November 2010 to ensure that global monitoring requirements were clearly defined. Additionally, amendments to Annex 11 have also been made that clarify regional monitoring responsibilities.

3. Asia/Pacific RVSM Monitoring arrangements

3.1 Assessment of the safety performance of RVSM airspace is undertaken 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. The work of the global ICAO RMAs is facilitated and standardised through the Regional Monitoring Agency Coordination Group (RMACG). For the APAC Region, RASMAG coordinates the work of the APANPIRG-endorsed RMA services provided by:

- The Australian Airspace Monitoring Agency (AAMA), operated by Airservices Australia.
- The China RMA, operated by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC).
- The Japan Airspace Safety Monitoring Agency (JASMA), operated by the Japan Civil Aviation Bureau.
- The Monitoring Agency for the Asia Region (MAAR), operated by Aeronautical Radio of Thailand (AEROTHAI).
- The Pacific Approvals Registry and Monitoring Organization (PARMO), operated by the United States Federal Aviation Administration.

4. Long term RVSM height monitoring requirements

4.1 The ICAO Separation and Airspace Safety Panel (SASP) has identified that height-keeping performance monitoring results for RVSM approved aircraft had, in some cases, demonstrated long-term adverse trends in ASE stability. The likely results of this trend, if not reversed, would be aircraft becoming non-compliant with RVSM requirements. Accordingly, to ensure that adverse trends in ASE stability were detected, it was recognised by SASP that globally applicable RVSM long-term height monitoring requirements would be necessary.

4.2 As a result of proposals made by the SASP, during 2007 the ICAO Air Navigation Commission (ANC) agreed to amendments to Annex 6 – *Operation of Aircraft* that detail global RVSM long-term monitoring requirements that became effective in November 2010. These requirements state as follows:

7.2.7 The State of the Operator that has issued an RVSM approval to an operator shall establish a requirement which ensures that two aeroplanes of each aircraft type grouping of the operator have their height keeping performance monitored, at least once every two years or within intervals of 1 000 flight hours per aeroplane, whichever period is longer. If an operator aircraft type grouping consists of a single aeroplane, monitoring of that aeroplane shall be accomplished within the specified period.

4.3 Although Annex 11 has required regional RVSM monitoring programmes since 2001, as a result of the adoption of the Annex 6 requirements above, during May 2009 the SASP proposed a revision to Annex 11 that clarifies the regional component of RVSM monitoring. The SASP proposal intended to retain the original long standing Annex 11 monitoring provisions whilst placing greater responsibilities on regional monitoring programmes to assist in delivering the ASE stability and aircraft group performance required by the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*. The amended provisions in Annex 11 now state:

3.3.5.1 For all airspace where a reduced vertical separation minimum of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the continued application of this vertical separation minimum meets the safety objectives. The scope of regional monitoring programmes shall be adequate to conduct analyses of aircraft group performance and evaluate the stability of altimetry system error.

3.3.5.2 Arrangements shall be put in place, through inter-regional agreement, for the sharing between regions of data from monitoring programmes.

4.4 In relation to the Annex 6 and Annex 11 requirements, APANPIRG had agreed (Conclusion 20/20) that the RVSM Minimum Monitoring Requirements (MMRs) that had previously been adopted for use by RMAs in the Asia/Pacific Region should continue in use for the time being. In recommending this conclusion to APANPIRG, RASMAG recognised that monitoring was a significant burden to operators and should be kept to the minimum necessary. Subsequently, the RMACG considered how best to ‘operationalise’ the Annex 6 and Annex 11 requirements. To that end it agreed to standardise on the MMR as the means by which the minimum requirements of Annex 6 and the need for a robust monitoring program with sufficient data for analysis. As a result, the Asia/Pacific RMAs advised States that the MMR as amended from time to time, would form the basis of monitoring requirements to specifically meet the Annex 6 requirements in relation to long term height-keeping monitoring. The current MMR is available on Asia/Pacific RMA web sites.

4.5 APANPIRG/18 recognized that the 2010 implementation of Annex 6 global long-term monitoring requirements for airframes used in RVSM operations would have significant impacts in the way regional monitoring was managed, including the need for widespread regional height monitoring infrastructure capability to be made available.

5. Monitoring of Airframes

5.1 The implementation of long-term height monitoring requirements has placed significant additional responsibilities on operators, State approval authorities and RMAs alike. Within the Asia/Pacific Region, the RMAs in conjunction with the RMACG, RASMAG and APANPIRG have standardised on a set of RVSM MMRs that reflect the Annex 6 minimum requirements for long term monitoring, and support the intent of the Annex 11 requirements for the establishment of adequate monitoring programs.

5.2 The Asia/Pacific RMAs assess the monitoring burden imposed by the Annex 6 requirements on an on-going basis and routinely report this information to States and RASMAG. The RMAs have determined that the number of airframes still to be monitored for the 2 year period ending November 2012 is approximately 546 airframes. **Table 1** provides a breakdown of this analysis.

	Resultant Monitoring Burden	Number of Airframes to be Monitored by Nov 2012
AAMA (Australia + Indonesia + Nauru + Papua New Guinea + Solomon Islands + Vanuatu)	249	140
China RMA (China + DPR Korea)	257	100
JASMA (Japan)	97	35
MAAR (Afghanistan + Bangladesh + Bhutan + Brunei Darussalam + Cambodia + Hong Kong, China + India + Lao PDR + Macao, China + Malaysia + Maldives + Mongolia + Myanmar + Nepal + Pakistan + Philippines + Singapore + Sri Lanka + Taiwan + Thailand + Vietnam)	505	220
PARMO (Cook Islands + Fiji + Kiribati + Marshall Islands + Micronesia + New Zealand + Palau + Republic of Korea + Samoa + Tonga)	114	51
Asia/Pacific Region - Grand Total (AAMA + China RMA + JASMA+ MAAR + PARMO)	1222	546

Table 1: Monitoring Burden Analysis

6. Ground-Based Monitoring Infrastructure

6.1 The implementation of long-term height monitoring has required different types of monitoring infrastructure to best ensure the Region meets the requirements of Annex 6. Prior to 2010, airframe monitoring within the Region was undertaken by means of either a ground-based system established outside of the Region, or by a portable unit temporarily mounted in the aircraft. Since 2010, ground-based systems have been established within the Region in Japan and Australia.

6.2 In the case of ground-based systems, monitoring is undertaken by aircraft flying in proximity to the Height Monitoring Unit (HMU) established at Setouchi in Japan to estimate aircraft ASE. Alternatively aircraft flying in Europe or in North America (where the ground-based systems are known as Aircraft Geometric Height Measurement Elements -AGHMEs), may be monitored by one of the three HMUs managed by Eurocontrol, one by the North Atlantic Central Monitoring Agency (NAT CMA), or any six AGHMEs managed by the Pacific Approvals Registry and Monitoring Agency (PARMO) - four in the United States and two in Canada.

6.3 Until recently, ground-based monitoring could only occur when an aircraft overflies – in level flight - a ground-based monitoring unit or transits the local airspace specifically associated with the unit. This is not convenient in all cases as operators may have to vary flight patterns to overfly an HMU. Therefore ground-based monitoring units are ideally located at points that are routinely overflown by aircraft engaged in normal scheduled operations, rather than at locations that require aircraft to divert from normal flight paths in order to overfly the ground monitoring unit.

6.4 In early 2011 the AAMA, operated by Airservices Australia, obtained ICAO endorsement of a methodology for height-keeping monitoring that utilises geometric height data

available from automatic dependant surveillance – broadcast (ADS-B) equipped aircraft. The ADS-B Height Monitoring System (AHMS) resulted from a cooperative project between the AAMA and the Federal Aviation Administration (FAA) of the United States. Operators wishing to utilise the system are only required to hold an RVSM approval and be equipped with an ADS-B that sources geometric data provided by GNSS. Monitoring in airspace where a wide-area ADS-B network is available will not require an aircraft to specifically overfly any specific AHMS site as normal flight operations can be monitored on a continuous basis with no operational impact.

6.5 AHMS has been implemented in Australian airspace and trials have recently been undertaken by MAAR leading to planned implementation within the Bangkok FIR. Further expansion of the use of AHMS within Asia/Pacific Region is planned for the near future.

6.5 The portable GPS Monitoring Unit (GMU) is a carry-on system installed in an aircraft for a single flight. Its main advantage is the ability to monitor an individual aircraft during normal operations without the need to fly over a ground-based monitoring system in a particular portion of airspace. Data files from a GMU must be post-processed to extract aircraft geometric height which must then be combined with other information in order to produce height keeping performance data. GMUs are used by the US FAA, AEROTHAI, ATMB of CAAC and one or two other approved service providers. GMU monitoring is coordinated by RMAs or State approval authorities; it is widely used and effective. However, it can be costly and inconvenient to operators: there are charges for the use of the unit, and its installation and subsequent removal may involve time out of service for the aircraft.

6.7 The advantage of ground-based monitoring systems (HMUs, AGHME or AHMS) is that they provide large volumes of data and information about the aircraft population and permit repeated measurements on individual airframes, which is highly beneficial in detecting trends in ASE performance. The location of ground-based monitoring systems is very important, as it determines the number of aircraft for which ASE estimates will be produced. RASMAG in conjunction with APANPIRG and Asia/Pacific States, continues to review the Region's height-keeping monitoring infrastructure to ensure adequate coverage.

6.8 The advantage of a portable airborne system (GMU) is that it provides the ability to target specific portions of the airspace population to meet immediate needs, however GMU monitoring does not provide the continuous data streams necessary to determine aircraft group performance and ASE stability. Therefore although GMU monitoring addresses the basic MMR, it should be considered only as supplementary to ground-based monitoring.

6.9 The currently implemented monitoring programme for the Asia/Pacific region a combination of ground-based monitoring systems such as the HMU, AGHME and AHMS, as well as airborne systems such as the GMU. However, recognising the cost of installing, operating and maintaining such systems, regional investment should be kept at the absolute minimum necessary to meet the operational requirements, any future additional deployment of these systems needs to be closely coordinated with APANPIRG, RASMAG and the Asia/Pacific RMAs. Such coordination will ensure effective monitoring within the Region whilst avoiding unnecessary investment in dedicated monitoring infrastructure.

7. Impacts on the Asia/Pacific Region

Objectives of height monitoring

7.1 In considering both the impact of the Annex 6 provisions and the proposed strengthening of Annex 11 regional provisions on the Asia/Pacific Region, an understanding of the objectives to be achieved by height monitoring is necessary. At the broadest level, the monitoring programme must ensure that the continued operational application of RVSM meets the established safety requirements.

7.2 In order to achieve this primary objective, three subsidiary objectives must be met for the performance monitoring of RVSM. The first is to ensure compliance with the MMR which serves as a check that operators have initially made any required airframe changes and then continue to maintain aircraft in accordance with manufacturer's recommendations for airworthiness. For this purpose, only a sample of observations from each of the operators' fleets is required and Annex 6 provisions require the monitoring at intervals of no more than two years.

7.3 The second objective is to conduct analyses of aircraft group performance, where a group consists of aircraft with nominally identical design (including nominally identical static systems and RVSM-related avionics units) as defined in Chapter 3 of the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)* and recognised in the strengthened Annex 11 provisions. In achieving this objective, a much larger data sample adequate to determine ASE performance is required. Accordingly, enough ASE monitoring data should be captured to be able to assess every monitoring group against RVSM performance requirements routinely throughout the two-year period.

7.4 The final objective requires that in order to fulfil the system performance monitoring required by Chapter 6 of the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*, and as recognised in the strengthened Annex 11 provisions, the monitoring process should also aim to provide evidence of ASE stability. Sufficient ASE performance data must be available to show that, for the bulk of airframes circulating in the RVSM environment, ASE performance does not vary substantially from the beginning to the end of the two-year monitoring period. Such data is obtained from repeated samples on individual airframes throughout the two-year period.

Portable and ground-based monitoring

7.5 In terms of meeting the MMR, monitoring completed using a portable GMU is acceptable. However, to assess aircraft group performance and long-term ASE stability, large volumes of data are necessary, including results of monitoring of the same airframes over a period of time. Such large volumes of data are only obtainable from ground-based monitoring installations that obtain data on relevant airframes on a regular basis. Accordingly, a regional monitoring infrastructure that provides the ability to meet the MMR requirements as well as the group performance and ASE stability monitoring requirements is necessary. This involves a mixture of portable GMU and ground-based monitoring capability used in a continuous and well coordinated manner.

Current Asia/Pacific monitoring capabilities

7.6 Ground-based monitoring systems have been implemented in Australia and Japan with future deployments planned for China and Thailand, and possibly further installations of HMUs in Japan. Additionally, the planned implementation of ADS-B surveillance systems in many Asian States will provide a significant source of monitoring data for the Regional RMAs to use for ASE calculations and other height-keeping monitoring activity.

7.7 Limited portable GMU monitoring capability is available via Asia/Pacific RMAs - as described in paragraph 6.5 above.

7.8 Clearly, in a region of the size of the Asia/Pacific it is not at all feasible to provide

100% monitoring capabilities in all areas. However, a review by RASMAG of the major international traffic flows previously identified that appropriate locations for installation of ground-based monitoring systems could include Australia/New Zealand, Southeast Asia, Northeast Asia, China and India/Pakistan. Section 6 of this document identifies that RASMAG in conjunction with the RMAs and States has been successful in implementing the identified infrastructure. The planned availability of additional ground-based monitoring capabilities in the Region will further enhance the current monitoring capability and ensure States and operators can meet monitoring obligations.

7.9 The implementation of the ground-based infrastructure, current or planned, should mean that existing regional portable GMU capability is adequate.

Coordination arrangements

7.10 In an effort to minimise duplications of effort whilst still ensuring compliance with monitoring provisions, effective coordination between RMAs globally, and between RMAs and the States they are serving, is essential. Each Asia/Pacific RMA examines on an ongoing basis, monitoring results accumulated by all other authorized global RMAs, regardless of region, in order to utilize those results to avoid duplication and reduce the actual monitoring burden faced by each RMA and operator.

7.11 APANPIRG has already recognised the importance of coordination between RMAs and States, with APANPIRG/19 (September 2008) promulgating the following Conclusion:

Conclusion 19/15 – Enhanced communications between States and RVSM RMAs

That, noting the Annex 6 provisions for the global long term monitoring of airframes used in RVSM operations and the critical role of Asia/Pacific RVSM Regional Monitoring Agencies (RMAs) in monitoring the safety of RVSM operations, the Regional Office draw the attention of States to the Long Term Height Monitoring Actions promulgated by RASMAG. In particular, States are encouraged to immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs.

7.12 Despite Conclusion 19/15, Asia/Pacific RMAs continue to experience difficulties in receiving timely and accurate information (including routine large height deviation [LHD] reporting) from States. In order to enable RMAs to assist States to fulfil their monitoring obligations, it is necessary that States:

- a) continuously update RMA databases of operators and aircraft holding State RVSM approvals;
- b) assist RMAs by providing data, such as ADS-B data, that will enable timely and effective monitoring within the Region;
- c) enable the expeditious forwarding of all LHD and related reports to RMAs, and
- d) ensure availability of current details for State RVSM Point of Contact (POC) officials.

7.13 To highlight the importance of data provision, APANPIRG/20 adopted Conclusion 20/22 calling for States to provide an update of RVSM approvals data in conjunction with the annual December traffic sample data submission required by Conclusion 16/4. In the event that adequate compliance with coordination arrangements is not achieved, RASMAG recommends that APANPIRG place non-compliant States on the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields.

8. Conclusions

8.1 The Annex 6 requirements for RVSM long-term height monitoring that took effect in November 2010 have had a significant impact on the way in which such monitoring is undertaken in the Asia/Pacific region. The RASMAG, in conjunction with the Asia/Pacific RMAs, has determined a monitoring burden of approximately 1222 airframes as at August 2012 with 544 airframes still to be monitored before end of November 2012. Work continues to have the remaining airframes monitored in accordance with the Annex 6 requirements.

8.2 Three primary objectives need to be achieved in terms of RVSM height monitoring:

- a) Compliance with the Annex requirements for long term height-keeping monitoring through the globally standardised Minimum Monitoring Requirement (MMR - e.g. two aircraft per type, per operator, per two years),
- b) Conduct of analyses of aircraft group performance, and
- c) Evaluation of the stability of altimetry system error.

8.3 Achievement of the first objective is via sampling of relatively few airframes at relatively long intervals. Achievement of the other two objectives requires large volumes of data obtained via repeated sampling of airframes over extended periods of time using ground-based monitoring equipment.

8.4 A new monitoring infrastructure has been deployed in the Asia/Pacific Region. A range of proven monitoring systems is currently available, including ground-based systems such as HMUs, AGHMEs and AHMS, and portable airborne GMUs. Additional HMUs and wider access to AHMS is planned for the short-term.

8.5 States retain responsibility for compliance with Annex provisions, including those relating to RVSM height monitoring. An extensive system of APANPIRG approved RMAs has been established in the Asia/Pacific region to assist States in this regard, provided States make the necessary data continuously available to RMAs and comply with relevant RMA requirements. Arrangements have been implemented between global RMAs to enable sharing of monitoring data.

8.6 However, within the Asia/Pacific Region, present coordination activities by States with their respective RMAs are in some cases inadequate. States will be required to comply with related APANPIRG Conclusions, including Conclusions 19/15 and 20/22, and immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs. Should voluntary compliance not be effective, RASMAG will recommend to APANPIRG that non-compliant States are placed on the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields.

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References:

- The RVSM Manual – *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*;
- The ICAO Regional Monitoring Agency (RMA) Manual - *Manual of Operating Procedures and Practices for Regional Monitoring Agencies in relation to the use of a 300 m (1 000 ft) Vertical Separation Minimum above FL 290*;
- Annex 11 – *Air Traffic Services*;
- Annex 6 – *Operation of Aircraft*;
- PANS-ATM, Doc 4444 - *Procedures for Air Navigation Services – Air Traffic Management*;
- APANPIRG Conclusions 17/4, 18/2, 18/3, 18/4, 19/15, 20/22 and 20/23;
- Regional Office State Letter AP018/8 of 31 January 2008; and
- Reports of the Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG/9 – May 2008, RASMAG/10 – December 2008, RASMAG/11 – June 2009)

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 30 August 2012)

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	RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang (including Timor-Leste) FIRs
		EMA	Current	Brisbane, Melbourne, Honiara and Nauru 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, Manager China RMA ADCC, ~~Engineer of Safety and Monitoring Technical Group~~, ATMB, email: tangjx@adcc.com.cn	China	RMA	Current	Beijing, Guangzhou, Kunming, Lanzhou, Pyongyang, Sanya, Shanghai, Shenyang, Urumqi, and Wuhan FIRs.
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	Current	Chennai, Colombo, Delhi, Dhaka, Kabul, Karachi, Kolkata, Lahore, Male, Mumbai, Yangon,
Japan Airspace Safety Monitoring Agency (JASMA) Mr. ~~Noritoshi Suzuki~~, Takashi Imuta, Special Assistant to the Director, Flight Procedures and Airspace Program Office, Japan Civil Aviation Bureau, email: suzuki-n248@mlit.go.jp imuta-t07j7@mlit.go.jp CRA function: Mr. ~~Hironori Okayama~~, Hiroyuki Nakano, Deputy Director, Air Traffic Control Association Japan, Japan Civil Aviation Bureau, email: okayama@atcaj.or.jp nakano-h2jh@mlit.go.jp web site: http://www.jasma.jp	Japan	RMA, EMA and CRA	Current	Fukuoka FIR

Organisation <i>(including contact officer)</i>	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, Kolkata, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Singapore, Taipei, 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, Director Air Traffic Services, 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

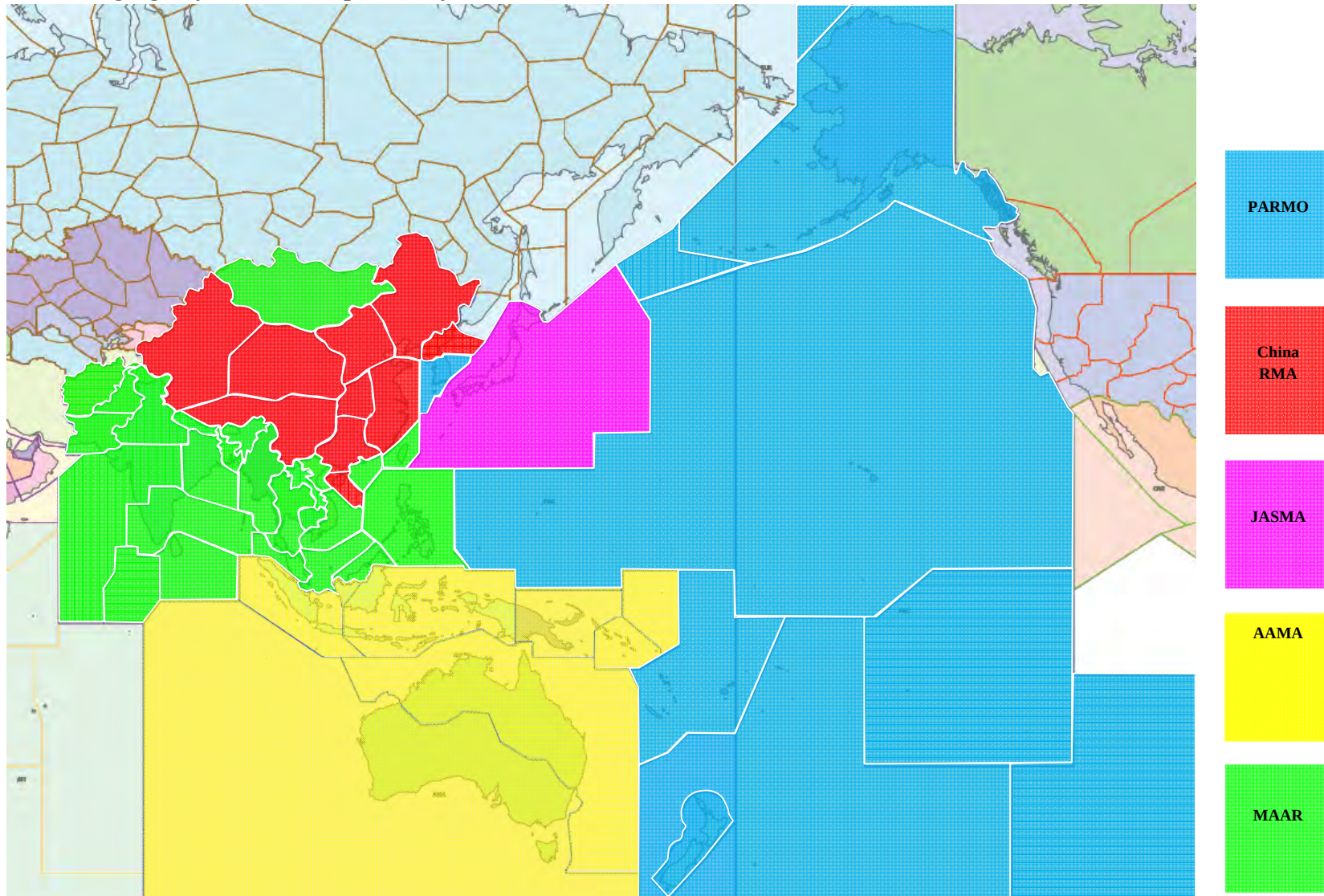
APANPIRG/23
Appendix B to the Report on Agenda Item 3.3

Organisation (including contact officer)	State	Competency	Status	Airspace assessed (FIRs)
FIT-ASIA Mr. Bradley Cornell, Boeing Engineering email: Bradley.D.Cornell@Boeing.Com	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)

APANPIRG/23
Appendix C to the Report on Agenda Item 3.3

Monitoring Agency Areas of Responsibility

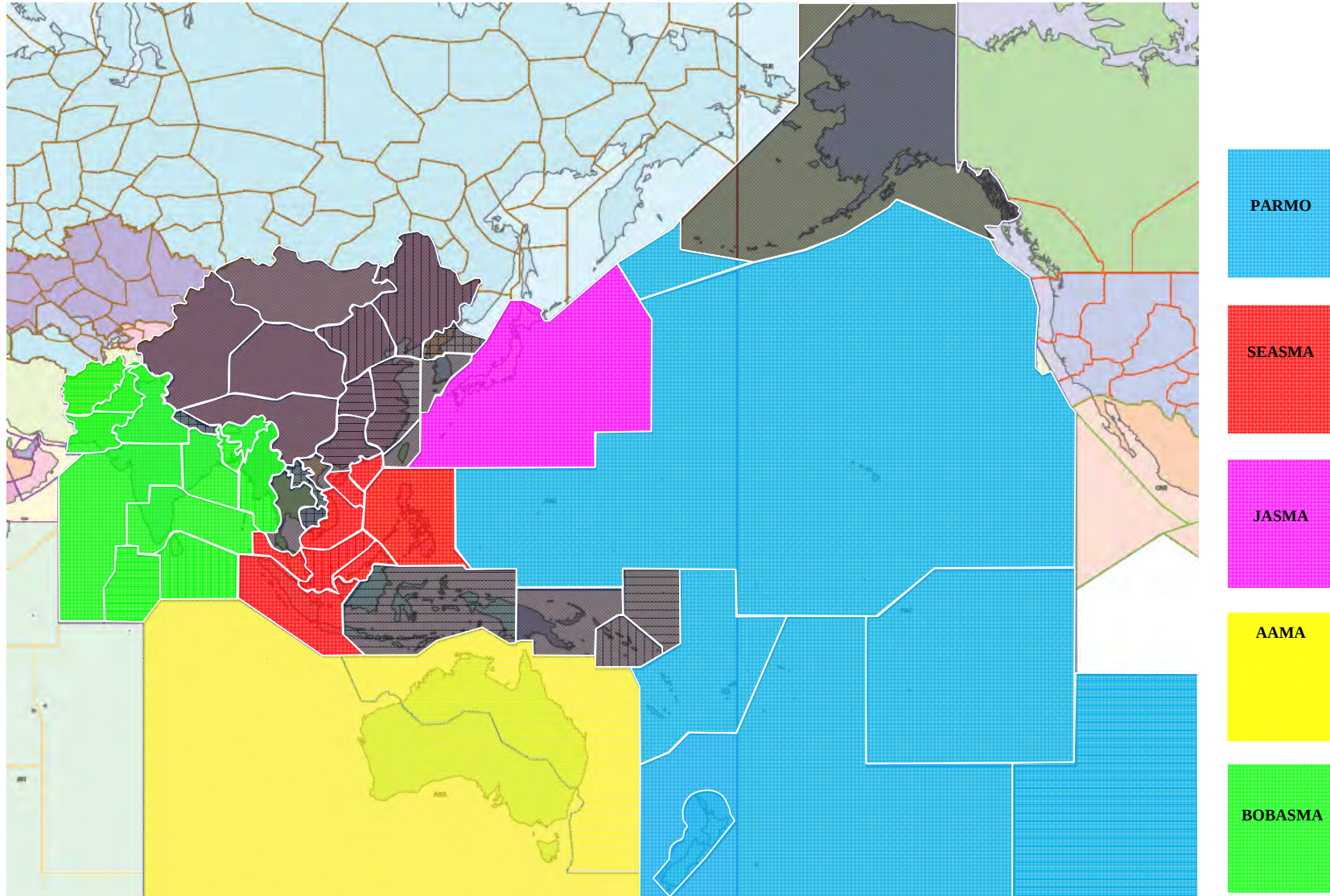
Regional Monitoring Agencies (Vertical)



APANPIRG/23
Appendix C to the Report on Agenda Item 3.3

Monitoring Agency Areas of Responsibility

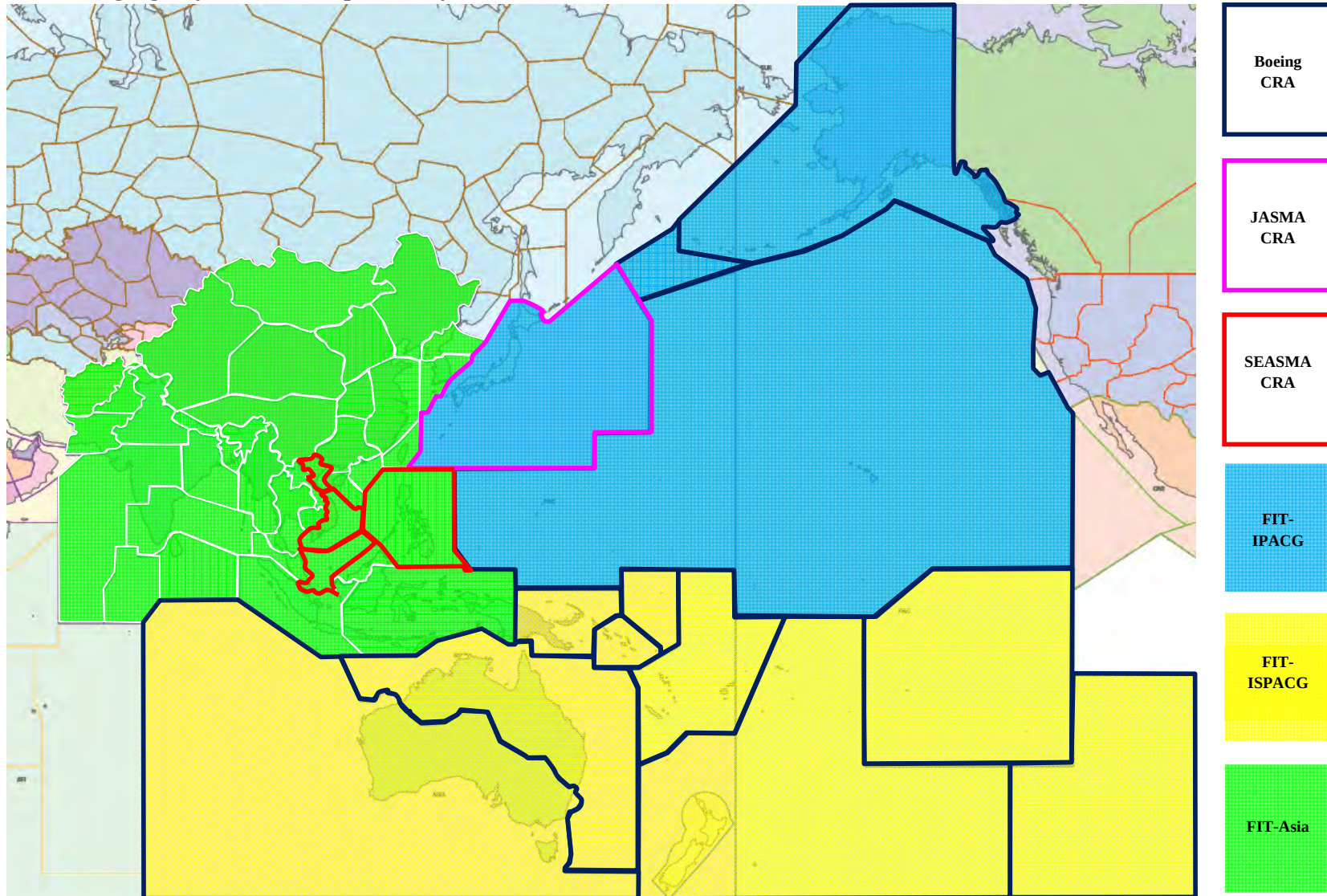
En-route Monitoring Agencies (Horizontal)



APANPIRG/23
Appendix C to the Report on Agenda Item 3.3

Monitoring Agency Areas of Responsibility

Central Reporting Agencies and FITs (Data-link)



AGENDA ITEM 3.4: CNS/MET

Agenda Item 3: Performance Framework for Regional air navigation planning and implementation

3.4 CNS/MET Matters

3.4.1 The meeting reviewed the outcome of the Sixteenth Meeting of the Communications, Navigation and Surveillance /Meteorology Sub-group (CNS/MET SG/16) held at the ICAO Asia and Pacific Regional Office, Bangkok, Thailand from 23 to 27 July 2012 as presented in WP/22. 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/16.

Relevant Action Items of the 48th DGCA Conference

3.4.2 The meeting noted that the Sub-group had reviewed the outcome of 48th DGCA Conference and identified 6 of the 8 Action Items of the Conference relating to the Work of the CNS/MET Sub-group. The meeting also noted that Items 48/1, 48/4, 48/5 and 48/6 had already been covered in the work programme of the CNS/MET Sub-group. The meeting encouraged States to follow up the recommendations of the 48th DGCA Conference and to provide CNS and MET related input to the 49th DGCA Conference.

Review outcome of the ATM/AIS/SAR/SG/22, RASMAG/16 and APSAPG Meetings

3.4.3 The meeting noted the key outcomes of the ATM/AIS/SAR/SG/22, APSAPG/1 and RASMAG/16 meetings related to the work programme of CNS/MET SG.

SIP Workshop on Aviation System Blocks Upgrades

3.4.4 The meeting noted that the SIP Workshop on 12th Air Navigation Conference and ASBUs was held in Bangkok from 14 to 18 May 2012. 12 Administrations of the ICAO Asia and Pacific Regions and two international organizations (CANSO & IATA) participated in the workshop. A similar workshop sponsored by Fiji was held in Nadi, Fiji from 21 to 25 May 2012. Five Pacific States and one international organization (IFALPA) participated in the workshop.

3.4.5 The objective of the workshops was to enhance the knowledge of civil aviation professionals in planning and implementation of air navigation systems on the basis of Aviation System Block Upgrades (ASBU) methodology and also to support States in their preparations for participation in the upcoming AN-Conf/12 in November 2012. The participating Administrations, through practice exercises gained a better understanding of ASBU methodology for planning and implementation of air navigation systems and the use of IFSET for estimating fuel efficiency and environmental benefits of the operational improvements. The meeting noted that some recommendations and/or suggestions on ASBU from participants of the workshops had been forwarded to ICAO Headquarters for consideration.

3.4.6 The CNS/MET SG/16 meeting reviewed the structure of Aviation Systems Block Upgrade (ASBU), including the concepts of Module, Thread, Block and Performance Improvement Area, the four elements of ASBU. The eighteen modules in Block 0 classified in four Performance Improvement Areas (PIAs) were described in terms of Module No., Module Title and the Module Brief Description. Considering that the similar task had already been taken up in Asia/Pacific Seamless ATM Planning Group (APSAPG), the meeting considered it unnecessary for duplicating the efforts. The meeting however agreed that first priority should be accorded to the mitigation of deficiencies that have already been identified. The meeting was reminded that all the Modules included in Block 0 may not be beneficial for the region in terms of cost and operational benefits so priority is to identify those modules, which are applicable for the region.

Aeronautical Fixed Service (AFS)AMHS/SWIM Workshop and the Seventh Meeting of ATNICG

3.4.7 The Seventh meeting of Aeronautical Telecommunication Network Implementation Coordination Group (ATNICG/7) and the ATS Message Handling System (AMHS)/System Wide Information Management (SWIM) Workshop, hosted by Aerothai was held in Chiang Mai, Thailand from 5 to 9 March, 2012.

3.4.8 The meeting noted that though System Wide Information Management (SWIM) had been included in Block 1 of ASBU, but it had a close relation with the module B0-30 in the timeframe from 2013 to 2017 and hence its implementation may start sooner than 2018 .

3.4.9 The meeting noted the views of ATNICG/7 on the following issues:

- i) that Aeronautical Communication Panel (ACP) was attaching more importance to the implementation of VoIP, whereas in Asia/Pacific Region AIDC was taking precedence over voice communication;
- ii) AFTN based AIDC be implemented using AMHS/AFTN gateway and between direct MTA/MTA switching in addition to over dedicated circuits and such comment should be reflected in the consolidated Pan-regional ICD for AIDC;
- iii) need to include telecommunication experts in the ad-hoc Task Force established to finalize Pan Regional ICD for AIDC;
- iv) ACP proposal to relegate ATN/OSI as Recommended Practices should not be supported in view of the fact that ATN/OSI is still being used in ASIA/PAC Region and also since it will be used for air-ground communication; and
- v) the services of a common network manager should be used to cut down the implementation time and to avoid complexities of security implementation.

Use of Wild Card character

3.4.10 ATNICG recommended States to consider AMC proposal to use wild card character and incorporate appropriate changes as deemed fit. It was recommended that ICAO should notify States through a State Letter regarding such change. States were requested to update information in respect of their administrations using the prescribed forms.

Common network for the region

3.4.11 The meeting agreed with ATNICG proposal to develop a strategy to address the issue whether the regional priority should be to have a common regional network or should the priority be assigned to developing solutions around discrete networks that already exist in the region.

Asia/Pacific IP Sub-Network Dependent Convergence Function (SND CF) ICD

3.4.12 The meeting noted that IP Sub-Network Dependent Convergence Function (SND CF) specified in ICAO Doc 9880 is meant for a completely meshed network and as of now the implementation in the region is on point-to-point basis. For the point-to-point connectivity, some of the parameters like Quality of Service etc. specified in Doc 9880 may not be required. In view of the foregoing, the meeting adopted the following Conclusion formulated by the ATNIG on Asia/Pacific IP SND CF ICD:

Conclusion 23/17 – Asia/Pacific IP SND CF ICD

That, the Asia/Pacific Internet Protocol (IP) Sub-Network Dependent Convergence Function (SND CF) Interface Control Document (ICD) provided in **Appendix A** to the Report on agenda item 3.4 be adopted as regional guidance material.

XML over AMHS

3.4.13 The meeting was informed about the option of conveying XML-based data over AMHS making use of the File Transfer Body Parts (FTBP) an element contained in the Extended ATSMHS as presented to the ATNIG/7. There was a proposal to adopt Basic ATSMHS plus FTBP option of Extended AMHS for the region. The meeting agreed with the requirement of reaching an inter-regional agreement on this issue.

Efficient functioning of AMC

3.4.14 The meeting noted a requirement identified by ATNIG for the AMC to make a provision through which States can easily identify recent changes and effectively access updated information. It was explained that in the absence of a provision of identifying recent changes only, the Comm. Centers have to review the whole information which becomes a significant task. Accordingly, the meeting agreed to the following Conclusion:

Conclusion 23/18 – More Efficient Functioning of AMC

That, ICAO be requested to invite EUROCONTROL AMC to consider the provision of more efficient function to enable States to identify recent changes from the previous AIRAC Cycle and to develop means of automation for providing updated AMHS Address Information.

Sample Memorandum of Cooperation (TMC)

3.4.15 A sample Technical Memorandum of Cooperation (TMC) for ATN/AMHS trials was developed by ATNIG for facilitating States in reaching an agreement about conducting trials required to evaluate the basic connectivity, interoperability, functionality and integrity of the ATN G/G Router. The meeting adopted the following Conclusion formulated by the ATNIG:

Conclusion 23/19– Sample TMC for ATN/AMHS Interconnection Trials

That, the sample Technical Memorandum of Cooperation (TMC) for ATN/AMHS interconnection trial between States, provided in **Appendix B** to the Report on agenda item 3.4 be adopted as regional guidance material for reference by States.

Establishment of an inter-regional APAC/NAT AIDC ICD Task Force

3.4.16 The CNS/MET SG/16 meeting discussed a proposal from NAT SPG/48 meeting (12-15 June 2012) for the establishment of an inter-regional APAC/NAT AIDC ICD Task Force and agreed with it. The meeting was informed that the APAC/NAT ICD for AIDC is being developed through harmonizing ICD documents and updates based on the latest versions 1.2.9 and 1.3.0 of the North Atlantic Common Coordination Interface Control Document (NAT CC ICD, NAT Doc 002) and APAC ICD for AIDC Version 3.

3.4.17 India informed that AIDC implementation within its administration between different makes of ATS Automation Systems has been successfully achieved and India is fully ready for implementation of AIDC with the neighboring States. The meeting emphasized the need of sharing of State AIDC implementation plans with the neighboring States.

3.4.18 In light of the foregoing, the meeting endorsed the TOR adopted by NAT SPG and adopted the following Conclusion:

Conclusion 23/20 – Inter-regional APAC/NAT AIDC Task Force

That,

- a) the Terms of Reference of the inter-regional APAC/NAT AIDC Task Force provided by NAT System Planning Group at **Appendix C** to the Report on agenda item 3.4 be endorsed;
- b) States in Asia/Pacific Regions with experience of AIDC implementation be encouraged to participate in the Task Force to contribute for finalization of inter-regional ICD for AIDC;
- c) the outcome of the task force should be coordinated with APANPIRG through the CNS Sub-group; and
- d) States be urged to share their AIDC implementation plan with the neighbouring States in order to implement AIDC in a timely manner.

Information Management Service (IMS) Network Planning

3.4.19 It was informed that the Technology Roadmap 2, to be presented at the upcoming Air Navigation Conference indicates merger of Air Traffic Service Inter-Facility Data Communication (AIDC) and Air Traffic Service Message Handling System (AMHS) into Information Management Service (IMS) beginning in approximately 2020. A preliminary analysis of the planned Information Management Service (IMS) environment using IPv6 network was briefly introduced. It was suggested to develop an IMS Operational Concept as a guideline for States to plan accordingly.

3.4.20 It is critical that an Operational Concept be developed which clearly defines the function of the network and its SWIM component. The concept of IMS is not yet well defined and understood by the user community. It is strongly recommended that ICAO Headquarters develop a clear IMS/SWIM Operational Concept at global level that identifies the impact to message generating systems before 2015 for the States to begin IMS/SWIM environment implementation in 2020. Furthermore, a cost/benefit analysis is a critical document for States to plan and justify their budget allocation. While recommending ATNICG to review requirement of IPv6 network implementation, the meeting adopted following Conclusion:

Conclusion 23/21 – IMS Operational Concept

That, ICAO be invited to

- a) develop IMS Operational Concept and expedite finalization of IPv6 network configuration; and
- b) conduct cost-benefit analyses for the implementation of an IPv6 network and IMS/SWIM at regional level.

ATN/AMHS Implementation status in India and SWIM over AMHS (WP/21)

3.4.21 India presented a paper on ATN/AMHS implementation status in India and harmonious implementation of SWIM over AMHS, in view of ASBU concept being introduced by ICAO. The implementation status of ATN/AMHS circuits in respect of Mumbai-Beijing, Mumbai-Bangkok, Mumbai –Karachi, Mumbai-Muscat and with other BIS states were highlighted. Most of the States have experienced implementation problems due to incompatibility between systems provided by different vendors. Most of these issues however have been resolved through bilateral coordination. India also briefed about its plans to expand the AMHS service at other major airports i.e. Delhi, Kolkata and Chennai. It was stressed that a pragmatic approach in planning by States under the guidance ICAO may be undertaken so as to provide robust infrastructure for provision of SWIM over ATN/AMHS. India proposed an APANPIRG conclusion urging states hosting BBIS and BIS nodes to prioritize resolution of bilateral technical and operational issues and establish AMHS network on urgent basis.

3.4.22 The meeting appreciated progress made by India, however, it was decided to refer such implementation issues to ATN/AMHS for addressing the concerns of India so as to establish regional ATN/AMHS network on urgent basis.

AFS improvement in Bangladesh and Pakistan

3.4.23 Bangladesh informed the meeting that up-gradation of AFTN/AMSS had been completed to receive and transmit New Format of Flight Plan. Necessary testing had been going on with Kolkata, India since 05 September 2012. Bangladesh also had a plan to test with Bangkok on 14 September 2012 and onwards. Their systems will be compliant with New Flight Plan requirement by 15 November 2012. The ATN/AMHS system will be ready for operation in early March 2013.

3.4.24 Pakistan informed the meeting that ATS MHS between Karachi and Mumbai had been operational. Successful Trial for sending and receiving New Format of Flight Plan was conducted over the AMHS link with Mumbai. Connection to the AMHS system in Karachi with terminals in domestic airports had also been established. New Format of Flight Plan testing using ATN/AMHS with Muscat was also carried out. Pakistan will be ready for implementation of the Flight Plan Amendment by 15 November 2012.

COM Coordination Meetings

3.4.25 A COM Coordination Meeting, attended by China, Mongolia and the Russian Federation was held in Shanghai, China from 18 to 20 October 2011. The meeting was hosted by the Air Traffic Management Bureau (ATMB), China. Another COM Coordination Meeting between Afghanistan and Pakistan, hosted by Pakistan Civil Aviation Authority (PCAA) was held in Karachi, Pakistan from 20 to 22 June 2012. The meetings reviewed the implementation and operational status of the required Aeronautical Fixed Service including AFTN/ATS direct speech circuits and developed coordinated Action Plans for improving the performance of some of the concerned circuits to satisfy the established operational requirements.

Aeronautical Mobile Service (AMS)Satellite Data-link Communication Operational Continuity Meeting

3.4.26 The meeting noted the significant outcome of the Workshop on Satellite data-link Communication and the Second Satellite data-link Operational Continuity Meeting (SOCM/2) held in Bangkok from 8 to 10 February, 2012.

MTSAT Services

3.4.27 In a study carried out by Japan, it has been concluded that MTSAT-1R is going to leave the orbit in 2015; MTSAT-2 will however continue to provide the service until 2020. Noting the proposed Japanese plan about continuity of MTSAT services after 2020, and the necessity of compatibility of the new/replacement satellite data-link systems, the meeting adopted following Conclusion.

Conclusion 23/22 – Support of AMSS in the new/replacement SATCOM System

That, States, implementing new/replacement SATCOM data-link systems be invited to consider the following in their study for next generation systems in support of AMSS:

- a) the system to be compatible with one of the existing and/or future AMSS systems such as INMARSAT, to support AMSS data link interoperability;
- b) to establish an operational environment which will enable seamless AMSS operation for AESs, and architecting AMSS systems with appropriate reliability both in space and ground segments; and
- c) to include function of SATVOICE for ATS services

Operation of FANS/1A IRIDIUM

3.4.28 Informing SOCM/2 that FANS 1/A over Iridium is a significantly lower cost solution as compared with other Aeronautical Mobile Satellite (Route) Services options, it was added that Iridium based equipment was easier to retrofit on aircraft, drew less power, is lighter in weight and provided global coverage including over the polar regions. Based on the information provided that Iridium was viable for CPDLC/RCP 240 and ADS-C type 180 operation, meeting adopted following Conclusion:

Conclusion 23/23 – FANS 1/A over Iridium (FOI) for ATS communication

That, considering that FANS 1/A over Iridium (FOI) is expected to be useable for CPDLC and ADS-C operations using Iridium Next beginning in 2015, FOI be accepted as one of the viable means for conducting ATS data-link communications in the ASIA/PAC Region.

INMARSAT Updates

3.4.29 The meeting noted that after the end of life of I-3 constellation expected in 2018, Classic Aero H+ technology will be available through to the end of life of the I-4 constellation expected in 2023. The meeting appreciated investment made by INMARSAT and its partners resulting in achieving acceptable level of message latency and stability of network, and noted that no further upgrade was foreseen till the end of life of I-3 constellation, when the remaining eligible aircraft will migrate to I-4 network. Swift Broad Band (SBB) Oceanic Safety Services will target 99.99% availability for systems using SBB with fallback to Class Aero.

Required Communication Performance (RCP) and Required Surveillance Performance Planning and Implementation (including IP/26)

3.4.30 The Second Satellite Operational Continuity Meeting (SOCM/2) proposal of planning and implementation of a performance based framework for communication and surveillance included in the Global Operational Data Link Document (GOLD) was discussed in the meeting. The meeting also reviewed performance-based framework for communication and surveillance developed by ISPACG and noted changes required to be implemented to Master Minimum Equipment List (MMEL), Regional SUPPs etc.

3.4.31 The USA recalled that the SOCM/2 recommended the APANPIRG Sub-Groups to include in their work program, the development and execution of a plan to implement a performance based framework for Required Communication Performance (RCP) and Required Surveillance Performance (RSP) and give due priority to such task. The RCP and RSP framework will initially apply performance specifications and monitoring as per the GOLD to FANS 1/A based CPDLC and ADS-C. The meeting was informed that in June 2011, the North Atlantic Region System Planning Group endorsed its RCP and ADS-C Surveillance Performance based operations implementation plan with an effective implementation date of February 2015. The performance-based framework should eventually apply to satellite voice (SATVOICE) communication for air traffic control as per the SVGM.

3.4.32 After a lengthy discussion on the subject, the meeting identified the need to further understand the proposed framework for RCP and required surveillance performance and accordingly agreed with the requirement of organizing a regional workshop on RCP and RSP in conjunction with the Data-Link Performance Monitoring Seminar as proposed by the first meeting of FIT-Asia and endorsed by the RASMAG/17 meeting. Following Conclusion was then adopted by the meeting:

Conclusion 23/24 – Workshop on RCP and RSP

That, ICAO be invited to organize a workshop on RCP and RSP in the Asia/Pacific Region

3.4.33 In addition, issues related to HF Data-Link performance as observed in the Auckland (NZZO) FIR, common outage/maintenance reporting template presented by ARINC etc. were also reviewed. The SOCM/2 meeting also discussed various data-link communication aspects of ADS-C and ADS-B systems and the relationship between them.

Guidance Material on SATVOICE and IRSVTF/3 Meeting

3.4.34 Seminar on SATVOICE and the Third Meeting of the ICAO Inter-regional SATVOICE Task Force (IRSVTF/3) was held from 13 to 16 February 2012 at ICAO APAC Regional Office, Bangkok, Thailand.

3.4.35 The IRSVTF was mandated to produce a globally applicable guidance material for using satellite voice for air traffic service (ATS) communications (SVGM). The IRSVTF/1 Meeting was held in ICAO Paris office from 25 to 27 January 2011 and the IRSVTF/2 Meeting, hosted by Boeing Company was held in Seattle North/Everett, USA from 14 to 16 September 2011.

3.4.36 The meeting noted following principles observed for the development of SVGM in line with the IRSVTF Terms of Reference (ToR).

- a) the guidance material would remain neutral on the scenarios identified in the ToR;
- b) the guidance material would be developed within the global ICAO RCP framework to provide States with some flexibility to apply different standards for different uses, without implication to seamless operations;
- c) the guidance material would provide a basis for determining acceptability of any implementation, taking into account routine and emergency use, provision and use of SATVOICE for ATS communications, procedures for the radio operator, controller and flight crew, performance specifications and qualification;
- d) the guidance on the use of portable Satellite Communications (SATCOM) phones would merely indicate that their use is not advisable for ATS communications, as its use is not allowed by national regulations of many States, and any special applications on their use would not be addressed by this guidance material;
- e) the guidance material would not specifically address Minimum Equipment List (MEL) matters, but could serve to facilitate State regulatory authorities in establishing policies in such matters; and
- f) the use of SATCOM technology alone (i.e. without any High Frequency (HF) capability) will require study beyond the target date for completing the first edition of the guidance material. This scenario would therefore not be analyzed by the Task Force

3.4.37 It was noted that the ICAO Operational Data Link Panel (OPLINKP) work programme includes amendments to ICAO Annexes/Procedures for Air Navigation (PANS) and Guidance material related to the use of SATVOICE for ATS communications. The outcome of the IRSVTF work will be provided to the OPLINKP Secretariat to review and decide on appropriate actions for global applicability of the SVGM.

3.4.38 The meeting noted that the guidance material developed by IRSVTF was endorsed by CNS/MET SG/16 and adopted following Conclusion.

Conclusion 23/25 - Adoption of 1st Edition of Satellite Voice (SATVOICE) Guidance Material (SVGM)

That, the 1st Edition of the Satellite Voice (SATVOICE) Guidance Material (SVGM) provided in **Appendix D** to the report on agenda item 3.4 be adopted.

3.4.39 Australia, providing a background on the use of SATVOICE for ATS purposes to the CNS/MET SG/16 meeting, reminded that during the development of SATCOM (ADS-C, CPDLC) in the mid-1990s, ICAO decided that SATVOICE, as a sub-set would not be deployed for ATS purposes for the reasons which included cost, third party procedures that would not allow use for separation standards reduction (such as RNP 4), because of English language proficiency issues and inability to incorporate SATVOICE into the aircraft FMS capabilities. As a consequence, the Australian Air Traffic Control system is not equipped to utilize SATVOICE for other than non-routine and emergency purposes. Australia also noted that many aircraft now come equipped with SATVOICE. Australia has been an active participant in the Inter-regional SATCOM Voice Task Force for the development of the SVGM. Australia supported the adoption of the guidance material with some observations.

3.4.40 The meeting recalled that the use of SATVOICE has been restricted to non-routine and emergency purposes in the ASIA/PAC Region since 1990s. Until such position is reviewed and updated as recommended by the IRSVTF, States were advised to specify the use of SATVOICE in their State AIPs. CNS SG was also tasked to review the strategy for use of SATVOICE in the Asia/Pacific Region.

3.4.41 IATA mentioned that implementation of SATVOICE involves cost to the operators. The meeting noted that India and some other States are permitting SATVOICE in place of one HF. The meeting considered necessary for CNS SG to review the existing regional strategy on use of SATVOICE in its work program.

3.4.42 Republic of Korea informed that several data link applications are provided at Incheon International Airport (IIA) including PDC (DCL) and D-ATIS. It was informed that the dedicated data-link communication links have been set up with the SITA AIRCOM Service to enable aircraft to access D-ATIS and DCL service via VHF datalink. DCL and D-ATIS are connected with SITA network through FEP server in Gimpo International Airport and are operating on 24-Hours basis at IIA. The difference between PDC service and DCL including associated procedures was informed. Advantage of providing DCL service includes improvement of safety and reduction of latency. It also reduces VHF congestion in terminal area; Similarly, D-ATIS Advantages includes:

- Pilot uses text information for weather and terminal conditions;
- Improves safety and reduces workload; and
- Pilot gets ATIS information anywhere within the coverage of a RGS

3.4.43 China informed about the VHF data links coverage and its ATS/AOC services and applications provided in China.

Datalink Performance Monitoring Results

3.4.44 Data-link performance monitoring results within Auckland Oceanic FIR were noted. The meeting also noted that the Central Reporting Agency (CRA) of the Informal South Pacific ATS Coordinating Group (ISPACG) has, for some time been publishing data-link monitoring results on its website at <http://www.ispacg-cra.com/performance.asp>.

3.4.45 Reminding the CNS/MET SG/16 meeting about GOLD data-link availability requirement of 99.9% for safety and 99.99% for traffic efficiency for the ANSPs operating reduced separation in areas of high traffic density, New Zealand informed that a maximum of 520 minutes outage in a 12 month period for safety target and 52 minutes outage with no more than 4 outages of greater than 10 minutes in 12 months for efficiency target were tolerable. It was also informed that a single outage event of over 15 hours (910 minutes) on 22 October 2011 had pushed the data-link performance in the FIR way below the specified targets. Information about outages on Iridium was also provided.

3.4.46 New Zealand also provided information on CPDLC ACTP performance as compared to the requirements for RCP 240 and 400 and ADS-C downlink performance compared to surveillance types 180 and 400. While safety targets for network availability are being achieved at present, it is clear that considerable improvement is necessary to meet the efficiency target.

SELCAL Code Pool Shortage

3.4.47 The meeting was reminded that CNS/MET SG/15 and APANPIRG/22 had discussed the issue of shortage of SELCAL codes (because of issuance of more than 30,000 codes against possible 10,920 codes with 16 tone combinations) and informed about the outcome of Aviation Spectrum Resource Inc. (ASRI) meeting with SELCAL avionics vendors and other interested organizations. It was also informed that ASRI meeting with SELCAL vendors had suggested adding 16 new tones to the current system with frequencies being interspersed between the existing 16 tones. This solution is expected to provide a large set of possible SELCAL codes (215,760) and would not have any impact on the current avionics.

NavigationReport of PBN/TF/9

3.4.48 The meeting reviewed the report of the Ninth Meeting of the Performance-Based Navigation Task Force (PBN/TF/9) held in Bangkok, Thailand from 27 to 29 March 2012.

3.4.49 The PBN Plan Review Team had undertaken assessments of 12 plans in 2012, there has been a significant improvement in the number of administrations with a 'Robust' plan, one-third of administrations in the region now had satisfactory PBN plans. Notwithstanding the overall improvement, a large number of States still remained with either 'Marginal' or 'Incomplete' plans, or had no plan.

3.4.50 Of significant interest to the Task Force was the proportion of Pacific Island administrations (14 of 18) that had not provided a PBN Plan to the ICAO APAC Office. Recalling that ICAO Assembly Resolution A37-11 required, *inter alia*, States to implement approach procedures that have vertical guidance on 30% of runway ends by 31 December 2010¹, vast majority of administrations that had advised the Regional Office of progress indicated achievement of this 30% implementation target.

3.4.51 A Special Implementation Project (SIP) was approved for a PBN implementation Workshop to be held in the South Pacific in December 2012 to assist small Pacific Island States to develop their PBN Plan.

3.4.52 The PBNTF discussed the establishment of a 'buddy' system for administrations that did not have a robust status plan. It was recognised that a simple training session was probably insufficient to develop a robust PBN response; hence the need to have a longer term relationship with States that were more advanced in PBN development was expressed. The PBNTF also identified 30 administrations that did not have a robust plan and also identified the possible means of individually tailored assistance for these 30 administrations.

3.4.53 While highlighting PBN and GNSS global developments, Australia provided an update on the Australian installation of GNSS Landing System (GLS) at Sydney. IATA supported the GLS technology but would prefer an aggressive timeline and implementation plan to meet airline requirements.

3.4.54 The PBNTF suggested that a GLS seminar could be held in the Asia/Pacific, noting that all 'new generation' Boeing, Airbus and Bombardier aircraft already had GLS equipment on board. The meeting adopted following Conclusion:

Conclusion 23/26 - Asia/Pacific GLS Seminar

That, ICAO plans an Asia/Pacific GNSS Landing System (GLS) Seminar to provide information on emerging GLS technology, airport and airline GLS planning, and the development of applicable standards.

3.4.55 The PBNTF meeting was apprised of the dialogue that had been on-going in Australia regarding the requirements of conventional instrument flight procedures flown using GNSS/RNP aircraft. IATA stated that this was a complex area with possible legal implications for ATC. The meeting noted lack of guidance on this matter and discussed a draft Conclusion formulated by the PBNTF asking ICAO to review and develop operational guidance materials for conventional instrument flight procedures flown using GNSS/RNP aircraft.

3.4.56 The APANPIRG/23 meeting did not adopt the draft Conclusion in order to clarify what was expected from the Conclusion. The meeting then decided to refer the issue back to the PBNTF for further deliberation. Australia was requested to prepare a working paper in coordination with IATA for discussion at next PBNTF meeting to be held in December 2012.

¹ Except where there is no local altimeter setting available and there are no aircraft suitably equipped for APV operations with a maximum certificated take-off mass of 5 700 kg or more, implementation of straight-in LNAV only procedures are acceptable.

3.4.57 The meeting noted that for the approach classifications (Non-Precision, Approach with Vertical Guidance [APV, SBAS-LPV, Baro-VNAV and RNP-AR] and Precision), there was no associated lighting and runway standards for APV. Apparently the Approach Classification Task Force (ACTF) was reviewing the APV definition. Australia was approving RNP-AR (Authorisation required) procedures based on individual safety cases, including assessment of approach aids.

3.4.58 The meeting noted discussions by the PBNTF on the responsibilities of a third party design organization for an Instrument Flight Procedure (IFP), especially RNP-AR approaches and the legal implications associated with it. Australia identified some issues with the current ICAO PANS-OPS (Doc 8168) design standard for Baro-VNAV that could be further taken up by the PBNTF.

3.4.59 IATA, Australia, Fiji and Thailand developed a draft amendment proposal for the Task Force TORs to include monitoring, feedback, encouraging State PBN implementations, and coordination with the ICAO FPP and COSCAPs. While adopting the following Decision proposed by the PBN Task Force, the meeting noted that longer term would be required for the PBNTF to deal with new tasks.

Decision 23/27 - Revised PBN/TF Terms of Reference

That, the following amendments are made to the PBN/TF Terms of Reference:

3) Identify other issues/action items arising from the work of ICAO or for consideration by ICAO in order to facilitate regional and global harmonization of existing as well as future applications, and where appropriate, provide responses and support to the ICAO ~~RNP~~ **PBNSG**.

4) Assist States in the preparation and review of their PBN implementation documentation **and provide feedback** to ensure regional harmonization and for possible inclusion in ICAO-developed model documentation.

5) Monitor the progress of State PBN implementation, identify constraints to implementation and capture information on the effectiveness (tangible benefits) of State PBN applications.

7) Address other regional PBN implementation issues, including the development of staff resources and skills, as needed by safety management. **Coordinate and consult with ICAO FPP, COSCAP, industry partners and volunteering administrations who are providing support to State PBN implementation.**

Regional GNSS activities

3.4.60 ICAO APAC Office was invited to participate and contribute to three GNSS related activities held during last one year, in the region. These activities were mostly aimed at increasing cooperation and coordination in the matters related to the implementation of GNSS for multiple sectors of applications including transportation.

3.4.61 **Sixteenth meeting of APEC GNSS Implementation Team (GIT/16)**, hosted by Aeronautical Radio of Thailand (AEROTHAI) was held in Bangkok from 15 to 17 February, 2012. GIT/16 developed a number of Recommendations and Action Items related to GNSS implementation. Some conclusion/action Items related to the work of CNS/MET Sub-group are reproduced below:

GIT Conclusion 23/2: The APAC GIT agrees to provide APEC GNSS Test-bed data to support ICAO Ionospheric Studies Task Force. Activities should be coordinated between ICAO APAC Office and APEC GIT Co-chairs.

GIT Action Item 23/7: For the GIT member economies collecting single/dual frequency data – to provide the GNSS Ionospheric data to support activities by the ICAO Ionospheric Studies Task Force.

GIT Action Item 23/8: For the project consultant of the PBNRREVP to cooperate with ICAO APAC Office through coordination with the APEC GIT Co-chair in the development of the questionnaire regarding the PBN and GNSS regulatory processes.

3.4.62 The First Asia-Oceania Space Weather Alliance (AOSWA) Workshop was organized in Chiang Mai, Thailand from 22 to 24 February, 2012. The workshop provided a platform to the experts for exchanging information/experience on space weather conditions and the effects of space weather on aviation. Space weather includes effect of ionospheric conditions on radio propagation for HF, satellite communications and satellite navigation. The workshop included a number of presentations on theoretical aspects of ionospheric effect and information on data collection/analysis activities that are going on in the region. ICAO APAC Office, through its presentation informed the Workshop about GNSS applications for aviation and sought support of the participating countries for the regional Ionospheric studies initiatives. The ICAO APAC Office was invited to join the Alliance as an Associate.

3.4.63 The UN ESCAP held a workshop on the Use of Multi-GNSS for Sustainable Development, in Bangkok on 21 and 22 March, 2012. Workshop noted that the recent advances in Multi-Global Navigation Satellite Systems had enabled a high potential of utilization in various applications for sustainable economic and social development. The Workshop was aimed to facilitate sharing of experiences and information on multi-GNSS utilization for transportation, disaster risk reduction, environment monitoring and agriculture to increase awareness among the users. Workshop suggested that a regional scintillation monitoring system could possibly be established under the guidance of UN ESCAP.

Ionospheric Study Task Force

3.4.64 The First meeting of ISTF, hosted by Japan Civil Aviation Bureau (JCAB) and Electronic Navigation Research Institute (ENRI) was held in Tokyo Japan from 27 to 29 February, 2012. Dr. Susumu Saito from ENRI, Japan was elected as chairman of the Task Force.

3.4.65 The ISTF Terms of Reference adopted by the CNS/MET SG/15 was reviewed and updated by the Task Force to make it more relevant to the objectives of the ISTF. The updated TOR was adopted the CNS/MET SG/16 meeting through a Decision.

3.4.66 It was agreed that the first step for the Task Force should be to confirm if there is a need to use a more complex (compared to the existing model) ionospheric model in the ASIA/PAC region, after analysing the shared data and then go to the next step of developing it if required. It was clarified that the ionospheric characterization requirements for GBAS and SBAS are different and hence different models need to be developed for them.

3.4.67 The Task Force discussed issues related to the handling of collected data and the outcome of analysis and concluded that the shared data should be used only for the study and development of ionospheric model in the Asia/Pacific Region for the purpose of satellite-based air navigation. Conditions of using data captured by the Hong Kong Satellite Positioning Reference Station Network was adopted as a guidance material and a sample MOU.

3.4.68 The meeting considered Task Force's recommendation to urge States not participating in the ISTF activities to share ionospheric data from their national Sources and adopted the following Conclusion:

Conclusion 23/28 – Sharing of Ionospheric Data

That, the States which are not participating in the Ionospheric Studies Task Force be urged to share ionospheric data from their national sources with the Task Force to support development of regional ionospheric models for GBAS and SBAS.

3.4.69 Based on the information provided by Republic of Korea, Tasks and Task Leads were identified to progress the objective of developing regional ionospheric models for GBAS and SBAS. It was agreed that the Task Leads identified should communicate with other members of the Task Force through e-mail.

3.4.70 A suggestion was made to create a web based forum to exchange information and a portal, 'ISTF' has been created in the ICAO Portal website, which is accessible to the ISTF members through password. The portal is being used extensively for the exchange of information and experience.

3.4.71 It was recommended that the ISTF will meet twice a year during its initial phase, in view of the forthcoming solar max and for developing a harmonized approach for data collection and analysis to maximize the benefits. The second meeting of the Task Force has been scheduled from 15 to 17 October 2012 in Bangkok. Meetings are being organized between ISTF and the relevant groups in Asian Institute of Technology and King Mongkut's Institute of Technology Ladkrabang, Bangkok (KMITL) to exchange information/experience on ionospheric data collection and analysis.

3.4.72 The meeting noted that in response to State Letter T 8/5.10, T 8/5.11:AP083/11 (CNS) dated 15 June 2011, completed data collection templates had been received from eight States and five-hundred-and-forty-two (542) stations had been nominated as data sources of ionospheric delay measurements. Thirty-seven (37) stations had been nominated as data sources of ionospheric scintillation measurements.

Australian navigation system changes

3.4.73 Australia informed about equipment mandates to apply surveillance and navigation capability to improve the safety and efficiency of Air Traffic Management (ATM) and for aircraft-to-aircraft conflict alerting and collision avoidance. The equipment mandates for GNSS Navigation under the IFR (SATNAV) were described. The relevant CASA NPRM is No. 1105AS which can be viewed on the CASA internet website at the link:
http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_100829.

3.4.74 The meeting noted that Australia would retain a selected set of approximately 215 terrestrial navigation aids to provide terminal and non-precision approach guidance at an adequate airport in the event of an aircraft experiencing difficulty with GNSS (GPS). List of the terrestrial navaids that are to be retained can be downloaded from:
http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_100829

3.4.75 Instrument Landing Systems will continue to provide precision approach guidance at major Australian capital city and regional airports. GLS is currently being deployed at Sydney; it is anticipated that it will be available for CAT-I service by end of 2012.

3.4.76 The meeting also noted that operational commissioning of a Honeywell SLS-4000 GBAS by the German DFS at Bremen had received the type approval as a primary landing system by the Federal Supervisory Authority for Air Navigation Services (BAF). The GBAS at Bremen may be used independently of the instrument landing system (ILS).

3.4.77 Japan informed that as a component of the long-term strategy of Future ATM and CNS structure in Japan, named CARATS, JCAB has engaged in the feasibility study of GBAS from both operational and technical aspects. ENRI has been operating a CAT-I GBAS functional prototype at Kansai International Airport (RJBB) to collect data for Hazardous Misleading Information (HMI) analysis since January 2011. Japan has been involved in the development of baseline SARPs of GBAS Service Type-D (GAST-D) which enables Category-III approach using GPS L1 signals. The prototype GAST-D ground subsystem is planned to be delivered in the third quarter of 2013.

Navigation Strategy

3.4.78 The meeting considered the Navigation Strategy for the Asia/Pacific Region adopted by APANPIRG/22 in September 2011. In considering the strategy, the meeting reviewed the CAR/SAM Strategy for the Evolution of Air Navigation Systems (First Edition) and considered papers for the 12th Air Navigation Conference on Global Navigation Satellite System (GNSS) Implementation Issues and Rationalization of Terrestrial Navigation Aids. Information on State activities was also taken into account. The meeting adopted the revised strategy updated by CNS/MET SG through the following Conclusion:

Conclusion 23/29 - Navigation Strategy for the Asia/Pacific Region

That, the revised navigation strategy provided in **Appendix E** to the Report on agenda item 3.4 be adopted for the Asia/Pacific Region.

Obstruction Criteria ILS

3.4.79 Based on the case analysis, India brought out that certain structure, despite being beyond the Localizer coverage volume were affecting the performance of ILS and hence, it was proposed to redefine ICAO guidance in Annex 10, Volume I to account for such instances. It was also proposed that this problem be taken up at appropriate technical forum so that it can be addressed and suitable guidance material to this effect be provided in appropriate ICAO document. Some of the participating States informed that they were undertaking detailed modeling or some other methods for each obstruction and that many tools are available to do this modeling.

Frangibility Criteria for ILS Glide Path Antenna Mast

3.4.80 The meeting was reminded that as per Annex 14 Para 9.9.3 and Aerodrome Design Manual (Doc 9157) all the equipment or installation required for air navigation purposes, which are located on the runway basic strip, runway end safety area (RESA) and taxiway strip should be frangible and mounted as low as possible. The paper from India brought to the notice of the meeting that as per Doc 9157 (Part 6 – Frangibility) Para 4.9.31 (b) that frangibility criteria for ILS Glide Path Antenna mast has not yet been developed. India invited the meeting to endorse the recommendation for inclusion of a suitable advisory clause for exclusion of Glide Path antenna mast and housing from the mandate of frangibility requirement till appropriate frangibility design criteria are developed for the same. The meeting recommended that this issue may be taken up by the Secretariat for consideration by the ICAO Aerodromes Panel and Navigation System Panel.

Rationalization of critical area behind localizer antenna

3.4.81 India expressed its opinion that after the introduction of log periodic antenna with high directivity and less susceptibility to multipath because of nearby ground obstructions, the threat on performance of ILS Localizer because of obstructions behind the antenna had reduced considerably. The paper proposed considerable reduction in the requirement of maintaining critical area behind localizer antenna to support airport development. The meeting was of the view that the issue may be put up to ICAO Navigation Systems Panel through a member of NSP in the Region for consideration.

Application of GAGAN Signal-in-Space for Regional Harmonization (WP/19)

3.4.82 India provided updates on the development of GAGAN. Signal-in-Space from GSAT-8 has become available since December 2011. Final System Acceptance Test (FSAT) was completed on 16 July 2012. GSAT-10 was scheduled for launching on 21 September 2012 which will provide redundant satellite to maintain sufficient backup. GAGAN signals are interoperable with EGNOS on the west and MSAS on the east to provide seamless coverage throughout Asia and Pacific Regions. India has updated its IGM- Multi-layer Data Fusion (MLDF) algorithm to achieve APV 1.0 service availability over Indian airspace. GAGAN footprint extends to a large portion of the region and many States sharing common boundaries with India wherein GAGAN service expandability and usability can easily be achieved with optimum cost and efforts.

3.4.83 The meeting appreciated efforts made by India. States were encouraged to explore avenues for mutual cooperation Programmes to achieve regional harmonization for GNSS implementation and provide feedback to India on the draft MOU presented to the meeting. ICAO Regional Office was requested to facilitate getting feedback from States concerned on the draft MOU through a State Letter.

Development of APV (SBAS) – LPV Approach Procedure for GAGAN (WP/24)

3.4.84 India informed about its preparation for implementation of GAGAN APV procedures. There is a requirement as per Annex 10 and PANS-OPS Doc8168 for minimum amount of information to be published for the purpose of encoding of navigation database for on-board use and for charting the procedures. Six airports in India have been identified for which APV procedures are to be designed. SBAS Channel number is to be published on every RNAV approach chart which includes LPV minima. According to Annex 10, the five digit SBAS channel number is unique throughout the world. However, centralized allocation of the channel number is not standardized in Annex 10. FAA is the principal organization for allocating the channel numbers for WAAS procedures and Eurocontrol is the centralized agency in European region for issue of channel number in coordination with FAA. Therefore, the meeting agreed with the proposal that India works as the nodal agency for coordination with FAA regarding channel number assignments for using GAGAN signal-in-space as it was considered the most practical way forward. The meeting had no objection for India to use letter “G” as the leading character of the identifier (in the Reference Path Indicator (RPI) of FAS data block for SBAS) for GAGAN based procedures in line with criteria stated in Doc 8168 for other SBAS providers. The meeting noted that GAGAN procedures using letter “G” as leading character will have no possibility of confusion with WAAS/EGNOS/MSAS procedures. In order to confirm that letter “G” be designated for GAGAN based procedure and reflected in the relevant ICAO document(s), India agreed to send a request letter to ICAO through the Regional Office on this matter.

GNSS Interference

3.4.85 The meeting was informed that State Letter T 8/5.1 & T8/5.15: AP156/11 (CNS) had been sent urging States to take necessary follow-up actions to prohibit interfering tendencies for GNSS through suitable administrative and legislative measures and put in place a well-coordinated mechanism in this effort. In this connection, the meeting noted recommendations/actions suggested to minimize interference on GNSS as advised in ICAO State Letter AN 13/4.5-12/50 dated 9 July 2012.

Surveillance

Outcome of ADS-B SITF/11 Meeting

3.4.86 The Eleventh Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force (ADS-B SITF/11) and an ADS-B Seminar, hosted by the Korean Office of Aviation, Ministry of Land, Transportation and Maritime Affairs (MLTM) and the Incheon International Airport Corporation (IIAC) were held from 24 to 27 April 2012 in Jeju, Republic of Korea.

Review of Terms of Reference and Subject/Tasks List

3.4.87 The meeting reviewed the revised TOR of ADS-B SITF as recommended by the Task Force and endorsed by the CNS/MET SG. Considering that ADS-B IN is part of ASBU modules to be considered for adoption by AN Conf/12, the meeting agreed that ADS-B IN implementation should be added included in the work programme of the Task Force. The meeting noted the updated Subject/Tasks List for ADS-B SITF and adopted following Decision:

Decision 23/30 - Revised Terms of Reference and Subject/Tasks List of ADS-B Study and Implementation Task Force

That, the revised Terms of Reference and updated Subject/Tasks List of ADS-B Study and Implementation Task Force provided in **Appendices F** and **Appendix G** to the Report on agenda item 3.4 be adopted.

Guidance Materials on ASTERIX Category 21 and ADS-B Data Sharing

3.4.88 The ADS-B SITF meeting reviewed the Draft Guidance Material on generation, processing and sharing of ASTERIX Category 21 Messages. The guidance material analyzed various aspects of generation, processing and sharing of ASTERIX Category 21 ADS-B messages. It introduced concept of grouping ASTERIX data fields (i.e. mandatory, desirable and optional ADS-B data fields) for the sharing of ADS-B data in ASTERIX Category 21 format to ensure system interoperability and harmonized ADS-B implementation in the Asia/Pacific Region.

3.4.89 The meeting also reviewed the draft “*Guidance material addressing military concerns regarding sharing of ADS-B data*” proposed by the Task Force. The meeting expressed appreciation for the development of a Guidance Material which would be very useful for the APSAPG for providing guidance on civil-military cooperation aspects. Accordingly, the meeting adopted following Conclusion.

Conclusion 23/31 - Guidance Materials on ASTERIX Category 21 Messages & Advice to Military Authorities regarding Sharing of ADS-B Data

That, the following ADS-B implementation guidance materials be adopted:

- a) generation, processing and sharing of ASTERIX Category 21 ADS-B Messages provided in **Appendix H** to the Report on agenda item 3.4; and
- b) advice to military authorities regarding sharing of ADS-B data provided in **Appendix I** to the Report on agenda item 3.4.

3.8.90 While concurring with the above Conclusion, USA informed the meeting that ASTERIX Category 33 is used in the United States.

Sample template on harmonization framework for ADS-B implementation

3.4.91 The meeting noted the proposed sample template on harmonization framework for inclusion into ADS-B implementation in the AIGD based on experience gained in the South China Sea ADS-B implementation project. Accordingly, the meeting adopted following Conclusion formulated by the Task Force:

Conclusion 23/32 – Amendment to ADS-B Implementation Guidance Document (AIGD)

That, the AIGD be amended to include a sample template on harmonization framework for ADS-B implementation as provided in **Appendix J** to the Report on agenda item 3.4.

Collaboration in ADS-B Implementation over the South China Sea and Bay of Bengal (WP/23)

3.4.92 CANSO highlighted several ADS-B initiatives over the South China Sea and the Bay of Bengal where it had been working closely with ICAO, IATA and several ANSPs to promote the implementation of ADS-B in the region. These initiatives were in support of APANPIRG Conclusions 22/34 and 22/35 and Action Item 4/48 of the 48th DGCA Conference.

3.4.93 It was reported that, at a meeting hosted by CANSO in July 2012, India and Myanmar agreed in principle to share ADS-B data involving ADS-B stations at Port Blair and Agartala in India and Sittwe and Coco Island in Myanmar. In a separate meeting, the Philippines also agreed in principle to the installation of an ADS-B station in Quezon Palawan and the sharing of ADS-B data with Singapore to extend ADS-B coverage in the eastern part of the South China Sea.

3.4.94 CANSO stated that the objective of both these initiatives was to plug radar surveillance gaps on some of the major traffic flows from SE to NE Asia and from Australasia to Europe. The States involved plan to issue a NOTAM/AIC for ADS-B mandate in 2013 to be effective in 2015. CANSO commended the States concerned for working together and noted that the success of such cross border collaboration with a strong focus on deliverables could be replicated in other high traffic density areas where there is a lack of surveillance. States were urged to move beyond plans to actual implementation and to start harmonising their plans with their neighbours.

Black List /White List filtering

3.4.95 The meeting noted that currently Australia uses a “white list” filtering system where only “approved” aircraft have their ADS-B data forwarded to ATC. Airservices Australia is working on a safety case, to abandon the use of the aircraft by aircraft “white list” filtering system and present all aircraft ADS-B transmissions other than known (blacklist) faulty transmissions. In view of the foregoing, the meeting considered it necessary to establish a database for the region to maintain a list of identified ADS-B airframe problems. Australia was requested to establish and maintain such database and States were requested to provide required information for entry in the Database for sharing. Accordingly, the meeting adopted following Conclusion:

Conclusion 23/33 – Database of Blacklist Airframe broadcasting misleading ADS-B Data

That,

- a) Australia be requested to establish and maintain a Database of Blacklist airframe broadcasting misleading ADS-B data for sharing with other Administrations in the Asia/Pacific Region; and
- b) States implementing ADS-B based surveillance service be encouraged to provide the identified occurrences of airframe broadcasting misleading data to Australia for entry into the ADS-B Blacklist Database.

3.4.96 IATA was very supportive of the approach being taken by Australia on discontinuing white list approval process.

3.4.97 USA informed the meeting that it does not intend to expand or continue the use of eligibility or blacklists for its implementation of ADS-B services. The U.S. is moving away from approved aircraft lists and will instead rely on the performance from the aircraft to the appropriate version/standard to use those aircraft for separation services with ADS-B and investigate those who are not operating properly. US believes that maintaining an eligibility list on a regional basis brings with it inherent problems. Maintaining a list for the entire region could become burdensome making it difficult to maintain its currency.

ADS-B derived data for RVSM height monitoring

3.4.98 The meeting noted the deliberations on the use of ADS-B derived data as a cost effective solution to enable long-term height monitoring capability. States were encouraged to consider utilizing ADS-B for this function as they implement ADS-B in the Region.

3.4.99 The meeting noted that the last Regional Airspace Safety Monitoring Advisory Group meeting (RASMAG/16, Bangkok, 20-24 February 2012) had endorsed this process and it was expected that the next RASMAG meeting (RASMAG/17, 28-31 August 2012) will be updated on RMA progress on the usage of ADS-B data for height monitoring. The meeting was also informed that RASMAG/17 is expected to discuss updated *Asia/Pacific Regional Impact Statement for RVSM monitoring* to incorporate reference to ADS-B as a preferred solution, given the cost advantages of using ADS-B for airlines.

3.4.100 In this connection, the meeting noted that MAAR Bangkok had agreed to receive and process ADS-B data for RVSM monitoring. However, calculating Altimetry System Error (ASE) using ADS-B data would largely depend on the availability of the ADS-B data from States and how to retrieve ADS-B data directly from the ADS-B messages by States. It was also required to forward all relevant data to States once the reports of calculation and analysis are completed.

3.4.101 The meeting endorsed the recommendation of the Task Force for RASMAG to develop a requirement and procedure for collection of ADS-B data for height monitoring.

States' activities on trials and implementation of ADS-B and multilateration

3.4.102 The meeting noted that updates on ADS-B implementation activities and plans were provided by Australia, Cambodia, China, Hong Kong China, Fiji Island, India, Indonesia, Japan, Republic of Korea, Singapore, USA and Viet Nam were included in the Task Force meeting report.

ADS-B data sharing and establishment of a database to support ATC operations and safety monitoring for the APAC Regions (WP/20)

3.4.103 Hong Kong, China presented a paper on sharing of ADS-B data and establishment of a database to support ATC operations and safety monitoring for the APAC Regions. Many States in the APAC Regions are initiating program to include ADS-B as one of the essential building elements for their Air Traffic Management Systems. The paper highlighted that apart from enhanced ATC surveillance, other information contained in the ADS-B reports could be used for effective safety monitoring purpose. The meeting noted Hong Kong, China's plan in making use of ADS-B data to support ATC operations and to develop a system for safety monitoring. States were encouraged to mutually share monitoring results when they are ready to establish their own blacklist for aircraft transmitting erroneous ADS-B data and perform safety monitoring using ADS-B data. The consolidated monitoring results would build a database for use by the APAC States in enhancing ATC surveillance operations over major traffic flow routes and busy airspace, as well as improving overall safety level of the entire APAC Regions. The meeting identified need for the ADS-B SITF to further study the requirement for the establishment of the database.

Australian ADS-B Mandate

3.4.104 Australia reiterated that ADS-B mandate for Australian upper airspace (at and above FL290) will become effective from 13 December 2013 and aircraft without required ADS-B equipage will not be allowed to fly into the specified airspace. The papers presented nine mandates including equipment mandates for GNSS Navigation under the IFR (SATNAV); for fitment of Mode S Transponders (with ADS-B OUT capability) and further mandates for ADS-B OUT equipment. The reasons for requiring applicable aircraft to be fitted with the modern navigation and surveillance technology were also explained.

3.4.105 Based on the feedback resulting from aviation industry consultation on the amendment proposal undertaken in September 2011, Australia had decided on 8 December 2011 for forward fit of SA Aware in the GNSS avionics. In making this decision, Australia was aware that the safety impact of not having SA Aware had been offset to a large extent by a recently approved lowering of the level of the aircraft transmitted position integrity (Navigation Uncertainty Category) parameter acceptable in the ADS-B ground system for display of ADS-B targets to ATC.

Flight with unserviceable ADS-B equipment

3.4.106 Industry consultation on the proposed additions to the ADS-B rule to allow for flight with unserviceable ADS-B equipment was also undertaken in the same NPRM (No 1103AS) that proposed the change to the date for SA Aware.

3.4.107 The outcome is that the Australian ADS-B rule has been amended to provide for aircraft having unserviceable ADS-B equipment undertaking flight under following conditions to position the aircraft for equipment repairs, as follows:

- a) the equipment was listed in the aircraft operator's Minimum Equipment List as a Permissible Unserviceability (PUS) for the flight; or
- b) flight with unserviceable equipment had been approved by CASA and both of the following applies:
 - i) the flight took place within 3 days of the discovery of the unserviceability; and
 - ii) ATC cleared the flight before it commenced.

Equipment mandate for fitment of TCAS II Version 7.1 avionics (ICAO standard)

3.4.108 An aircraft that is turbine powered and is used in public transport services first placed on the Australian Civil Aircraft Register on/after 1 January 2014 that has a maximum certified take-off weight in excess of 5700 kg or has a certified passenger capacity of more than 19 passengers must be fitted with an approved TCAS II Version 7.1. This mandate is in accordance with the ICAO Annex 10 Volume IV standard for forward fitment in new turbine powered aeroplanes.

3.4.109 While thanking Australia for the proactive action taken by CASA, IATA expressed concerns at CNS/MET SG/16 meeting about the mandate for TSO-C145, TSO-C146 and TSO-C196 by 6 February 2014 and considered that it would be challenging.

ATM Automation Modernization

3.4.110 Hong Kong, China through its paper presented to CNS/MET SG/16 shared experiences in planning and implementation of the ATM modernization project to meet the traffic growth and to support ICAO's ASBU initiative. The project has adopted the design concept of SEED, i.e. Sustainable, Environmental friendly and Educational to ensure the sustainability of aviation development in the region. The meeting noted the work done by Hong Kong, China and agreed to the need for early harmonization of potential system interoperability issues when deploying AIDC and ATN/AMHS.

Establishment of Safety Database in the ASIA/PAC Region

3.4.111 Hong Kong, China presented the paper and initiated a proposal on sharing of ADS-B data for performance monitoring and establishment of a regional database to support ATC operations and safety monitoring for the ASIA/PAC Region. The database proposed to be developed will contain information on black listed aircraft (based on harmonized determining criteria) and analyzed safety results, which would be of use to States in ADS-B implementation and safety monitoring for major traffic flow (MTF) routes and busy airspace.

3.4.112 Hong Kong, China considered that there may be benefit for CNS/MET Sub-group to cooperate with RASMAG for early adoption of a holistic approach in collecting and managing ADS-B information shared with States. There is a very important prerequisite for ICAO member States to agree on sharing of ADS-B data for improved safety monitoring purposes. Therefore, the meeting adopted following Conclusion formulated by the CNS/MET SG

Conclusion 23/34 – Sharing of ADS-B data to support ATC operations and safety monitoring

That, States be urged to provide ADS-B data for sharing to support ATC operations and safety monitoring.

3.4.113 The meeting also recommended ICAO Regional Office to notify States by a consolidated State Letter including the Conclusion adopted under agenda 3.3, on provision of ADS-B data for height-keeping monitoring to RMA formulated by RASMAG

3.4.114 Hong Kong, China also recommended coordinating with RASMAG for establishing an arrangement for up keeping and managing a regional database containing operational data and safety analysis results.

Surveillance and Broadcast Services (SBS) Programme in USA

3.4.115 USA provided updates on the recent FAA's activities in the implementation of ADS-B. Surveillance and Broadcast Services (SBS) programme, including air traffic separation service; ADS-R which is a pilot advisory service that receives data from aircraft on one link and immediately rebroadcasts it on the other link; the up-linking of Traffic Information Services - Broadcast (TIS-B) and Flight Information Services – Broadcast (FIS-B) to the equipped aircraft. The following two radio links are supported:

- 978 MHz Universal Access Transceiver (UAT) link per FAA TSO-C154c; and
- 1090 MHz Extended Squitter (1090ES) link per TSO-C166b.

3.4.116 It was informed that as of 23 March 2012, 418 radio sites (of over 700 planned sites) were constructed and 371 radio sites have been declared operational by the FAA. The latest map of the operational radios can be found at: <http://www.faa.gov/nextgen/flashmap> . Various ADS-B based applications and services were introduced. By 2015, FAA plans to integrate ADS-B surveillance data in the Advanced Technologies and Oceanic Procedures (ATOP) automation platform to support ATC separation services in oceanic airspace for which the U.S. is responsible.

SIC assignments in India

3.4.117 India informed the meeting about the addressing scheme of Surveillance Exchange for India controlled Surveillance Infrastructure. The information provided by India on the assigned system identification code (SIC) will be reflected in the next consolidated amendment to the regional supplement document. States were encouraged to provide such information to the ICAO Regional Office for updates.

Low Altitude VFR Surveillance System

3.4.118 The Republic of Korea introduced their plans and activities concerning the Korean government's low altitude VFR aircraft surveillance system - en-route radar substitute system. The meeting was informed about the steady increase of VFR flights in the ROK including light and ultra-light aircraft for various purposes that fly low altitude. Approximately 236 aircrafts are expected to register and operate by September 2012. In order to achieve a secure operation of the VFR aircraft, Korea established mid-and long-term plans to remove blind zones for VHF Radio communications in the low altitude sections and to build up a proper surveillance system.

3.4.119 IATA expressed concerns about infrastructure and avionics cost involved for providing such service to GA type aircraft and the impact on the performance of air traffic controllers.

Review of Regional Surveillance Strategy

3.4.120 The meeting reviewed the regional Surveillance Strategy for Asia/Pacific Region which was last updated by the ADS-B SITF/9, CNS/MET SG/14 and adopted by APANPIRG/21 in 2010 through Conclusion 21/41. The meeting endorsed a recommendation from USA for removal of "ACAS acts as situational awareness tool and last resort for safety conflict resolution" from consideration part and a recommendation from China for adding "SMR" into the items for consideration part i.e. "multilateration is a technology that can supplement SSR, ADS-B and SMR". Accordingly the meeting adopted following Conclusion:

Conclusion 23/35 – Surveillance Strategy for the Asia/Pacific Region

That, the revised surveillance strategy for the Asia/Pacific Region provided in the **Appendix K** to the Report on agenda item 3.4 be adopted.

Aeronautical electromagnetic spectrum utilization

WRC – 2012 Outcome and WRC-15 Agenda Items

3.4.121 ITU World Radio communication Conference – 2012 (WRC-12) was held in Geneva, Switzerland from 23 January to 17 February, 2012. The meeting noted the preparations for WRC-12 at regional level and the outcome of the WRC-12. A consolidated analysis of WRC-12 outcome is provided at **Appendix L** to the Report on agenda item 3.4. CNS/MET Sub-group agreed that the WRC-12 outcome, particularly on Agenda Items of critical interest to civil aviation were generally in line with the ICAO Position. WRC-15 Agenda Items of significant interest to civil aviation were briefly discussed and it was informed that ICAO Position on WRC-15 Agenda Item of critical interest to civil aviation will be developed by December 2012. Of considerable interest to civil aviation will be the Agenda Items relating to Wireless Avionics Intra-Communication (WAIC), use of FSS spectrum for UAS and sharing of aviation bands with other applications.

3.4.122 The meeting urged States to actively participate in all the national and regional level meetings to defend ICAO position on WRC-15 Agenda Items and support ICAO efforts in the protection of aeronautical allocations at the WRC-15. Like for earlier WRCs, States were requested to nominate/re-confirm contact focal points for WRC-15 in their administrations, and following Conclusion was adopted:

Conclusion 23/36 – Nomination of Contact Focal Point

That, States be urged to nominate/reconfirm Contact Focal Points for WRC-15 and inform ICAO APAC Office about their contact details.

3.4.123 Australia while reviewing the outcome of WRC-12 commented that ‘Agenda items were resolved in a manner that either increased the ability of aviation to use spectrum, or protected existing use’. The meeting was informed about WRC-15 agenda items that will be of specific interest to Australia. The meeting noted that the 1st APG WRC-15 meeting is planned in Viet Nam in the second week of September, 2012

3.4.124 Many States and IATA appreciated the criticality of protecting spectrum to support growth of aviation and informed that the IATA has a dedicated team to support in this area. New Zealand noted that both New Zealand and Australia had established Aviation Spectrum Groups to involve the aviation industry in the preparation for World Radio Conferences. The New Zealand ASG included representatives from the CAA, ANSPs, airlines and the defence force, the radio regulator attended as an observer. The involvement of industry in WRC preparation was found very beneficial. In view of the foregoing, the meeting adopted following Conclusion:

Conclusion 23/37 - Preparations for WRC-15

That,

- a) States consider national and international requirements for aeronautical services identified in the WRC-15 Agenda and develop national positions in line with ICAO Position to ensure the availability and protection of spectrum for aviation use;
- b) States actively participate and support WRC-15 aeronautical spectrum issues in national and international meetings including APT Preparatory Group for WRC-15, ITU-R Working Party 5B and JTG 4-5-6-7; and
- c) States be encouraged to establish consultative groups of aviation industry participants to assist in the preparations for WRC-15 as appropriate.

ICAO Spectrum Strategic Objectives

3.4.125 The meeting noted the draft ICAO Spectrum Strategic Objectives which were being developed by ACP Working Group F and are likely to be completed in September 2012. These Strategic Objectives address, for each frequency band used by aviation, the medium and long term requirements to support CNS systems within a timescale of 25 to 30 years. Draft ICAO Spectrum Strategic Objectives and updated ICAO Policy Statements are provided in **Appendix M** to the Report on agenda item 3.4. Considering that substantial change has been incorporated in the Handbook on radio frequency requirements for civil aviation (Doc 9718), the meeting agreed with a proposal to organize a SIP workshop to share information on the related developments and adopted following Conclusion:

Conclusion 23/38 – A SIP Workshop on Radio Spectrum Management

That, a Special Implementation Programme (SIP) Workshop on radio spectrum management including revision to the overall ICAO Spectrum Policy and relevant frequency assignment planning criteria be organized in the Asia/Pacific Region.

Comprehensive Revision of Radio Frequency Handbook (Doc 9718) Volume I

3.4.126 Draft amendments to ICAO *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation* (Doc 9718) Volume I resulting from a review of the ITU WRC-12 outcome was presented to the meeting and it was informed that ICAO Position on WRC-15 will be included after it has been finalized.

Radio Frequency Handbook (Doc 9718) Volume II

3.4.127 Information about the proposed Volume II of the *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation* (Doc 9718) was provided to the meeting. The new Volume II provides information on the detailed frequency assignment planning criteria for VHF air/ground communication systems and the approval procedures. Most of the guidance material currently included in Annex 10 will be shifted to the Handbook, Volume II and this Handbook will bring in a single publication, the spectrum management and frequency management aspects of use of aeronautical frequency bands. The updated frequency assignment planning criteria is placed at **Appendix N** to the Report on agenda item 3.4 for review.

World Area Forecast System (WAFS)

WAFS implementation

3.4.128 The meeting was apprised of updates to the WAFS service reference document that reflected the transition from ISCS-G2 to WIFS and the re-prioritization of GRIB2 over GRIB1, with a note that the WAFS service reference document does not have official status under WAFSOPSG/SADISOPSG or WIFS guidance documentation from USA and, therefore, in the case of differences between documents, official WAFSOPSG/SADISOPSG or WIFS documentation will take precedence.

3.4.129 Results from a survey of the Asia/Pacific region on the operational use of WAFS were provided to the meeting and are contained in **Appendix O** to the Report on agenda item 3.4. A working paper summarizing the results, with regards Secure SADIS FTP download speed, was submitted to SADISOPSG/17 (29 to 31 May 2012) and, recognizing the increasing number of users of Secure SADIS FTP, the SADISOPSG requested a feasibility study be conducted into increasing the allocated bandwidth of the Secure SADIS FTP Service (SADISOPSG Conclusion 17/23 refers).

3.4.130 Information on the review of the Work Plan of the WAFS/I TF, including the terms of reference (TOR) and composition, is provided later in this Report under “*MET Sub-group and Task Forces*”.

3.4.131 The meeting was advised of a number of issues concerning WAFS forecasts from WAFS London and WAFS Washington that were raised through user feedback, and that relevant guidance on interpretation and visualization of the harmonized gridded forecasts of Cumulonimbus cloud, icing and turbulence potential, and on the threshold values to be adopted, will be based on the outcomes of WAFSOPSG Conclusion 6/15.

3.4.132 The meeting was apprised of a number of WAFS-related actions that have been completed since WAFSOPSG/6 (March 2011) including implementation of a new SIGWX Production Platform at WAFS London, availability of harmonized WAFS CB cloud, icing and turbulence forecasts in GRIB2 format, cessation of ISCS-G2, prioritization of GRIB2 above the GRIB1 WAFS Aviation Forecasts, WAFS backup tests and criteria specified for access to Internet based services (SADIS FTP/Secure SADIS FTP/WIFS).

3.4.133 In light of the recent prioritization of GRIB2 above GRIB1 (WAFSOPSG Conclusion 6/10 refers) plus the higher spatial and temporal resolution of GRIB2 (in accordance with Annex 3 appendix 2, 1.2) noting that GRIB 1 WAFS forecasts no longer fulfill the Annex 3 requirements in terms of temporal and spatial resolution whereas the GRIB 2 WAFS forecasts do and, furthermore, that WAFSOPSG has already indicated that GRIB 1 will be withdrawn in November 2013, APANPIRG/23 adopted the following Conclusion:

Conclusion 23/39 – User readiness for transition from GRIB1 to GRIB2 code form WAFS forecasts

That, ICAO urges States/users of WAFS forecasts in the ASIA/PAC Region to accelerate preparations for transition from WMO GRIB1 to GRIB2 WAFS forecasts if not already done so.

SADIS

3.4.134 The meeting learned that cessation of the SADIS FTP service will occur on 30th November 2012 in accordance with SADISOPSG Conclusion 23/15, and therefore it is of urgent importance that those users who take the SADIS FTP service formally register for Secure SADIS FTP accounts, if not already done so, and to ensure that their systems are ready for Secure SADIS FTP before cessation of the SADIS FTP service, and that the application of backup/contingency WIFS accounts was also encouraged.

WIFS

3.4.135 The meeting learned that since May 2010, the United States, as the WIFS Provider State, has made available to States the WIFS to access WAFS products and OPMET data as the replacement service to the satellite broadcast service known as the International Satellite Communication System (ISCS). Furthermore, all users that require access to the WAFS Products and OPMET data hosted on WIFS must register for an account, and be approved. Of the 20 former ISCS User States in the ASIA/PAC Region, 17 have registered for one or more WIFS accounts and 3 have declined.

3.4.136 The meeting was apprised that, in light of WAFSOPSG/6 Conclusion 6/4, the ASIA/PAC FASID Table MET 6 was introduced to list the primary Internet-Based service in the ASIA/PAC Region for WAFS Forecasts (SADIS FTP/WIFS or both) and furthermore that subsequent feedback from users concerned the non-requirement for WIFS access (e.g., French territories, Japan and Viet Nam). Therefore APANPIRG/23 adopted the following Conclusion:

Conclusion 23/40 – Update to the ASIA/PAC FASID Table MET 6

That, the ASIA/PAC FASID Table MET 6 be amended to reflect the requirements provided by States for primary Internet-Based service for WAFS Forecasts as provided in **Appendix P** to the Report on agenda item 3.4.

Gridded forecasts (icing, turbulence and CB) and visualization

3.4.137 Information was provided on the Hong Kong, China study of the performance of WAFS gridded forecasts of CAT potential over the Hong Kong Flight Information Region (Hong Kong FIR) during the 7 months period (29 November 2011 to 30 May 2012) immediately after harmonization using special air-reports, which concluded with a number of issues that were being addressed by WAFSOPSG/6 Conclusions 6/15a and 6/15b.

Regional Implementation of International Airways Volcano Watch (IAVW)

Darwin VAAC

3.4.138 The meeting was presented with information on progress by the Darwin Volcanic Ash Advisory Centre (VAAC) on the implementation of the International Airways Volcano Watch in the region, through ongoing engagement with volcano observatories, meteorological agencies, airlines and the scientific community.

3.4.139 Notably, significant progress was made by Darwin VAAC with regards the provision of operational backup services with both Tokyo VAAC and Wellington VAAC. Upcoming developments include transition to primary backup from Tokyo VAAC for the area north of latitude 20°S and primary backup from Wellington VAAC for the area south of latitude 20°S.

3.4.140 The meeting was advised that a test of the backup arrangement conducted with Tokyo VAAC on 18th January 2012 identified a number of operationally significant matters (OPMET/M TF/10 WP/13 refers) and follow-up testing is scheduled for September 2012. The Darwin – Tokyo VAAC backup test procedures are given in **Appendix Q** to the Report on agenda item 3.4 (and were updated during APANPIRG based on information provided by States prior to the meeting). The backup procedures now need to be extended to include Wellington VAAC and, in light of the discussion above, APANPIRG/23 adopted the following Conclusion:

Conclusion 23/41 –VAAC Backup Procedures in the ASIA/PAC Region

That, Australia, Japan and New Zealand considers the further development of:

- a) VAAC Backup Procedures in the Asia-Pacific Region, as given at **Appendix Q** to the Report on agenda item 3.4, in order to include Tokyo, Wellington and Darwin VAACs; and
- b) Procedures for VAAC Backup Tests between Tokyo, Wellington and Darwin VAACs for inclusion in the Asia/Pacific Regional SIGMET Guide.

IVATF

3.4.141 The meeting was informed of a number of recommendations that have emerged from the International Volcanic Ash Task Force (IVATF) that include:

- a) IVATF/4 Recommendation 4/9: Concerning volcanic ash observations and the communication channels between VAACs and States with active volcanoes;
- b) IVATF/4 Recommendation 4/15: Concerning the Air Traffic Management Volcanic Ash Contingency Plan template and its use in preparing regional volcanic ash contingency plans; and
- c) IVATF/4 Recommendation 4/24: Concerning the roles of VAA, VA SIGMET and NOTAM in relation to the IAVW.

Regional Implementation of International Tropical Cyclone Watch (ITCW)Implementation of Tropical Cyclone Advisories in Graphical Format

3.4.142 The meeting was reminded of the recommendation to provide graphical advisories on Tropical Cyclone (TCG) from Tropical Cyclone Advisory Centres (TCACs), as introduced in Amendment 75 to Annex 3 that became applicable 18 November 2010 (Annex 3, Appendix 2, 5.1.3 refers).

3.4.143 The meeting was also advised on the limited status of implementation of TCG, as reported at the SADISOPSG/17 in Cairo, May 2012, and, that recognizing the availability of TCG from the TCACs is considered desirable in the interest of safety, regularity or efficiency of international air navigation, the (SADISOPSG) Secretariat intends to bring these matters to the attention of the WMO Seventh Tropical Cyclone RSMC/TCWC Technical Coordination Meeting to be held in Indonesia in November 2012.

Meteorological advisories and warningsReview of METWARN/I TF/2 meeting

3.4.144 The meeting was provided with outcomes from the second meeting of the Meteorological Advisories and Warnings Implementation Task Force (METWARN/I TF/2) that was held in Bangkok, Thailand, from 19-20 April 2012 and overlapped with the tenth meeting of the OPMET Management Task Force (OPMET/M TF/10) on 19 April to review SIGMET issues (the full report may be accessed at the following website: <http://www.bangkok.icao.int/cns/meeting.do>)

3.4.145 Information on the review of the Work Plan of the METWARN/I TF, including the terms of reference (TOR) and composition is provided later in this Report under “*MET Sub-group and Task Forces*”.

Framework on Regional Contingency Plans

3.4.146 The meeting was provided with updates on the progress of the METWARN/I TF to develop a framework of regional contingency plan for weather phenomenon that includes volcanic ash, tropical cyclone, radioactive cloud and tsunami, which may be included as a major component of the regional ATM contingency plan being developed by the RACP/TF. Furthermore, the link between the METWARN/I TF and RACP/TF will be consolidated through liaison between the Secretariat and the development of a working paper for the RACP/TF/2 in March 2013.

Review SIGMET tests

3.4.147 The meeting was apprised of the results of SIGMET tests that were conducted on the 8th, 15th and 22nd November 2011 at 0200 UTC and follow-up action being led by the OPMET/M and METWARN/I TFs.

3.4.148 There was increased State and Meteorological Watch Office (MWO) participation in the 2011 SIGMET tests, as well as an increase in the number of SIGMETs issued, compared to the previous tests. Furthermore, all five Regional OPMET Databanks (RODBs) in the Region: Bangkok, Brisbane, Tokyo, Singapore and Nadi participated in the tests.

3.4.149 In total, 7 States (Afghanistan, Bangladesh, Nauru, Nepal, Papua New Guinea, Solomon Islands and Sri Lanka) have not participated in any of the SIGMET tests conducted. One of the non-participating States, Papua New Guinea, has responsibility for SIGMET issuance on behalf of Nauru and the Solomon Islands. Additional SIGMET monitoring was scheduled for 6 States, which will provide information with regards the issuance of, or lack of, SIGMET in States under concern.

3.4.150 The test results showed that a significant proportion of the errors recorded in the tests were formatting errors attributed to Australia and the CNS/MET SG noted that work is underway to implement remedies for the test errors. Furthermore, States are advised of SIGMET test errors via ICAO State Letter for awareness and remedial action.

3.4.151 The meeting was advised that the CNS/MET SG/16 noted that in light of the tactical nature of SIGMET information, which is far below the resolution capable by current global modeling techniques, the meeting noted that for the foreseeable future the local capability for the issuance of SIGMET would remain a cornerstone of the quality systems of MET providers which must be implemented by States under the Annex 3 provisions for QMS, applicable from November 2012.

Guidance for radioactive material

3.4.152 The meeting was informed that the Asia/Pacific regional SIGMET Guide was amended in July 2011 to include an example of SIGMET on radioactive cloud (SIGMET Guide, Appendix G).

3.4.153 The meeting was also informed that IAVWOPSG/6 (September 2011) requested ad-hoc groups to continue with tasks identified to address the key issues concerning the importance, complexity and lack of expertise on radioactive clouds (IAVWOPSG Conclusion 6/29 and Conclusion 6/30 refer). Consequently the further development of regional guidance material for the issuance of RDOACT CLD SIGMET will depend on the outcomes from the IAVWOPSG/7 meeting, in Bangkok in March 2013, which will review the work of the ad-hoc groups discussed above.

Review METWSG SIGMET advisory trial

3.4.154 The meeting was provided with information on the results and evaluation of the SIGMET advisory trial in Asia designated by the Meteorological Warnings Study Group (METWSG) and conducted by China between 4th May and 30th July 2010.

3.4.155 The meeting also learned that results and evaluation of the trial were previously presented by China to METWSG/4, in Montréal from 15 to 18 May 2012, which took into consideration the issuance of SIGMET advisory information from selected regional centres in the global trial in its deliberations on how to proceed with improving SIGMET including formulation of the action to develop a final proposal for endorsement by the MET Divisional Meeting, by 15 March 2013, on SIGMET implementation.

3.4.156 The meeting was also informed that China put significant effort into conducting the SIGMET advisory trial with the aim of improving SIGMET issuance in the region; the trial showed there were some improvements in SIGMET issuance, which generally supported the establishment of regional SIGMET advisory centres; and IATA supported the concept of Regional Advisory Centres (in support of SIGMET) as being evaluated by METWSG.

Review SIGMET Guide

3.4.157 The meeting was advised that the review of regional SIGMET Guides by METWSG/4 (May 2012) noted several inconsistencies between regional SIGMET Guides and agreed that a comprehensive review of all regional SIGMET Guides should be carried out noting that these guides generally contained generic information (which would not vary regionally) and specific information pertaining to the communications and other needs of each region. The OPMET/M TF will monitor the progress of METWSG with regards the global review of SIGMET Guides.

Implementation of the issuance of OPMET (TAF, METAR, SPECI) ExchangesOPMET Management Task Force Report

3.4.158 The meeting was provided with outcomes from the Tenth Meeting of the OPMET Management Task Force (OPMET/M TF/10) that was held in Bangkok, Thailand, from 17 to 19 April 2012 and overlapped with the Second Meeting of the Meteorological Advisories and Warnings Implementation Task Force (METWARN/I TF/2) on 19 April to review SIGMET issues (the full report may be accessed at the following website: <http://www.bangkok.icao.int/cns/meeting.do>).

3.4.159 Information on the review of the Work Plan of the OPMET/M TF, including the terms of reference (TOR) and composition is provided later in this report under “*MET Sub-group and Task Forces*”.

IATA OPMET Data Monitoring

3.4.160 The meeting was apprised of the results of IATA monitoring of the SADIS/WIFS broadcast over a period of 9 weeks (ending 4th July 2012) for AOP Aerodromes in the ASIA/PAC region that showed 90.4% issued METAR (SA) and 94.3% issued TAF (FT) and for Non-AOP aerodromes in the ASIA/PAC region showed that 83.5% issue METAR (SA) and 96.5% issue TAF (FT).

3.4.161 In light of the increasing use of Non-AOP Aerodromes by international operators (e.g., Non-AOP Aerodromes are widely used as en-route alternates and for EDTO operation), IATA requested (at CNS/MET SG/16) that all available OPMET data (AOP and non-AOP) be distributed including METAR and TAF for Non-AOP aerodromes if available.

3.4.162 Furthermore (at CNS/MET SG/16) IATA reported some cases (1 AOP and 3 Non-AOP Aerodromes) in the ASIA/PAC Region where more than one type of TAF was available, noting that meteorological offices, when issuing TAF, shall ensure that not more than one TAF is valid at an aerodrome at any given time (Annex 3, 6.2.7 refers).

3.4.163 In light of the information provided above, and noting IATA requests for the improved availability of OPMET data for Non-AOP aerodromes, APANPIRG/23 adopted the following Conclusion:

Conclusion 23/42 - Improvement of OPMET Data Availability

That, the ICAO Secretariat, with the assistance of the OPMET/M TF, be invited to:

- a) continue the efforts to improve the availability (IATA requires at least 95% for AOP and 90% for non-AOP Aerodromes listed in the FASID), timeliness and regularity of OPMET data at the RODBs, SADIS and WIFS, through regular monitoring and testing; and

- b) remind States concerned to ensure not more than one TAF is valid at an aerodrome at any given time (in accordance with Annex 3 – *Meteorological Service for International Air Navigation*, 6.2.7), and transmitted internationally as per ICAO provisions for services in support of flight planning.

3.4.164 IATA monitoring showed that OPMET data is available on SADIS/WIFS broadcasts for some aerodromes in the ASIA/PAC Region which are not listed in the FASID Table MET 2A and, as Non-AOP Aerodromes are widely used as en-route alternates, emergency airports and for EDTO operation, IATA (at CNS/MET SG/16) advised that OPMET data for these aerodromes are important and should be available to all airlines.

3.4.165 IATA monitoring of METAR from the ASIA/PAC Region showed that the majority of METARs are received at the end users environment within 12 minutes after observations.

3.4.166 IATA monitoring of TAF from the ASIA/PAC Region showed that many TAF were received either hours in advance or in some cases sometime after commencement of the effective validity time. The requirement for IATA is that TAF should be prepared not later than one hour before it becomes effective and that it should be distributed not later than 25 minutes before it becomes effective (note: Annex 3 provisions recommend that TAF should be filed for transmission at least one hour before the commencement of their period of validity, unless otherwise determined by regional air navigation agreement; and Regional ANP provisions state that the filing time of the TAF bulletins should be one hour before the start of the period of validity). In light of the information above APANPIRG/23 adopted the following Conclusion:

Conclusion 23/43 - Improvement of Timeliness, Regularity and Availability of OPMET

That, ICAO urges the States in the ASIA/PAC Region to:

- a) note the proposed Amendment 76 Annex 3 provision (intended applicability in November 2013) that will require an aerodrome forecast in the TAF code form to be issued not earlier than one hour prior to the beginning of its validity period;
- b) note that IATA expressed its requirement for international exchange of aerodrome forecasts to be completed no later than 30 minutes before the commencement of the period of validity *;
- c) continue efforts for standardized procedures for the issuance of OPMET data;
- d) consider the details provided in the IATA monitoring for the ASIA/PAC Region; and
- e) improve the issuance of OPMET data with respect to timeliness, regularity and availability.

* ICAO to consider the requirements expressed by IATA and amends the global provisions as necessary.

3.4.167 IATA monitoring of the OPMET exchange showed some deficiencies in the application of the Standards and Recommended Practices described in ICAO Annex 3 that have persisted for some time and the number of incorrect OPMET data messages has increased. In light of the IATA monitoring, APANPIRG/23 adopted the following Conclusion:

Conclusion 23/44 - Improvement of OPMET data format

That, ICAO remind the States in the Asia Pacific Region of the:

- a) Standards and Recommended Practices in Annex 3 – *Meteorological Service for International Air Navigation* concerning provision of operational meteorological information; and
- b) Annex 3 provisions concerning the quality management of meteorological information to be supplied to users that includes verification and validation procedures to be applied for the exchange of meteorological information for operational purposes, such as OPMET information.

ROBEX Handbook and ICD Updates

3.4.168 The meeting was informed that OPMET/M TF/10 (April 2012) adopted updates to the ROBEX Handbook and ICD for the 2012 amendment and (OPMET/M TF/10) requested States to review the ROBEX Handbook (Table A and B) with regards the METAR/TAF availability at aerodromes where 24/7 service is not provided and to inform the ICAO Regional Office of necessary updates. Additional updates to the ROBEX Handbook were provided directly by States.

Review of regional procedures contained in the ANP/FASIDReview MET part of Basic ANP and FASID

3.4.169 The meeting was informed of the Proposal for Amendment (PfA) of Basic ANP (AP11-03) and FASID (AP11-04) that were revised and re-approved during 2011/12 (State Letters APAC 11/3-MET:AP069/12 & 11/4-MET:AP046/12 refer).

3.4.170 The meeting was also advised about updates to clearly specify the criteria for the access to the Internet-based services in light of the global coverage of the public Internet introduced as FASID Table MET 6, which lists the primary Internet-based service (SADIS FTP and/or WIFS) from which States/users in the ASIA/PAC Region should obtain WAFS forecasts (WAFSOPSG Conclusion 6/2 refers). These updates were implemented in PfA AP12/4-MET/Basic ANP and AP12/9-MET/FASID (State Letters APAC 12/4-MET:AP071/12 & 12/9-MET:AP072/12 refer).

3.4.171 Additional updates to the FASID were adopted by OPMET/M TF/10 (April 2012) and are subject to a PfA, which is under preparation in the Regional Office for subsequent review and approval.

3.4.172 With reference to APANPIRG Conclusion 21/10, information was provided to inform the meeting that the ICAO Secretariat representing MET, ATM, IIM and SAST within the ANB considered the transfer of FASID Table ATS 2 (HF radiotelephony VOLMET broadcasts) from ATS to MET and came to the view that it is undesirable at the present time to implement such a move for reasons that include the fact that FASID Table ATS 2 contains, in addition to requirements for MET, information that resides more firmly in the arenas of ATS or CNS/ATM. Furthermore, the proposed move (APANPIRG Conclusion 21/10) would have significant implications on resources as it is currently not in the scope of activities planned for the migration of the paper-based ANP environment to the eANP environment, which makes it impractical at the present time. Notwithstanding this view, as the eANP is launched and further matures, offering customizable views and dynamic interactions with all FASID Tables, it may be necessary to review the above considerations at a later stage. However, it should be noted that the ATS and CNS/ATM aspects noted above that are beyond the remit of MET would likely still apply in the eANP era.

MET support to ATM

Review MET/ATM Task Force

3.4.173 The meeting was reminded that the Second meeting of the Asia/Pacific MET/ATM Task force (MET/ATM TF/2) was held in Fukuoka, Japan from 27-28 January 2011 in conjunction with the ICAO/WMO joint APAC MET/ATM Seminar, from 24-26 January 2011. Furthermore, the MET/ATM TF/2 meeting and Seminar were the latest activities of the MET/ATM TF and the position of Chair, which was held by Australia, is now vacant and should be decided by the group at or before the next MET/ATM meeting.

3.4.174 The meeting was reminded that the TOR of the MET/ATM TF included a link with the METWARN/I TF for coordination on a framework for contingency plans for specific phenomenon including volcanic ash, radioactive cloud, tropical cyclone and Tsunami. Furthermore, in relation to the global problem of providing optimal volcanic ash information, the recent METWARN/I TF/2 meeting (April 2012) agreed that the establishment of detailed user requirements in the Asia/Pacific regions should be a priority of the MET/ATM TF.

3.4.175 Information on the review of the Work Plan of the MET/ATM TF, including the Terms of Reference (ToR) and composition, is provided later in this report under “*MET Sub-group and Task Forces*”.

Other MET issues (e.g. QMS, Competency & Training)

Quality Management

3.4.176 The meeting was reminded of the Amendment 75 to Annex 3 that requires the implementation of quality management systems for meteorological information and becomes applicable from 15 November 2012 and that, in order to facilitate States with the implementation of the Annex 3 quality management provisions, guidance on the implementation of quality systems is provided in the form of ICAO Doc. 9873 – *Manual on the Quality Management System for the provision of Meteorological Service for International Air Navigation* (also WMO-No. 1001 – *Guide to the Quality Management System for the Provision of Meteorological Services for International Air Navigation*) and a new WMO guide titled ‘*A Practical Guide for the Implementation of a Quality Management System for National Meteorological and Hydrological Services*’.

3.4.177 Furthermore, an Australian-hosted WMO website provides a resource for information on quality management systems for meteorological service providers at: http://www.bom.gov.au/wmo/quality_management.shtml. Additionally, a COMET online training module titled ‘*Quality Management Systems: Implementation in Meteorological Services*’ provides a one-hour overview of the key concepts, benefits and principles of an effective quality management system based on the ISO 9001:2008 quality management standard and is available on the MetEd website: https://www.meted.ucar.edu/training_module.php?id=869.

3.4.178 The meeting was advised that a significant amount of work had been conducted by the WMO in establishing quality management (QM) principles around the globe, including the capacity building work for quality systems conducted in conjunction with the Australian Bureau of Meteorology.

3.4.179 In light of the approaching applicability of the Annex 3 quality management system requirement, and the notably high proportion of States in the Asia/Pacific Region that were yet to implement quality systems for aeronautical meteorological service, the meeting adopted following Conclusion:

Conclusion 23/45 - Implementation of Quality Management Systems for Meteorological Service Provision

That ICAO, in coordination with the World Meteorological Organization (WMO), considers urgent strategies to foster the implementation of quality management systems for meteorological service amongst States in the Asia/Pacific Region in light of the ICAO Annex 3 – *Meteorological Service for International Air Navigation* requirement applicable 15 November 2012.

MET Sub-group and Task Forces

3.4.180 The meeting was reminded that MET Task Forces were established to foster cooperation between States on specific tasks to develop, manage or implement processes, procedures or systems to improve the meteorological service to international civil air navigation. Those four (4) MET Task Forces were:

- a) OPMET Management Task Force (OPMET/M TF);
- b) WAFS Implementation Task Force (WAFS/I TF);
- c) Meteorological Advisories and Warnings Implementation Task Force (METWARN/I TF); and
- d) Meteorology / Air Traffic Management Task Force (MET/ATM TF).

3.4.181 Furthermore, a task force, once established, should operate in a task orientated approach, with a clear work plan, objective(s) and milestone(s), taking into account the Agreed Actions from APANPIRG and its Sub-groups (relating to MET).

3.4.182 The meeting was advised of the noting by CNS/MET SG/16 that some important tasks or activities (MET related) are currently not specified in the MET Task Force structure, including space weather, quality management, qualification and competency assessment, aerodrome climatologies and implementation of the Aviation System Block Upgrades (ASBUs).

3.4.183 An ad-hoc break-out group at the CNS/MET SG/16 Meeting, comprising Australia (facilitator), China, Hong Kong-China, USA, UK, Japan, Thailand, New Zealand, IATA, WMO and the ICAO Secretariat, was delegated to formulate a revised MET SG structure that would:

- a) retain the OPMET/M TF as a key MET SG Task Force;
- b) consider how best to streamline the other MET SG tasks related to gathering user requirements and implementation of aviation meteorological services within the Asia/Pacific Region;
- c) identify activities in other APANPIRG Sub-groups or Task Forces that would benefit from MET input and collaboration; and
- d) develop a framework to address any tasks and activities related to aeronautical meteorology.

3.4.184

A summary of the break-out group discussions follows:

- all tasks of the existing four Task Forces, plus other issues concerned with quality management, ASBUs, space weather, competencies and training, should be managed as defined tasks for completion within a specified timeframe;
- due to the ongoing monitoring and testing role, the OPMET/M TF should be migrated from Task Force to Working Group – and renamed the ROBEX Working Group;
- with regards to WAFS, the following tasks were considered as a priority:
 - i) facilitate the migration from GRIB1 to GRIB2 WAFS data in the ASIA/PAC Region by November 2013;
 - ii) facilitate the implementation and utilization of gridded forecasts of CB, icing and turbulence in the ASIA/PAC Regions; and
 - iii) establish training requirements in WAFS products in the ASIA/PAC Region and provide this information to the WAFSOPSG and SADISOPSG;
- with regards to MET requirements for ATM, the following tasks were considered as a priority:
 - i) assess the current meteorological services, systems and architecture in the ASIA/PAC Region and determine/recommend improvements to ensure that meteorological information can be integrated into decision support tools for ATM and flight operations; and
 - ii) Utilizing work from the IAWWOPSG, establish detailed user requirements for the ASIA/PAC Region to ensure the provision of optimal volcanic ash information from the VAACs to meet the need of ATM and flight operations;
- with regards MET advisory and warning information, the following tasks were considered as a priority:
 - i) monitor current deficiencies (including those arising from the RODB WG) and provide assistance States to remove the deficiencies, e.g., SIGMET, Aerodrome Warnings, Wind Shear Warnings;
 - ii) provide (ASIA/PAC) regional specific information to METWSG for input into the global review of SIGMET Guides; and
 - iii) contribute to regional contingency plans through the RACP/TF for specific phenomenon, including volcanic ash, radioactive cloud, tropical cyclones and tsunami;
- with regards to other issues, quality management and competencies and training are effectively handled by WMO; the MET requirements for ASBUs coincide with the tasks mentioned above; and the space weather issues are being handled by IAWWOPSG (which is developing a concept of operations, so it would be premature to assign a specific task in this regard at this stage).

3.4.185 The meeting was advised that, as a result of the above, CNS/MET SG/16 decided that the existing Task Force chairs would provide the Secretariat with updated PFF, TOR and Work Plans for the following groups based on the existing Task Forces:

- ROBEX Working Group;
- WAFS Task Force;
- MET Requirements (MET/R) Task Force; and
- Hazardous Weather (HW) Task Force.

Updated CNS/ATM Implementation and Planning Matrix

3.4.186 The meeting reviewed and updated the CNS/ATM Implementation and Planning Matrix. It was noted that the CNS/ATM Implementation Planning Matrix has since been updated regularly. CNS/ATM Implementation Matrix reflects the status of implementation of major CNS/ATM elements in the region which includes ATN, AIDC, CPDLC, GNSS, ADS-C and ADS-B. The updated Matrix is provided in **Appendix R** to the Report on agenda item 3.4.

Working arrangement for CNS and MET Sub-groups in 2013

3.4.187 The meeting reviewed the new Terms of Reference (TOR) approved by the APANPIRG/22 for the CNS and MET Sub-groups. The CNS/MET SG/16 Meeting noted new structure of APANPIRG contributory bodies as approved by APANPIRG/22. The new structure and the approved TORs for the APANPIRG Sub-groups will become effective from 2013 meeting year and will be subject to further review in 2016.

3.4.188 The meeting reviewed the Subject and Tasks List for CNS and MET Sub-groups and adopted following Decision.

Decision 23/46 - Subjects and Task Lists for CNS and MET Sub-groups

That, the list of Subjects/Tasks for CNS Sub-group provided in the **Appendix S** and list of Subjects/Tasks for MET Sub-group provided in the **Appendix T** to the Report on agenda item 3.4 be adopted.

Consideration on election of chairpersons for the CNS and MET Sub-groups

3.4.189 The Chairman of CNS/MET SG presented a paper to CNS/MET SG/16 Meeting on the consideration for election of chairpersons for the CNS and MET Sub-groups. In addition to some required personal characteristics of chairpersons, he highlighted primary role of the Chairperson and identified following main functions:

- In conjunction with the members and the Secretary, decide the date and duration of the subgroup meetings.
- Support the Secretary in establishing the agenda of meetings.
- Report the activities of the subgroup to APANPIRG. Associated within this is assisting the Secretary in the preparation of meeting reports and attendance at APANPIRG Meeting to present the report of the subgroup.
- Coordinate the activities of the subgroup with the work programs of other contributory bodies. This is normally achieved by correspondence and an annual meeting of subgroup chairpersons immediately prior to the APANPIRG Meeting.

System Wide Information Management (SWIM) and NextGen

3.4.190 The meeting noted a number of key points which were raised in the ACP WG-I meeting regarding SWIM and issues which were included in the paper from USA on NextGen.

XML based OPMET Traffic over AMHS

3.4.191 USA presented a paper to CNS/MET SG/16 which discussed the transit of Extensible Markup Language (XML)-based OPMET messages over Air Traffic Message Handling System (AMHS), and by extension, over Aeronautical Fixed Telecommunication Network (AFTN). It was concluded that the use of current AFTN and AMHS messaging systems for the exchange of XML-based OPMET data, although not without issues, is clearly a feasible endeavor. It was also recommended that the OPMET data user community provide operational requirements, including message length and frequency, to the Asia/Pacific Aeronautical Telecommunication Network Implementation Planning Group (ATNICG) for implementation planning.

3.4.192 The meeting noted that the FAA had completed the XML over AMHS testing with Civil Aviation Authority (CAA) of Hong Kong, China and CAA of Singapore. The FAA, the United Kingdom's National Air Traffic Services (NATS), and CAA of Singapore, as requested by ICAO Regional Office, have planned to carry out a test to distribute XML based OPMET message over operational AMHS. The test is planned for September 2012. Singapore informed the meeting that the AMHS service with United Kingdom has been put into operation since March 2012.

ICAO Assistance in procurement of Aviation equipment

3.4.193 The meeting was provided insights into the ICAO Technical Co-operation Bureau's Procurement process and its role to support the projects initiated and administered by the Technical Co-operation Program in assisting Member States to implement ICAO Standards and Recommended Practices (SARPS). The ICAO TCB Procurement Quality Assurance Process is ISO 9001:2008 certified.

3.4.194 Taking into cognizance the benefits to States/Administrations derived from using ICAO's Procurement Services which include cost-effective procurement solutions while guaranteeing strict neutrality, objectivity and transparency and at the same time promoting compliance to ICAO SARPs, the meeting adopted following Conclusion:

Conclusion 23/47 –Benefits of using ICAO Procurement Services

That, the States/Administrations in the ASIA/PAC Region be encouraged to consider utilizing ICAO's Civil Aviation Purchasing Service in their procurement of civil aviation equipment and services.

Space Weather

3.4.195 While introducing the definition of Space Weather, Australia highlighted that space weather events impact aviation operations by degrading communications, navigation and surveillance (CNS) services and solar radiation can be detrimental to the health of crews and passengers. It was considered that the space weather information function should be appropriately covered as a multidiscipline approach at the regional level. While recommending ICAO to address this matter at global level, the meeting considered that CNS and MET Sub-groups should review the impact of space weather in their respective areas. Accordingly, the meeting agreed to formulate following decision:

Decision 23/48 – Aspect of Space Weather

That, CNS and MET SGs review the impact of space weather in the CNS and MET area and report to APANPIRG.

Note of appreciation

3.4.196 The meeting expressed its appreciation and gratitude to:

- a) Aeronautical Radio of Thailand for hosting ATNICG/7 and the SWIM workshop;
- b) ATMB, China and PCAA, Pakistan for hosting COM coordination meetings;
- c) Japan Civil Aviation Bureau (JCAB) and Electronic Navigation Research Institute (ENRI) for hosting the First Meeting of Ionospheric Study Task Force;
- d) the Office of Civil Aviation of MLTM and the Incheon International Airport Corporation (IIAC) for hosting the ADS-B Seminar and the Eleventh Meeting of ADS-B SITF;
- e) AAI, India for hosting the seventh meeting of the South East Asia and Bay of Bengal ADS-B Working Group Meeting.
- f) DCA, Myanmar to host SEA/BOB ADS-B WG/8 Meeting in December 2012;
- g) DGCA, Indonesia to host ATNICG/8 Meeting in March 2013;
- h) AAI, India for its offer to host ADS-B SITF/12 Meeting in April 2013;
- i) Hong Kong China for offer to host ADS SITF/13 Meeting in 2014.

3.4.197 Recalling the developments that had taken place since its first meeting in 1997 in Beijing, Chairman CNS/MET SG commented upon the tasks and challenges that were facing the groups in the changed structure. Chairman CNS/MET SG expressed his appreciation for the support he got from the Vice Chairmen in conducting the meetings. He also appreciated the continuous support provided by the secretariat.

3.4.198 The meeting recorded its appreciation and gratitude to Mr. Jeff Bollard, as Chairman of CNS/MET SG, Mr. Lo Weng Kee, as Vice Chairman of the SG and Dr. Cheng Cho-ming and Mr. Keith Mackersy, as Co-Vice Chairmen of the MET SG for their dedicated efforts and achievements. The meeting noted the able leadership of chairmen and the valuable contributions of CNS/MET SG to the APANPIRG objectives in last 16 years.



International Civil Aviation Organization
Asia and Pacific Office

ASIA/PACIFIC
INTERFACE CONTROL DOCUMENT
FOR
AERONAUTICAL TELECOMMUNICATION NETWORK
GROUND-GROUND ROUTER
IP SNDCE

First Edition – September 2012

EXECUTIVE SUMMARY

The Aeronautical Telecommunication Network (ATN) is a global inter-network that provides digital communications to satisfy the increasing telecommunication demands of air traffic service communication, aeronautical operational control, aeronautical administrative communication, and aeronautical passenger communication.

The ATN is composed of a network infrastructure and applications that provide the global communication for ground-ground (G/G) and air-ground services. The ATN network infrastructure includes ATN backbone communication links, ATN routers, and end systems. The ATN applications include among others context management (CM), controller-pilot data link communication (CPDLC) and air traffic service message handling service (ATSMHS).

The Asia/Pacific region is implementing an ATN network to support regional and global ATN services. This Interface Control Document (ICD) specifies the IP sub-network interface requirements for ATN G/G Boundary Intermediate Systems that form nodes of the Asia/Pacific ATN regional backbone network and/or have inter-State connectivity, to ensure interoperability between States. This ICD applies to point-to-point IP sub-network connections between Boundary Intermediate Systems.

1.0 Introduction

1.1 Purpose and Scope

This document provides Interface Control Document guidelines for IP sub-network connections used to communicate between the ATN Ground-Ground Routers that form nodes of the Asia/Pacific regional network Backbone and/or have inter-State/Organization connectivity within the Asia/Pacific region, to assure interoperability.

The scope of this ICD and its relationship to the ATN Router ICD and IP ICD is shown in Figure 1-1. This ICD addresses the sub-network layer of the ATN G/G router using the IP SND CF specified in ICAO Doc 9880.

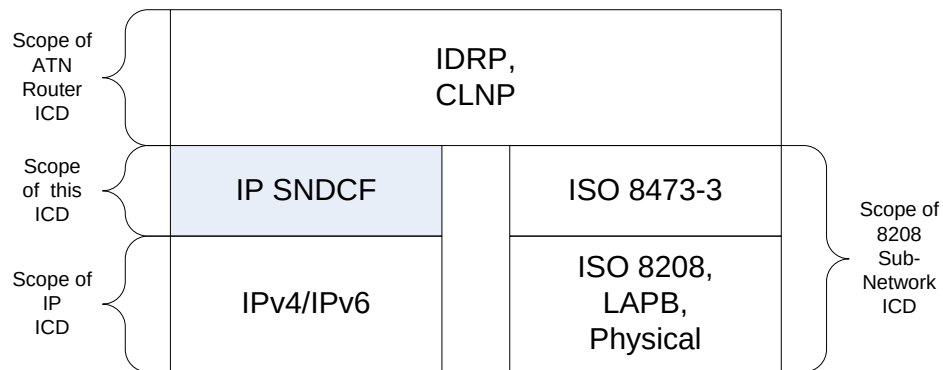


Figure 1-1: ATN Router Protocol Stack and Scope of this Document

1.3 Reference Documents

1.3.1 ICAO

[1] ICAO Doc 9880-AN/466 – Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols, Part III Chapter 3 – Internet Communications Service

1.3.2 ASIA/PAC

[2] ASIA/PAC Interface Control Document for Aeronautical Telecommunication Network Ground-Ground Router, Second Edition, April 2005

[3] ASIA/PAC Interface Control Document for Aeronautical Telecommunication Network Ground-Ground Router ISO/IEC 8208 Sub-Network, First Edition, April 2005

[4] ASIA/PAC Interface Control Document for the Internet Protocol, To Be Developed (TBD)

1.3.3 IETF

[5] RFC 1791, Internet Protocol – DARPA Internet Program Protocol Specification, September 1981

[6] RFC 2460, Internet Protocol, Version 6 (IPv6) Specification, December 1998

[7] RFC 2474, Definition of Differentiated Services Field (DS Field) in IPv4 and IPv6 Headers, December 1998

1.3.4 ISO/IEC

[8] ISO/IEC 8473-1, Information Technology – Protocol for providing the connectionless-mode network service: Protocol specification, 1994

[9] ISO/IEC 9542, Information processing systems – Telecommunications and information exchange between systems – End system to Intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO/IEC 8473), 1988

[10] ISO/IEC 10747, Information processing systems – Telecommunications and information exchange between systems – Protocol for exchange of inter-domain routing information among intermediate systems to support forwarding of ISO 8473 PDUs, 1994

2.0 IP SNDCF

The purpose of a Subnetwork Dependent Convergence Function (SND CF) is to provide the connectionless SN-Service assumed by the ATN Internet Protocols over real sub-networks.

The ATN Internet Protocols which use the Subnetwork Service (SN-Service) provided by an SND CF are the ISO/IEC 8473 Internetwork Protocol [8] and the ISO/IEC 9542 End System to Intermediate System Protocol [9] entities.

The Subnetwork Service (SN-Service) provided by an SND CF as specified in this ICD is provided directly to the ISO/IEC 8473 Internetwork Protocol entity and indirectly to the ISO/IEC 10747 Inter-Domain Routing Protocol [10] entity.

Table 2-1 identifies the Subnetwork Services and Associated Parameters used Asia/Pac entities.

Table 2-1 SN-Services and Associated Parameters

Parameter	SN-UNITDATA Request	SN-UNITDATA Indication
SN-Source-Address	Mandatory	Mandatory
SN-Destination-Address	Mandatory	Mandatory
SN-Priority	Optional	Optional
SN-Quality-of-Service	Optional	Optional
SNS-Userdata	Mandatory	Mandatory

Asia/Pac is planning to use the IP SND CF on a point-to-point basis and so requirement that might otherwise apply to an IP sub-network such as Priority and QOS do not apply. Table 2-2 contains a Point-to-Point Profile for the IP SND CF.

Table 2-2 Point-to-Point Profile for the IP SNDCEF

Item	Function	Doc 9880 Reference	G-G Router Support
Title	Provision of the SN-UNITDATA.Request Service Element	3.7.10.3	
Title	Service Element Parameters	3.7.10.3.1	
	For IPv4, the SN-Source-Address and SN-Destination-Address parameters shall be 32-bit IP Addresses.	3.7.10.3.1.1	Yes
	For IPv6, the SN-Source-Address and SN-Destination-Address parameters shall be 16-octet IP Addresses.	3.7.10.3.1.2	Yes
	As a local matter, the SN-Source-Address shall either be used to indicate the SNPA from which the encapsulated PDU is to be sent, or set to a null value.	3.7.10.3.1.3	Either
	As a local matter, the SN-Quality-of-Service subparameters, if present, other than priority shall either be ignored by the IP SNDCEF, or used to determine the Differential Service Requirements for the encapsulating IP Packet header.	3.7.10.3.1.4	Ignored
	The priority subparameter of the SN-Quality-of-Service service parameter shall be used to determine the value of the Differentiated Service field indicated in the encapsulating IP Packet header as described in the procedures below.	3.7.10.3.1.5	No
	The SN-Userdata shall be an unconstrained octet-string (e.g. an encoded CLNP PDU including the CLNP header and user data).	3.7.10.3.1.6	Yes
Title	Procedures	3.7.10.3.2	N/A
Title	IPv4 Subnetworks	3.7.10.3.2.1	N/A
	When the IP SNDCEF SN-UNITDATA.Request service element is invoked, an IPv4 datagram shall be constructed with the SN-Userdata as the data portion of the datagram (the payload).	3.7.10.3.2.1.1	Yes
	The IP datagram header shall be constructed according to RFC 1791 [5]	3.7.10.3.2.1.2	Yes
	The protocol shall be set to decimal 80	3.7.10.3.2.1.2.a	Yes

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	The source address shall be the IP Address assigned to the interface from which the packet is sent.	3.7.10.3.2.1.2.b	Yes																		
	The destination address shall be the SN-Destination-Address.	3.7.10.3.2.1.2.c	Yes																		
	The Time to Live shall be set to a locally specified value, which shall be configurable.	3.7.10.3.2.1.2.d	No																		
	The 3 topmost bits of the Differentiated Service Code Point (DSCP, former precedence subfield) of the Type of Service (TOS) field shall be set depending on the value of the priority subparameter of the SN-Quality-of-Service service parameter, as follows: <table><tr><td>IP Precedence</td><td>CLNP Priority</td></tr><tr><td>000</td><td>0,1,2,3,4,5</td></tr><tr><td>001</td><td>6,7</td></tr><tr><td>010</td><td>8,9</td></tr><tr><td>011</td><td>10</td></tr><tr><td>100</td><td>11,12,13</td></tr><tr><td>101</td><td>14</td></tr><tr><td>110</td><td>N/A</td></tr><tr><td>111</td><td>N/A</td></tr></table>	IP Precedence	CLNP Priority	000	0,1,2,3,4,5	001	6,7	010	8,9	011	10	100	11,12,13	101	14	110	N/A	111	N/A	3.7.10.3.2.1.2.e	No
IP Precedence	CLNP Priority																				
000	0,1,2,3,4,5																				
001	6,7																				
010	8,9																				
011	10																				
100	11,12,13																				
101	14																				
110	N/A																				
111	N/A																				
	As a local matter, the remaining Differentiated Service bits shall be set to correspond to the SN-Quality-of-Service parameter or to a locally specified default value.	3.7.10.3.2.1.2.f	No																		
	The last two bits of the TOS field (i.e. bits 6 and 7), shall be set to zero.	3.7.10.3.2.1.2.g	No																		
	The resulting IP datagram shall be forwarded to its addressed destination on the IP Network.	3.7.10.3.2.1.3	Yes																		
Title	IPv6 Subnetworks	3.7.10.3.2.2																			
	When the IP SND CF SN-UNITDATA.Request service element is invoked, an IPv6 header shall be constructed with the SN-Userdata as the payload of the complete datagram.	3.7.10.3.2.2.1	Yes																		
	The IP datagram header shall be constructed according to RFC 2460 [6]	3.7.10.3.2.2.2	Yes																		
	The Next Header field shall be set to decimal 80 unless extension headers are present, when the Next Header field of the final header shall be set to decimal 80.	3.7.10.3.2.2.2.a	Yes																		

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	The source address shall be the IP Address assigned to the interface from which the packet is sent.	3.7.10.3.2.2.2.b	Yes
	The destination address shall be the SN-Destination-Address.	3.7.10.3.2.2.2.c	Yes
	The Hop Limit shall be set to a locally specified value, which shall be configurable.	3.7.10.3.2.2.2.d	No
	The Flow Label shall be set to zeroes.	3.7.10.3.2.2.2.e	Yes
	The Traffic Class shall be set according to RFC 2474 [7]. The value of the first six bits (the DSCP) shall be set to the value xxx000, where the bits 'xxx' are set depending on the value of the priority subparameter of the SN-Quality-of-Service service parameter and according to Doc 9880 (i.e. they are set to the value of the precedence bits in Doc 9880).	3.7.10.3.2.2.2.f	No
	The last two bits of the Traffic class shall be set to zero.	3.7.10.3.2.2.2.g	No
Title	SN-UNITDATA.Indication Service Element	3.7.10.4	
Title	IPv4 Subnetworks	3.7.10.4.1	
	The system shall be configured such that IP packets with a protocol id of 80 are passed to the IP SNDCEF.	3.7.10.4.1.1	Yes
	All IP Datagrams passed to the IPv4 SNDCEF by the IP Network Service provider shall result in an SN-UNITDATA.Indication, constructed as follows	3.7.10.4.1.2	Yes
	The SN-Source-Address shall be set to the value of the source address field of the IP Datagram header.	3.7.10.4.1.2.a	Yes
	The SN-Destination-Address shall be set to the value of the destination address field of the IP Datagram header.	3.7.10.4.1.2.b	Yes
	The SN-Userdata shall be the data portion of the IP datagram.	3.7.10.4.1.2.c	Yes
	No SN-Quality-of-service parameter shall be present.	3.7.10.4.1.2.d	No
Title	IPv6 Subnetworks	3.7.10.4.2	
	The system shall be configured such that IP packets with a next header byte for the payload set to 80 are passed to the IP SNDCEF.	3.7.10.4.2.1	Yes
	All IP Datagrams passed to the IPv6 SNDCEF by the IP Network Service provider shall result in an SN-UNITDATA.Indication, constructed as follows	3.7.10.4.2.2	Yes

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	The SN-Source-Address shall be set to the value of the source address field of the IPDatagram header.	3.7.10.4.2.2.a	Yes
	The SN-Destination-Address shall be set to the value of the destination address field of the IPDatagram header.	3.7.10.4.2.2.b	Yes
	The SN-Unitdata shall be the payload of the IP datagram.	3.7.10.4.2.2.c	Yes
	No SN-Quality-of-service parameter shall be present.	3.7.10.4.2.2.d	No
Title	ICMP Message Handling	3.7.10.5	
	If a “Destination Unreachable” or “Time Exceeded” ICMP message is received by the IP SNDCEF, this should be reported to a layer management function indicating the destination IP Address for which the problem is reported, so that appropriate action may taken.	3.7.10.5.1.1	Yes
	An ICMP message indicating a “Parameter Problem” may indicate a software or configuration error and this should be notified to layer management so that the error is noted and fixed by a network manager.	3.7.10.5.1.2	Yes
Title	Resilient Operation	3.7.10.6	
	When it has more than one interface to an IP network, an ATN system implementing the IP SNDCEF shall rely upon the configuration, topology and management of an underlying IP Subnetwork, including IP functions implemented by the ATN system itself, in order to support resilient operation.	3.7.10.6.1	Yes
	Even if the ATN system has more than one interface to the IP network, a single IP address shall be used to support an adjacency with a given remote BIS.	3.7.10.6.2	Yes

SAMPLE TMC ON ATN/AMHS TESTING

TECHNICAL MEMORANDUM OF COOPERATION

BETWEEN

[To be filled in (Organisation 1)]

AND

[To be filled in (Organisation 2)]

ATN/AMHS

**BETWEEN [To be filled in (State 1)] AND [To be filled in (State
2)]**

[To be filled in (Date of TMC)]

Revision History

[illegible]

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TECHNICAL MEMORANDUM OF COOPERATION (TMC)

THIS AGREEMENT is made between the [To be filled in (Organisation 1)] and [To be filled in (Organisation 2)] as two air navigation services providers, hereinafter collectively referred to as “Parties” and individually as “Party”.

WHEREAS the Parties wish to jointly establish an Air Traffic Service Message Handling Service (AMHS) between [To be filled in (State 1)] and [To be filled in (State 2)] in support of the International Civil Aviation Organisation (ICAO) Aeronautical Telecommunication Network (ATN)/AMHS implementation plans for the Asia/Pacific Region.

AND WHEREAS the Parties have successfully completed the ATN/AMHS Trial hereinafter described in preparation for a smooth ATN/AMHS implementation.

NOW THEREFORE the Parties AGREE as follows:

ARTICLE 1 - CITATION

- 1.1 This Agreement will hereinafter be referred to as the ATN/AMHS Technical Memorandum of Cooperation (TMC).
- 1.2 For avoidance of doubt, this TMC (including its annexes and appendices) supersedes all prior draft versions of the TMC.

ARTICLE 2 – PURPOSE

- 2.1 This TMC defines the scope of the ATN/AMHS between [To be filled in (State 1)] and [To be filled in (State 2)] which the Parties are establishing on the terms of this TMC.
- 2.2 This TMC also sets out the ATN/AMHS Trial which the Parties have completed to enable the establishment of the ATN/AMHS between [To be filled in (State 1)] and [To be filled in (State 2)].

ARTICLE 3 – FINANCIAL TERMS

- 3.1 Each Party will be responsible respectively for all the costs and expenses arising from the ATN/AMHS connection from its local terminal to the international connection points provided by its telecom carriers and all equipment, software and associated costs required for the ATN/AMHS operation.

ARTICLE 4 – SCOPE OF ATN/AMHS

- 4.1 The ATN/AMHS will be based on the ATN Standards and Recommended Practices (SARPs) contained in ICAO Annex 10 Volume III Part 1 Chapter 3 and the Technical Provisions contained in ICAO Doc 9705 Volume III and/or ICAO Doc 9880 Part II.
- 4.2 The ATN/AMHS connection will be based on the existing ICAO AFTN routing directory for the Asia/Pacific Region and will be between the connection points in [To be filled in (State 1)] and [To be filled in (State 2)].
- 4.3 The AMHS traffic to be routed via this ATN/AMHS connection will be as follows:

<u>From</u> <u>(Originating/Relaying</u> <u>Station)</u>	<u>To</u> <u>(Connection Point)</u>	<u>For</u> <u>(Intended destination of AMHS traffic)</u>
[To be filled in (State 1)]	[To be filled in (State 2)]	[To be filled in by State 1]
[To be filled in (State 2)]	[To be filled in (State 1)]	[To be filled in by State 2]

- 4.4 If amendments to the ICAO AFTN/ATN routing plan are made by ICAO Regional Office, the Parties may agree to revise the intended destinations for AMHS traffic set out in paragraph 4.3 to allow for the consequent change in the AMHS traffic or destinations.

ARTICLE 5 – CONTINGENCY ARRANGEMENTS

- 5.1 The Parties will ensure that fallback procedures in the event of circuit or other failure affecting the flow of AHMS traffic between them are established and supported by their respective routing partners:

	Routing Partners
[To be filled in (State 1)]	[To be filled in by State 1]
[To be filled in (State 2)]	[To be filled in by State 1]

- 5.2 The Parties will, through regular meetings and other appropriate means, review and exchange information on their respective procedures and the support arrangements and assist each other to strengthen these contingency arrangements.

ARTICLE 6 – ATN/AMHS TRIAL

- 6.1 The ATN/AMHS Trial to enable the establishment of the AMHS under this TMC was conducted to evaluate the basic connectivity, interoperability, functionality and integrity of the ATN G/G Routers, AMHS systems and AMHS/AFTN Gateway Systems between the Parties.
- 6.2 The ATN/AMHS Trial consisted of the following tests:

Tests	Test Dates
ATN Connectivity Bilateral Tests A. ATN Router Configuration - SNDCEF over X.25 B. ATN Router Configuration - SNDCEF over IP C. X.400 P1 Configuration – TP0 over TCP/IP	<i>[To be filled in]</i>
ATN/AMHS Inter-Operability Tests	<i>[To be filled in]</i>
ATN/AMHS Pre-Operational Tests	<i>[To be filled in]</i>

6.3 The test cases for the tests conducted under the ATN/AMHS trial are as follows:

I. ATN Connectivity Bilateral Tests

	Bilateral Test Procedures
ATN Router Configuration (SNDCF over X.25)	
PTA101	Private X.25 Network Connectivity Test
PTA102	CLNP Connectivity Test
PTA103	IDRP Connectivity Test
PTA104	BIS Disconnection/Re-connection Test
PTA105	Failure/Restoration of Carrier Media/ATN Router
ATN Router Configuration (SNDCF over IP)	
PTA201	Private IP Network Connectivity Test
PTA202	CLNP Connectivity Test
PTA203	IDRP Connectivity Test
PTA204	BIS Disconnection/Re-connection Test
PTA205	Failure/Restoration of Carrier Media/ATN Router
X.400 P1 Configuration (X.400 P1 TP0 over TCP/IP)	
PTA301	Private IP Network Connectivity Test
PTA302	Network Disconnection/Re-connection Test
PTA303	Failure/Restoration of Carrier Media

II. ATN/AMHS Inter-Operability Tests

A. Test Cases from Annex E of ICAO Asia/Pacific Guidance for AMHS Conformance Testing (AMHS Manual) version 3.0 Sep 2009

	Bilateral Test Procedures
Submission, Transfer and Delivery Operation (AMHS to AMHS)	
IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)
IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)
Gateway Operations (AFTN to AMHS)	
IT201	Convert an AFTN message to AMHS format (IUT-A)
IT202	Convert an AFTN message to AMHS format (IUT-B)

	Bilateral Test Procedures
Gateway Operations (AMHS to AFTN)	
IT301	Convert an IPM generated by UA of IUT-A to AFTN format (IUT-B)
Gateway Operations (AFTN to AMHS to AFTN)	
IT401	Convert an AFTN message to AMHS and back to AFTN format (IUT-A)
IT402	Convert an AFTN message to AMHS and back to AFTN format (IUT-B)
Gateway Operations – Special case scenarios	
IT501	Distribute an IPM to AMHS and AFTN users
IT502	Expand a DL addressing both AMHS and AFTN users
IT503	Convert an IPM, if the ATS-message-text contains more than 1800 characters
IT504	Split an incoming IPM addressing more than 21 AFTN users
IT505	Probe Conveyance Test
Stress traffic situations	
IT601	Stress load
	Trilateral Test procedures – optional
Submission/Transfer/Delivery and Relay operations	
IT701	Submission/Transfer/Delivery between the partner MTAs
IT702	Relay operations
Test of special situations	
IT801	Alternate MTA routing
IT802	Loop detection

B. Additional selected and bilaterally agreed interoperability tests cases.

III. ATN/AMHS Pre-Operational Tests

A. Test Cases from Annex F of Guidance Document for AMHS Conformance Testing (AMHS Manual) version 3.0 Sep 2009

	Test Function
PRE001	Go-NoGo test Test partner1 to Test partner 2
PRE002	Go-NoGo test Test partner 2 to Test partner 1
PRE003	Exchange of duplicated Operational messages, check of integrity
PRE004	Stress/Load Test (queued data)

B. Additional selected and bilaterally agreed pre-operational tests cases.

- 6.4 The details of the tests and the test procedures for the test cases are set out in **Annex 1**.
- 6.5 The test results for each of the test cases conducted according to the test procedures in **Annex 1** are recorded and compiled in the test report provided in **Annex 2**.
- 6.6 The achievements, problems, and lessons learnt from the tests-related activities are also set out in **Annex 2**.

ARTICLE 7 – COMMITMENT

- 7.1 The Parties will use all reasonable endeavours to carry out their respective responsibilities and will cooperate to ensure the effectiveness and reliability of the ATN/AHMS between [To be filled in (State 1)] and [To be filled in (State 2)] established under this TMC.
- 7.2 In furtherance of this commitment, the Parties will conduct additional tests using additional test cases as may be agreed between them. The details of such additional tests and test cases and their test procedures and test results when agreed to between the Parties may be added to Annexes 1 and 2 as Addenda attachments in sequential running numbers, referencing this TMC as follows;
- (a) “TMC Annex 1 - Addendum No. 1”
 - (b) “TMC Annex 2 – Addendum No. 1”, etc.
- 7.3 If a Party assesses that a test or any change in AMHS requirement or service detail is not affordable or not cost effective to implement, that Party may decline to undertake that test or carry out that requirement or service detail but will nevertheless continue to cooperate with the other Party to reach a mutually acceptable outcome.

ARTICLE 8 – AMENDMENTS

- 8.1 This TMC may be amended by agreement of the Parties in writing and in particular to effect any amendment necessitated by changes in ICAO's recommendations on AMHS requirements or service details.
- 8.2 The agreed amendments in writing will take effect when signed by the duly authorised representatives of the Parties unless otherwise provided for in the written amendments.

ARTICLE 9 – ATN/AMHS COMMENCEMENT DATE

- 9.1 The ATN/AMHS between [To be filled in (State 1)] and [To be filled in (State 2)] under this TMC will commence one (1) month from the date this TMC comes into force under Article 11.1.

ARTICLE 10 - RESOLUTION OF DISAGREEMENTS

- 10.1 Any disagreement regarding the interpretation or application of this TMC or its annexes and appendices shall be resolved in good faith by mutual consultations between the Parties and will not be referred to any court, international tribunal or third party for settlement.

ARTICLE 11 - ENTRY INTO FORCE

- 11.1 This TMC will enter into force on the date of the last signature by the parties named below.

ARTICLE 12 - SIGNATURE IN COUNTERPARTS

- 12.1 To facilitate execution, this TMC and each of its annexes and addenda may be executed in counterparts, each of which will be an original, but all of which together will constitute one and the same agreement.

[To be filled in (State 1/Organisation 1)] Authorised Representative _____ [To be filled in by State 1/Organisation 1] _____ Date	[To be filled in (State 2/Organisation 2)] Authorised Representative _____ [To be filled in by State 2/Organisation 2] _____ Date

TERMS OF REFERENCE
THE ICAO INTER-REGIONAL APAC/NAT AIDC TASK FORCE

Deliverable(s)

- a) A pan-regional APAC/NAT AIDC document.

Scope of work

The following are the broad principles describing the scope of work:

- a) take into account the APAC, NAT and any other existing guidance material related to AIDC; and
- b) be consistent with the global ICAO framework to ensure global harmonization and interoperability.

Composition

The task force would be composed of experts nominated by the APAC and NAT States, international organization and industry. Additional membership could be invited from other Regions.

Conduct of the work and schedule

The task force shall complete its work by 1 Q 2014. The work would be carried out by means of electronic correspondence as far as practicable. Minimum amount of face to face meetings would be planned.



Satellite Voice Guidance Material (SVGGM)

This edition has been approved by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and the North Atlantic Systems Planning Group (NAT SPG)

First Edition — 23 July 2012

International Civil Aviation Organization

This document is available from the following web sites:

<http://www.paris.icao.int>

<http://www.bangkok.icao.int>

This document was developed by the Inter-Regional Satellite Voice Task Force (IRSVTF). For more information, contact the ICAO Regional Office.



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First Edition — 23 July 2012

International Civil Aviation Organization

The issue of amendments is announced by the ICAO Regional Offices concerned, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

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FOREWORD.

1. Historical background

1.1 The *Satellite Voice Guidance Material* (SVGM) is the result of a task force established by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and the North Atlantic Systems Planning Group (NAT SPG) at the request of the ICAO Air Navigation Commission (ANC) made during its 4th Meeting of the 183rd Session held on 21 January 2010.

1.2 In procedural airspace, aeronautical communications have historically been conducted with high frequency (HF) radios due to the advantage of being able to transmit and receive air-ground communications for thousands of miles. Most appropriate authorities hence required two independent HF sets on-board.

1.3 In the early 1980s, civil aviation recognized the increasing limitations of the present communications, navigation, and surveillance (CNS) systems for air traffic management (ATM) and the need to make improvements to overcome them and meet future needs. Thus the Council of ICAO established the Special Committee on Future Air Navigation Systems (FANS) to study new concepts and new technologies and to recommend a system that would overcome the present and foreseen problems. The Committee made an extensive study of existing systems and the application of new technologies. It concluded that the limitations of the existing systems are intrinsic to the systems themselves and that problems could not be overcome on a global scale except by the exploitation of satellite technology. Thus a new concept of air navigation based on satellite technology was developed and consequently endorsed by the Tenth Air Navigation Conference in September 1991.

1.4 The potential for improvement in efficiency resulting from the adoption of satellite technology was discussed at length during the Limited NAT Regional Air Navigation (LIM/NAT/RAN) Conference in Cascais, Portugal, in 1992. Although both data and voice communications were evaluated, it was recognised that data offered greater economic benefit and that the emphasis should be put on that form of communications. This was not seen as precluding the use of voice in abnormal circumstances but the use of SATCOM voice for routine communications was not seen as viable.

1.5 In 1995, the initial future air navigation system (FANS 1/A) provided an integrated airborne CNS package. In addition to required navigation performance (RNP) and global navigation satellite system (GNSS) capabilities, FANS 1/A includes controller pilot data link communications (CPDLC) and automatic dependent surveillance – contract (ADS-C) capabilities using SATCOM, VHF, and HF data links. CPDLC and ADS-C were seen as the normal or preferred means of ATS communications and surveillance in procedural airspace. However, voice communications would continue to be required as an alternative means of ATS communications. At the same time, aircraft were equipped with SATVOICE capability.

1.6 In June 2001, the 37th Meeting of the ICAO North Atlantic Systems Planning Group (NAT SPG, 12-14 June 2001) agreed that a study would be initiated to assess the viability of using SATVOICE for waypoint position reporting as an initial step. The study was accompanied by NAT trials that successfully demonstrated SATVOICE could be an effective and reliable long range communication system (LRCS) to support ATS voice communications. However, there were costs associated with implementation and use.

1.7 In 2003, the 39th NAT SPG Meeting (17-19 June 2003) agreed that the *NAT Regional Supplementary Procedures (SUPPs)* (Doc 7030) needed to be amended to define the non-routine

circumstances that would justify use of SATVOICE between the flight crew and the radio operator as well as indicating that emergency communications should be with the ATC facilities. Work was also started on removing the NAT-specific provisions that prevented use of SATVOICE for routine communications.

1.8 In 2008, the 44th Meeting of the NAT SPG (17-20 June 2008) agreed that authorization to use SATVOICE for all ATS communications would permit reduction in risk of communications failure, improve safety of operations, and alleviate HF channel congestion. However, guidance material would be needed to address a number of issues related to call setup times, security and system performance and capacity. It was further concluded that any decision regarding Minimum Equipment List (MEL) relief of one HF radio was subject to approval by the appropriate authority. This work resulted in NAT SPG Conclusion 45/28 endorsing a proposal for amendment to the NAT SUPPS Doc 7030 that removed the above-mentioned provision.

1.9 Some State authorities had granted aircraft operators time-limited MEL dispatch relief of one HF radio whereby the aircraft may be dispatched for a limited period of time (e.g. 5 or 10 days) with only a single operational HF radio system and a single operational SATVOICE system. Aircraft operators were seeking MEL dispatch relief of one HF radio with no time limits by demonstrating that a SATVOICE system was a viable LRCS.

1.10 In 2010, the ICAO ANC having reviewed the progress of the NAT SPG SATVOICE studies, requested that an ICAO inter-regional task force be established to develop globally applicable *Satellite Voice Guidance Material* (SVGM) in support of the global implementation of aeronautical mobile satellite (route) communications systems (AMS(R)S). Consistent with ICAO's *Global Air Navigation Plan (Doc 9750)*, this guidance material has been developed within the global ICAO required communication performance (RCP) framework. The guidance material also takes account of the required surveillance performance (RSP) framework as detailed in the *Global Operational Data Link Document (GOLD)*. and required surveillance performance (RSP) framework to provide States with flexibility to apply different standards for different uses, without implication to seamless operations.

1.11 This edition of the *Satellite Voice Guidance Material (SVGM)* provides a comprehensive update of various regional and State guidance material for ANSPs and aircraft operators to use SATVOICE for ATS communications. This includes the incorporation of performance-based specifications to be applied, where appropriate (i.e. RCP for controller intervention and RSP for position reporting), as well as associated guidance on data collection, monitoring, and analysis. This guidance material will aid the appropriate authority in establishing its policies on MEL regarding the number and type of LRCS on board the aircraft, taking into account the SATVOICE infrastructure along the flight and airspace communication requirements. However, it assumes that sufficient HF voice infrastructure will remain in service and that the aircraft will be equipped with at least one operational HF voice system.

2. Scope and purpose

2.1 The SVGM provides guidance and information concerning SATVOICE communications for aeronautical use and is intended to facilitate the uniform application of ICAO Standards and Recommended Practices (SARPs) contained in Annex 2 — *Rules of the Air* and in Annex 11 — *Air Traffic Services*, the provisions in the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) and, when necessary, the *Regional Supplementary Procedures* (Doc 7030).

2.2 This guidance material is intended to maximize operational benefits of SATVOICE implementations by promoting seamless and interoperable SATVOICE operations throughout the world. This edition provides guidance material for current and near term operations. It also includes an appendix

that provides a high level concept of operations and considerations for the development of future SATVOICE systems. Future editions are expected as experience is gained in the use of SATVOICE capability for ATS communications.

2.3 The following principles were adhered to in the development of this guidance material:

- a) build on the ICAO performance based framework to provide States with flexibility to apply different standards for different uses, without implication to seamless operations, interoperability and safety;
- b) provide a basis for States in determining acceptability of any implementation within an ATS unit (ATSU), a radio facility or aircraft equipage, taking into account routine and emergency use, the provision of ATS using SATVOICE communications, procedures for the radio operator, controller and flight crew, performance specifications and qualification;
- c) note that in-flight use of portable SATVOICE phones for ATS communications is not allowed, according to many existing State operating regulations;
- d) serve to facilitate State authorities or Regional Safety Oversight Organizations (RSOOs) in establishing policies in MEL matters; and
- e) address the use of SATVOICE for ATS communications, but assumes aircraft equipage and ground infrastructure will continue to maintain HF voice capability.

2.4 The following personnel and organizations should be knowledgeable with relevant aspects of its contents: regulators, airspace planners, aircraft operators, dispatchers, air navigation service providers (ANSPs), aeronautical stations, communication service providers (CSPs), satellite service providers (SSPs), and radio operators, training organizations, regional/State monitoring agencies, automation specialists, and aircraft manufacturers and equipment suppliers.

2.5 The guidance material will support the following activities:

- a) the States' activities in relation to the following:
 - 1) safety oversight of air navigation services;
 - 2) operational eligibility, flight crew training and qualification; and
 - 3) airworthiness certification of aircraft SATVOICE systems.
- b) the development of agreements and/or contractual arrangements between ANSPs and aircraft operators and their respective CSPs;
- c) development of operational procedures; and
- d) operational monitoring, analysis, and exchange of operational data among regions, States, RSOOs and communication service providers.

2.6 Guidance material and information concerning SATCOM data communications is not within the scope of this guidance material and can be found in the *Global Operational Data Link Document (GOLD)*.

3. Status

3.1 This guidance document may contain material that may eventually become Standards and Recommended Practices (SARPs), or PANS provisions when it has reached the maturity and stability

necessary for adoption or approval. It may also comprise material prepared as an amplification of the basic provisions in the corresponding SARPs and PANS to assist the user in their application.

4. Implementation

4.1 The implementation of facilities, services and procedures is the responsibility of Contracting States; they are applied in actual operations only after, and in so far as, States have implemented them. However, with a view to facilitating their processing towards implementation by States, this guidance material has been prepared in language which will permit direct use by air navigation service personnel and others associated with the provision of air traffic services to international air navigation.

5. Promulgation of information

5.1 Information relating to the establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations should be notified and take effect in accordance with Annex 15 — Aeronautical Information Services.

6. References

6.1 The following references are cited in this document:

- a) ICAO Annex 1 — Personnel Licensing;
- b) ICAO Annex 2 — Rules of the Air;
- c) ICAO Annex 4 — Aeronautical Charts;
- d) ICAO Annex 6 — Operation of Aircraft – Part I — International Commercial Air Transport — Aeroplanes;
- e) ICAO Annex 10 — Aeronautical Telecommunications – Volume II — Communication Procedures including those with PANS status;
- f) ICAO Annex 10 — Aeronautical Telecommunications – Volume III — Communication Systems;
- g) ICAO Annex 11 — Air Traffic Services;
- h) ICAO Annex 15 — Aeronautical Information Services;
- i) Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, ICAO Doc 4444);
- j) Regional Supplementary Procedures (Regional SUPPs, ICAO Doc 7030);
- k) Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, ICAO Doc 8400);
- l) Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services (ICAO Doc 8585);
- m) Aircraft Type Designators (ICAO Doc 8643);
- n) Manual of Radiotelephony (ICAO Doc 9432);

- o) Manual on Airspace Planning Methodology for the Determination of Separation Minima (ICAO Doc 9689);
- p) Performance Based Navigation Manual (PBN) (ICAO Doc 9613);
- q) Global Air Navigation Plan (Doc 9750)
- r) Manual on Required Communication Performance (RCP) (ICAO Doc 9869);
- s) Global Operational Data Link Document (GOLD);
- t) Manual on the Aeronautical Mobile Satellite (Route) Service (ICAO Doc 9925);
- u) ANSI/ASA S3.2-2009, Method for Measuring the Intelligibility of Speech Over Communication Systems;
- v) RTCA DO-210D, Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS);
- w) RTCA DO-262A, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS);
- x) ARINC 741, Aviation Satellite Communication System ;
- y) ARINC 761, Second Generation Aviation Satellite Communication System, Aircraft Installation Provisions;
- z) ARINC 781, Mark 3 Aviation Satellite Communication System;
- aa) FAA TSO-159C – Avionics Supporting Next Generation Satellite Systems (NGSS); and
- bb) FAA Advisory Circular 20-150A – Satellite Voice Equipment as a Means for Air Traffic Services Communications.

7. Changes to the document

This document is maintained as a regional document in coordination with ICAO planning and implementation regional groups (PIRGs) providing SATVOICE services within their region. Each participating PIRG establishes a mechanism for submitting and administering change proposals.

A change proposal can be submitted by any stakeholder participating in SATVOICE operations. The stakeholder should submit a change proposal to their ICAO Regional Office. The ICAO Regional Office will coordinate the change proposal within its own Region, other Regional Offices, and ICAO HQ, to determine the acceptability of the change proposal. Once the ICAO Regional Office has completed coordination and the participating PIRGs accept the change proposal, the guidance document would be amended to incorporate the approved proposals.

8. Amendments to the SVGM

Amendment	Source(s)	Subject(s)	Approved applicable
1 st Edition (2012)	Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/23 – 2012)	<i>Satellite Voice Guidance Material</i> (SVGM)	Applicable within participating Regions on 1 October 2012.

North Atlantic Implementation
Management Group (NAT
IMG) on behalf of the NAT
Systems Planning Group
(NAT IMG/41 – 2012)

DRAFT

APANPIRG/23
Appendix D to the Report on Agenda Item 3.4

Chapter 1. Definitions

1.1 Terms and definitions

When the following terms are used in the present document they have the following meanings.

Note 1.— Where the term has “(ICAO)” annotated, the term has already been defined as such in ICAO provisions.

Note 2.— The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU).

Term

Access number. The number used by the ATSU, aeronautical station or aeronautical operational control (AOC) to access the network switch to contact an aircraft via SATVOICE.

Actual communication performance (ACP). The dynamic assessment of the operational performance of the communication path, with human performance and technical performance included in the assessment. (ICAO)

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. (ICAO)

Aeronautical mobile satellite (route) service (AMS(R)S). An aeronautical mobile-satellite service reserved for communications relating to safety and regularity of flights, primarily along national or international civil air routes. (ICAO)

Note.— Includes both voice and data, In this document, the use of AMS(R)S for voice communications is referred to as SATVOICE to reflect the operational use of the term in standard phraseology and messages.

Aeronautical mobile service (RR S1.32). A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies. (ICAO)

Aeronautical operational control (AOC). Communication required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity and efficiency reasons. (ICAO)

Aeronautical station (RR S1.81). A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea. (ICAO)

Note.— Aeronautical station is commonly referred to as a radio facility.

Term

Air navigation service provider (ANSP). An organization responsible for the provision of air navigation services.

Note.— This term is sometimes referred to as air traffic service provider (ATSP), although an ANSP may be considered broader in scope of its service provision. In the context of this document they are synonymous.

Air traffic control (ATC) service. A service provided for the purpose of:

- a) preventing collisions:
 - 1) between aircraft, and
 - 2) on the manoeuvring area between aircraft and obstructions; and
- b) expediting and maintaining an orderly flow of air traffic. (ICAO)

Air traffic management (ATM). The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions. (ICAO)

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service). (ICAO)

Air traffic services unit (ATSU). A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office. (ICAO)

Aircraft active flight plan. (See flight plan).

Aircraft address. A unique combination of 24 bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance. (ICAO)

Aircraft identification. A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications. (ICAO)

Note 1.— The aircraft identification does not exceed 7 characters and is either the aircraft registration or the ICAO designator for the aircraft operating agency followed by the flight identification.

Note 2.— ICAO designators for aircraft operating agencies are contained in Doc 8585.

Aircraft registration. A group of letters, figures or a combination thereof which is assigned by the State of Registry to identify the aircraft.

Note.— Also referred to as registration marking.

Term

Aircraft system availability (A_{AIR}). The required probability of available capability on an aircraft.

Note.— The actual aircraft system availability is computed assuming that the service is available in the relevant airspace.

Appropriate ATS authority. The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned. (ICAO)

Appropriate authority.

- a) Regarding flight over the high seas: The relevant authority of the State of Registry.
- b) Regarding flight other than over the high seas: The relevant authority of the State having sovereignty over the territory being overflown. (ICAO)

Area control centre (ACC). A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction. (ICAO)

ATC waypoint. A waypoint contained in Item 15 of the ICAO flight plan, or as amended by ATC.

Note.— A waypoint inserted by the flight crew for purposes of conducting flight operations such as points of no return are not ATC waypoints.

ATS surveillance service. A term used to indicate service provided directly by means of an ATS surveillance system. (ICAO)

Continuity (C) for RCTP. The proportion of intervention messages and responses that can be delivered within the specified RCTP time for intervention.

Note.— For voice communications, continuity would take into consideration any dropped calls.

C for $RCTP_{AS}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{AS}$ time for intervention.

C for $RCTP_{AS/AIR}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{AS/AIR}$ time for intervention.

Note.— Continuity for $RCTP_{AS/AIR}$ is the proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.

C for $RCTP_{ATSU}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{ATSU}$ time for intervention.

C for $RCTP_{CSP}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{CSP}$ time for intervention.

Term

C for RSTP. The proportion of intervention messages and responses that can be delivered within the specified RSTP for intervention.

Note.— For voice communications, continuity would take into consideration any dropped calls.

C for RSTP_{AS}. The proportion of surveillance messages that can be delivered within the specified RSTP_{AS}.

C for RSTP_{AS/AIR}. The proportion of surveillance messages that can be delivered within the specified RSTP_{AS/AIR}.

Note.— Continuity for RSTP_{AS/AIR} is the proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.

C for RSTP_{ATSU}. The proportion of surveillance messages that can be delivered within the specified RSTP_{ATSU}.

C for RSTP_{CSP}. The proportion of surveillance messages that can be delivered within the specified RSTP_{CSP}.

C for operational performance. The proportion of clearance transactions that can be completed or position reports that can be delivered within the specified operational performance time.

Note.— For voice communications, continuity would take into consideration any dropped calls.

Call sign. The designator used in air-ground communications to identify the aircraft and is equivalent to the encoded aircraft identification.

Caller line identification (CLI). A display of the identification of a caller to the recipient prior to answering the call.

Note.— For the purposes of ATS communications, caller line identification to the flight crew is a display of facility name or the facility designator for the aeronautical station or ATS unit. For the radio operator/controller it is a display of the aircraft identification.

Communication service provider (CSP). Any public or private entity providing communication services for general air traffic.

Communication services. Aeronautical fixed and mobile services to enable ground-ground and/or air-ground communications for safety and regularity of flight.

Compulsory reporting point. An ATC waypoint for which a position report is required by the aircraft.

Control area (CTA). A controlled airspace extending upwards from a specified limit above the earth. (ICAO)

Term

Current flight plan. (See flight plan).

Diagnostic Rhyme Test (DRT). A test and scoring system for speech intelligibility using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar. (ANSI/ASA S3.2-2009)

Note.— *Speech intelligibility is a vital factor in aeronautical safety communications. The DRT is specifically designed to test intelligibility of speech using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar (e.g, goat/coat). They are then played the same word pairs processed through the condition (e.g, codec) under test and the success rate is scored. Intelligibility is largely dependent on consonant recognition; vowel recognition is less important. The target users for aeronautical communications are, as for the DRT listening panels, trained listeners (pilots, air traffic controllers) who use standard phrases.*

Filed flight plan. (See flight plan).

Flight identification. A group of numbers, which is usually associated with an ICAO designator for an aircraft operating agency, to identify the aircraft in Item 7 of the flight plan.

Flight information region (FIR). An airspace of defined dimensions within which flight information service and alerting service are provided. (ICAO)

Flight level (FL). A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals. (ICAO)

Note 1.— *A pressure type altimeter calibrated in accordance with the Standard Atmosphere:*

- a) when set to a QNH altimeter setting, will indicate altitude;*
- b) when set to QFE altimeter setting, will indicate height above the QFE reference datum;*
- c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.*

Note 2.— *The terms “height” and “altitude”, used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.*

Flight management computer waypoint position reporting (FMC WPR). A data link capability used for position reporting.

Note. — *See also the GOLD.*

Flight manual. A manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft. (ICAO)

Term

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft. (ICAO)

A flight plan can take several forms, such as:

Current flight plan (CPL). The flight plan, including changes, if any, brought about by subsequent clearances. (ICAO)

Note 1.— When the word “message” is used as a suffix to this term, it denotes the content and format of the current flight plan data sent from one unit to another.

Filed flight plan (FPL). The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes. (ICAO)

Note 2.— When the word “message” is used as a suffix to this term, it denotes the content and format of the filed flight plan data as transmitted.

Aircraft active flight plan. The flight plan used by the flight crew. The sequence of legs and associated constraints that define the expected 3D or 4D trajectory of the aircraft from takeoff to landing. (RTCA/EUROCAE)

Global mobile satellite system (GMSS). A generic term referring to the selection of satellite phone providers available to private customers.

Note.— GMSS is a term analogous to PSTN, referring to traditional wire-based telephony.

Grade of service. The rate at which calls are rejected due to network congestion.

Note.— Grade of service is a criterion for specifying service availability.

Long-range communication system (LRCS). A system that uses satellite relay, data link, high frequency, or another approved communication system which extends beyond line of sight.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures. (ICAO)

Maximum accumulated unplanned outage time (min/yr). A criterion applied to a given operational airspace of FIR that defines the maximum time allowed for the total sum of the unplanned outages that exceed the unplanned outage duration limit in any twelve month period

Note.— The criterion does not apply to unplanned outages that are less than the unplanned outage duration limit or planned outages. Unplanned outages that are less than the unplanned outage duration limit are considered against the criterion for continuity.

Maximum number of unplanned outages (per year). A criterion applied to a given operational airspace or FIR that defines the maximum number allowed for unplanned outages in any twelve month period.

Term

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type. (ICAO)

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. (ICAO)

Operational communication transaction. The process a human uses to initiate the transmission of an instruction, clearance, flight information, and/or request, and is completed when that human is confident that the transaction is complete.

Operational performance (monitored). The portion of the transaction time (used for intervention or position reporting) that does not include the times for message composition or recognition of the operational response.

Note 1.— For voice communications used for intervention, operational performance comprises RCTP, queue/connect performance and call performance.

Note 2.— For voice communications used for position reporting, operational performance comprises RSTP, initiator performance, radio operator answer performance and call performance.

Note 3.— The operational performance is the post-implementation monitored performance.

Personal identification number (PIN). A secret numeric password shared between a user and a system that can be used to authenticate the user to the system.

Note.— For the purposes of ATS communications, all PIN numbers are issued for the same purpose, as there is no PIN that grants higher priority or access than another. The priority of the call is determined by the dialing string and ground initiated calling service used. Calling Line Identification (caller ID) is just a substitute for the radio operator not having to dial the PIN number for ground initiated calls. When CLI is implemented for the customer, then all calls made from the access numbers provided to the GES provider will not be prompted for a PIN when the call is placed to the aircraft. If the switch does not recognize the pre-defined CLI list provided to the GES, then the caller will be prompted for the PIN code.

Preemption. The immediate and automatic seizure of resources allocated to a lower-priority call. A higher priority call will interrupt communication resources being used by a lower-priority communication to establish a connection without any indication or delay.

Note.— If the intervening call is the same or lower, the current call will not be preempted and the intervening caller will get an indication that the line is not available. The effects of preemption can be minimized by multiple channels and conference calling, but not completely eliminated.

Priority level. An indication of call precedence for ground to air or air to ground calls. Priority level may be used to establish preemption.

Term

Public switched telephone network (PSTN). A network of the world's public circuit-switched telephone networks. It consists of telephone lines, fiber optic cables, microwave transmission links, cellular networks, communications satellites, and undersea telephone cables, all inter-connected by switching centers, thus allowing any telephone in the world to communicate with any other.

Queue/connect performance. The operational portion of the transaction time to organize and place the call either via a manual or automated dialing sequence depending on equipment at the aeronautical station.

Note.— For voice communications, queue/connect performance begins when the message from the ATSU via the network is sent to the queue and ends when the last digit of the dialing sequence is finished.

Radio facility. A term commonly used to refer to an aeronautical station.

RCP availability (A). The required probability that an operational communication transaction can be initiated when needed.

Note.— For voice communications, this translates to any failure prohibiting the call to be initiated to include congestion (much like the analogy of a terrestrial mobile phone network). However this definition does not apply to a busy condition whereby the entity being called is already on the phone and does not have a way to put the existing call on hold or if able to, rejects the additional incoming call.

RCP call performance. The operational portion of a communication from when an indication of an incoming call begins to when the parties on the call have completed the communication and the radio operator sends the message to the ATSU.

RCP continuity (C). The required probability that an operational communication transaction can be completed within the communication transaction time, either ET or TT 95%, given that the service was available at the start of the transaction.

Note.— For voice communications, this translates into 1 out of 1,000 or 5 out of 100 calls for ET 99.9% and TT 95%, respectively, not being able to conclude their voice transactions within the allotted time or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call.

RCP expiration time (ET). The maximum time for the completion of the operational communication transaction after which the initiator is required to revert to an alternative procedure.

RCP initiator performance. The operational portion of the transaction time for the controller to compile the voice clearance message and send it to the radio operator.

Note.— RCP initiator performance is from when the controller needs to send a clearance to when the controller sends it to the radio operator.

Term

RCP integrity (I). The required probability that an operational communication transaction is completed with no undetected errors.

Note 1.— Whilst RCP integrity is defined in terms of the “goodness” of the communication capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}), consistent with RNAV/RNP specifications.

Note 2.— For voice communications, this translates to the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

RCP nominal time (TT 95%). The maximum nominal time within which 95% of operational communication transactions are required to be completed.

RCP specification. A specification (e.g. RCP 400) that provides the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP and aircraft operator.

RCTP_{AS}. The summed critical transit times for an ATC intervention message and a response message allocated to the aeronautical station.

Note.— For voice communications, RCTP_{AS} includes two concurrent processes:

a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and

b) the aeronautical station sends the response to the ATSU via the ground-ground network; the performance is denoted by RCTP_{AS}.

RCTP_{AS/AIR}. The technical time for the air-ground network and associated components to set up a ground-to-air call.

Note.— RCTP_{AS/AIR} begins when the last digit of the dialing sequence is finished and ends when the aircraft indicates an incoming call to the flight crew.

RCTP_{ATSU}. The summed critical transit times for an ATC intervention message and a response message, allocated to the ATSU system.

RCTP_{CSP}. The summed critical transit times for an ATC intervention message and a response message, allocated to the CSP system.

Required communication performance (RCP). A statement of the performance requirements for operational communication in support of specific ATM functions. (ICAO)

Term

Required communication technical performance (RCTP). The portion of the (intervention) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response.

Note.— For voice communications, RCTP comprises $RCTP_{ATSU}$, $RCTP_{AS}$, $RCTP_{AS/AIR}$ and $RCTP_{CSP}$.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace. (ICAO)

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Required surveillance performance (RSP). A statement of the performance requirements for operational surveillance in support of specific ATM functions.

Required surveillance technical performance (RSTP). The portion of the (position reporting) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response.

Note.— For voice communications, RSTP comprises $RSTP_{ATSU}$, $RSTP_{AS}$, $RSTP_{AS/AIR}$ and $RSTP_{CSP}$.

Responder performance criteria. The operational portion of the transaction time to prepare the operational response, and includes the recognition of the instruction, and message composition (e.g. flight crew/HMI for intervention transactions).

RSP answer performance. The operational portion of the transaction time to represent when the radio operator is able to answer the incoming call given the other duties that the radio operator may concurrently be performing.

Note.— RSP answer performance is from when the telephone at the radio operator indicates an incoming call to when the call is actually picked up.

RSP availability (A). The required probability that surveillance information can be provided when needed.

Note.— For voice communications, this translates to any failure prohibiting the call to be initiated to include congestion (much like the analogy of a terrestrial mobile phone network). However, this definition does not apply to a busy condition whereby the entity being called is already on the phone and does not have a way to put the existing call on hold or if able to, rejects the additional incoming call.

RSP call performance. The operational portion of a communication from when the radio operator answers an incoming call to when the parties on the call have completed the communication and the radio operator sends the message to the ATSU.

Term

RSP continuity (C). The required probability that surveillance information can be delivered within the RSP delivery time parameter, either OT or DT 95%, given that the service was available at the start of delivery.

Note.— For voice communications, this translates into 1 out of 1,000 calls or 5 out of 100 calls not being able to conclude their voice delivery within the allotted time (OT or DT 95%, respectively) or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call.

RSP initiator performance. The operational portion of the transaction time to prepare the operational response, and includes the necessary flight deck tasks to compile the voice message position report, finding & selecting the SATVOICE number (e.g. short code) from the aircraft's telephone directory, confirming the correct priority for the call and pressing the "call/send" button.

Note.— RSP initiator performance is from when the flight crew has reached their designated reporting point to when the last digit (call/send) button is pushed in the aircraft to initiate the call.

RSP integrity (I). The required probability that the surveillance information is delivered with no undetected errors.

Note 1.— RSP integrity is defined in terms of the "goodness" of the communication capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}), consistent with RNAV/RNP specifications.

Note 2.— For voice communications, This translates to the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

RSP nominal delivery time (DT 95%). The maximum nominal time within which 95% of surveillance information is required to be successfully delivered.

RSP overdue delivery time (OT). The maximum time for the successful delivery of surveillance information after which the initiator is required to revert to an alternative procedure.

RSP specification. A specification (e.g. RSP 400) that represents the values assigned to RSP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP/SSP and aircraft operator.

RSTP_{AS}. The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the aeronautical station.

Note.— For voice communications, RCTP_{AS} includes two concurrent processes:

a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the communication; and

b) the aeronautical station sends the response to the ATSU via the ground-ground network; the performance is denoted by RCTP_{AS}.

Term

RSTP_{AS/AIR}. The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the air-ground network and associated aircraft components to initiate an air-to-ground call.

Note.— *RSTP_{AS/AIR} begins when the last digit of the dialing sequence is finished and ends when the radio operator receives an indication of an incoming call.*

RSTP_{ATSU}. The overdue (OD) or nominal (DT) transit time for surveillance information from the CSP interface to the ATSU's flight data processing system.

RSTP_{CSP}. The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the CSP.

Satellite communication service provider. Typically provides the inter-working unit of the terrestrial sub-system which connects the satellite ground earth station, or Gateway, and the terrestrial network in support of AMS(R)S. Commonly referred to as SSP (see SSP definition).

Satellite network operations provider. Typically provides the satellite sub-system which includes the satellite(s) and may or may not include the ground earth stations or Gateway. Commonly referred to as SSP (see SSP definition)

Satellite service provider (SSP). An entity or group of entities that provide, via satellite, aeronautical fixed services and/or aeronautical mobile services at least from the signal in space to/from aircraft, to the attachment point of the ground earth station (GES) to the ground communication services network.

SATVOICE number. The number used to contact an aircraft or ground facility via SATVOICE.

Note.— *The SATVOICE number takes different forms:*

a) *After the access number has been dialed, the aircraft SATVOICE number is the ICAO aircraft address represented by an 8-digit octal code;*

b) *The ATSU or aeronautical station SATVOICE number is a 6-digit short code or a PSTN direct dial number, which are published on aeronautical charts, AIP (or equivalent publication); and*

c) *AOC SATVOICE number is a PSTN direct dial number.*

Service availability (A_{CSP}). The required probability that the communication service is available to all users in a specific airspace when desired.

Surveillance data. Information pertaining to the identification of aircraft and/or obstructions for route conformance monitoring and safety and efficient conduct of flight.

Note.— *In this document, surveillance data applies to voice position reports similar in nature to HF voice position reports, except it is conducted using SATVOICE.*

Term

Terrestrial Network Service Provider. Typically provides the aviation centric terrestrial sub-system which provides connectivity to the end-users, such as ATS providers, airlines and flight departments. Commonly referred to as CSP (see CSP Definition).

Unplanned outage duration (minutes). The time from when an unplanned outage begins to when the ATSU receives notification that the service has been restored.

Unplanned outage duration limit (minutes). A criterion applied to a given operational airspace or FIR that defines the maximum time for the duration of an unplanned outage at which time there is an operational impact.

Unplanned outage notification delay (min). Notification to the ATSU of an unplanned outage. Measured from when the unplanned outage begins to when the ATSU receives notification.

1.2 Acronyms

ACC	Area control centre (ICAO)
ACP	Actual communication performance
ACTP	Actual communication technical performance
AIP	Aeronautical Information Publication (ICAO)
AMS(R)S	Aeronautical mobile satellite (route) service (ICAO)
AOC	Aeronautical operational control (ICAO)
ATC	Air traffic control (ICAO)
ATM	Air traffic management (ICAO)
ANSP	Air navigation service provider
ATS	Air traffic service (ICAO)
ATSU	ATS unit
C	Continuity
CLI	Caller line identification
CNS	Communications, navigation and surveillance (ICAO)
CNS/ATM	Communications, navigation and surveillance/air traffic management (ICAO)

COM	Communications, (ICAO)
CSP	Communication service provider
CTA	Control area (ICAO)
DCPC	Direct controller pilot communications
DRT	Diagnostic rhyme test (ANSI/ASA S3.2-2009)
EMERG	Emergency (ICAO)
ETD	Estimated time of departure or estimating departure (ICAO)
FANS 1/A	Future air navigation system 1/A <i>Note.— As defined by RTCA DO-258A/EUROCAE ED-100A, or previous standards that defined the FANS 1/A capability. FANS 1/A generally means that the data link system on an aircraft, the ATSU ground system, and communication service provision comply with the standard. In certain cases, specific reference is made to a particular type of FANS 1/A aircraft as follows:</i> <i>a) FANS 1/A+ means that the aircraft completely complies with Revision A of the standard, which includes message latency timer; and</i> <i>b) FANS 1/A ADS-C means that the aircraft complies with data link initiation capability and ADS-C applications, but does not include the CPDLC application.</i>
FANS	Future air navigation system
FIR	Flight information region (ICAO)
FMC WPR	Flight management computer waypoint position reporting
GEO	Geosynchronous earth orbit
GES	Ground earth station
GMSS	Global mobile satellite system
GOLD	Global Operational Data Link Document
HF	High frequency (3-30 Mhz) (ICAO)
ICD	Interface control document
LEO	Low earth orbit
LRCS	Long-range communication system
MEL	Minimum equipment list (ICAO)

MEO	Medium earth orbit
MET	Meteorological or meteorology (ICAO)
MMEL	Master minimum equipment list (ICAO)
PIN	Personal identification number
PSTN	Public switched telephone network
RCP	Required communication performance
RCTP	Required communication technical performance
RGS	Radio ground station
RNAV	Area navigation
RNP	Required navigation performance
RSP	Required surveillance performance
RSTP	Required surveillance technical performance
RTF	Radiotelephone (ICAO)
SARPs	Standards and Recommended Practices (ICAO)
SATCOM	Satellite communication (ICAO)
SATVOICE	Satellite voice
SELCAL	Selective calling system (ICAO)
SSP	Satellite service provider
VHF	Very high frequency (30-300 MHz) (ICAO)

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Appendix D to the Report on Agenda Item 3.4

Chapter 2. Overview of aeronautical SATVOICE system

2.1 General

2.1.1 This guidance material is intended for use of SATVOICE to provide ATS communications, in accordance with AIPs (or equivalent publication), Doc 7030 and under the following conditions:

- a) the aircraft equipment is approved by the State of the Operator or the State of Registry;
- b) the flight crew communicates with the appropriate aeronautical station or ATS unit; and
- c) when prescribed, while operating in an HF air-ground communications environment, the flight crew operates SELCAL or maintains a listening watch on the assigned HF frequency.

2.1.2 Dedicated SATVOICE numbers for aeronautical stations and air traffic services units (ATSUs) are published in AIPs (or equivalent publication) where a SATVOICE service is available.

2.1.3 SATVOICE provides a means of reducing the risk of communication failures, improving safety and efficiency of operations and alleviating HF/VHF channel congestion. SATVOICE can improve current ATS communications via a radio operator and provide direct controller-pilot communications (DCPC) for more efficient ATS communications, such as in processing negotiations or requests from the flight crew.

2.1.4 SATVOICE could potentially be considered a LRCS as defined by State MMEL/MEL policies. When approving reduced carriage requirements for HF radio, States may allow aircraft to operate with only one serviceable HF radio. However, airspace requirements will take precedence over the MMEL/MEL requirements. This guidance material may facilitate alignment of airspace requirements with State (or Regional) MMEL/MEL policies and LRCS requirements (See also **paragraph 3.3.2**).

Note 1.— HF voice is the only LRCS currently available for ATC communications in many areas. Therefore, this guidance material assumes that in areas requiring two operational LRCSs, at least one will need to be HF voice, and in areas requiring one LRCS, that system will need to be HF voice.

Note 2.— In procedural airspace where CPDLC and ADS-C is available and the aircraft is capable, the controller would normally choose CPDLC and ADS-C as the means of communication. However, the controller may choose to use SATVOICE for DCPC, when necessary, as opposed to relaying through the radio operator. SATVOICE is not a replacement for ADS-C/CPDLC or HF/VHF voice via a radio operator.

Note 3.— This guidance material does not address the use of portable SATVOICE phones, which are not allowed by national regulations of many States.

2.2 Aeronautical SATVOICE system overview

2.2.1 This section provides an overview of the aeronautical SATVOICE systems concerning SATVOICE services. A full description of these systems is beyond the scope of this document. **Appendix A** provides a high level future concept of operations and considerations for the development of future SATVOICE systems.

2.2.2 Satellite communication systems are defined by three different altitude orbits; low earth orbit (LEO), medium earth orbit (MEO) and geosynchronous earth orbit (GEO). The altitude of the orbit determines the area illuminated by the satellite. The higher the orbit the weaker the signal is from the

satellite, but it has a much larger footprint. Propagation loss is overcome by increased complexity of the antenna systems along with higher transmitter power. Conversely, a LEO satellite's footprint is much smaller requiring a higher number of satellites to provide coverage, but the antennas used are much simpler along with reduced radio frequency power requirement on the subscriber end. Also, the lifetime of a LEO satellite is less due to drag caused by the close proximity of earth.

2.2.3 There are three satellite systems servicing the aeronautical market. Inmarsat and Japan operate GEO satellite systems, and Iridium operates a LEO satellite system. These satellite systems use AMS(R)S L-band frequencies reserved for aeronautical safety services.

2.2.4 **Figure 2-1** provides an overview of the aeronautical SATVOICE system and shows the various components that make up the complete system, including the ANSP(s), ATS unit(s), aeronautical station(s), CSP(s), SSP(s), PSTN, aircraft and the aircraft operator(s).

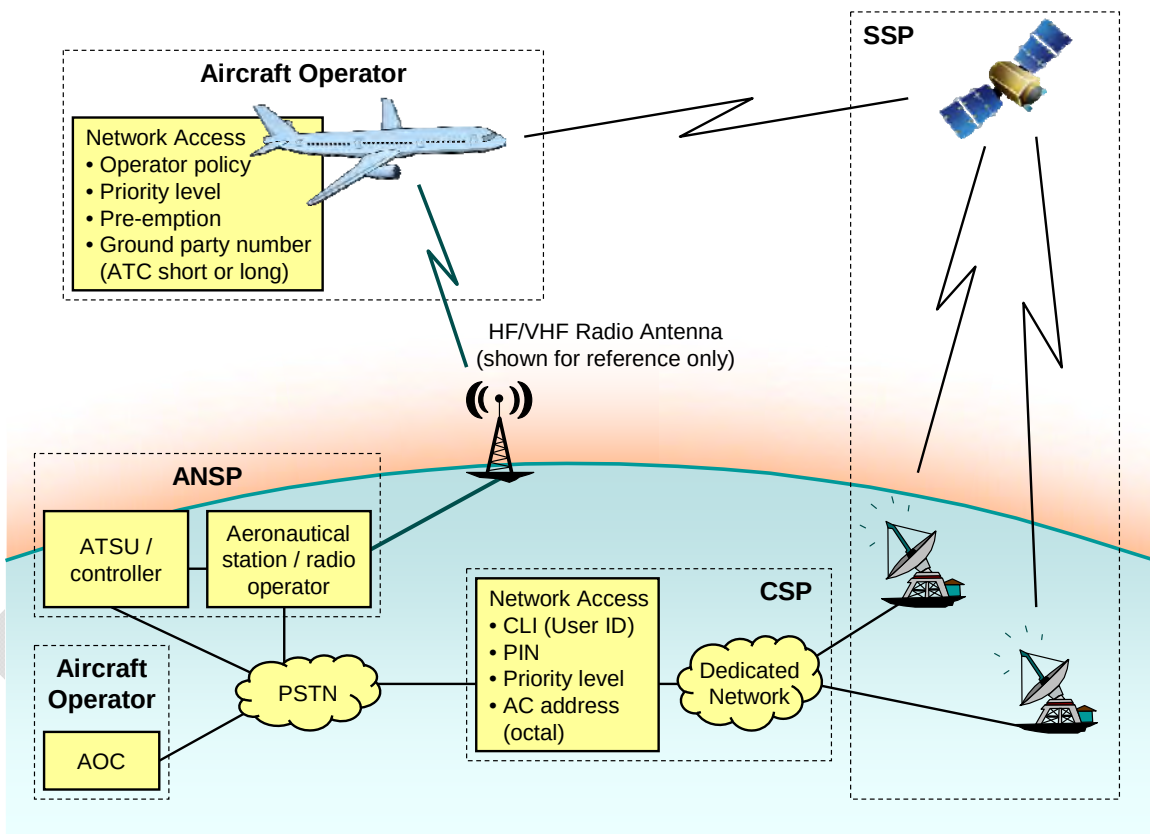


Figure 2-1. Aeronautical SATVOICE system overview

2.3 Iridium

2.3.1 Iridium uses a constellation of 66 satellites at an altitude of 780 km (450 miles) in six orbital planes, with eleven satellites in each orbital plane, providing global coverage. Additionally there are a number of spare satellites to replace any in-orbit failures. At that altitude each satellite covers a circular area of 4,700 km (2,900 miles) and is in-view to a location on the ground for approximately 9 minutes. Using a small amount of overlap in coverage between each satellite, the Iridium network hands-

off the call to the next satellite coming into view to the ground location. This is similar to a GSM cellular telephone system where the subscriber moves from one cell site to another except that the satellite is the moving vehicle. The speed of the aircraft appears almost stationary compared to the speed the satellite moves.

2.3.2 Iridium uses a combination of both frequency and time multiplexing along with 48 spot beams developed by the phased array antenna from each satellite. The frequency band used by subscribers are within L-band AMS(R)S 1,616 MHz to 1,626.5 MHz block. Iridium transmits and receives on this single block by multiplexing time slots to control the direction of the signal. This L-band connection from the satellite to the mobile subscriber is cross-linked via inter-satellite connectivity using Ka-band frequencies. Each satellite connects to the satellite in front, behind and to each side on Ka-band. This inter-satellite Ka-band connection is routed within the satellite constellation to the ground station gateway in Tempe, Arizona. Connectivity in Tempe is also on the Ka-band. Iridium's reliability is affected by rain fade on Ka-band to the Tempe gateway. A second ground earth station is being considered to minimize the effects of rain fade.

2.3.3 Iridium's new constellation, referred to as Iridium Next, will replenish the existing constellation with next generation satellites in the same orbital planes. These satellites will be fully backwards compatible to existing Iridium transceivers, but new services and features will also be introduced to properly equipped aircraft.

2.4 Inmarsat

2.4.1 The Inmarsat network of satellites is in geostationary orbit directly above the earth equator at an altitude of 35,786 km (22,236 miles). At that altitude above earth, each satellite's footprint covers approximately 120 degrees of the earth at the equator and to approximately 82 degrees North and 82 degrees South latitude. The orbital period of each satellite is exactly the same as the rotation period of earth so each satellite appears to remain in the same position. Inmarsat periodically renews its satellite constellations and operates both I-3 and I-4 generation satellites.

2.4.2 There are three new I-4 (Alphasat will become the 4th I-4) and four I-3 satellites providing aviation services, to include PSTN-based voice. L-band frequencies allocated for aviation AMS(R)S are split between a transmit and receive block. This allows the subscriber unit using a frequency duplexer to receive and transmit simultaneously. Inmarsat's primary transmit frequency allocation is adjacent to Iridium's allocation used for both transmit and receive; this can cause interference to the secondary Iridium receive allocation when the aircraft operator desires both satellite services to operate simultaneously and on the same aircraft.

2.4.3 SwiftBroadband (SBB) is the next Safety Services technology to be introduced after Classic Aero. SBB is only available on the Inmarsat I-4 satellites providing such services as PSTN voice, but will also introduce new capabilities to properly equipped aircraft.

2.5 Japan multi-function transport satellite (MTSAT)

2.5.1 MTSAT is a GEO satellite system. The functionality is equivalent to that of an Inmarsat I-3 except that the coverage footprint is limited to Asia and the Pacific Ocean centered over Japan. MTSAT is therefore interoperable with the I-3 constellation so that the subscriber unit can logon between MTSAT and I-3 (and Classic Aero services of I-4) when the correct commercial service provisions are in place.

2.5.2 MTSAT consists of two satellites in a hot spare configuration. MTSAT-1R provides the primary communications link and if there be a problem with that satellite, MTSAT-2 will step in as the backup. When the end of life timeframe occurs for the MTSAT-1R satellite, it is expected that MTSAT-2 will become the primary communications link with a single layer of satellite coverage instead of two. This is expected to be sufficient given the reliability record of these satellites.

2.6 Access to SATVOICE services

2.6.1 The aeronautical SATVOICE system uses the public switched telephone network (PSTN) and/or dedicated networks to route calls between the aircraft and the appropriate ground party. Dedicated network access switches locate the aircraft anywhere in the world regardless of the satellite and ground earth station (GES) to which the aircraft is logged on.

2.6.2 The SSP authorizes CSPs (or aeronautical communication service providers) to provide network access to users. However, the authorization may allow the CSP to use parts of the network or some of the network access switches that are owned and operated by other parties, which are also authorized by the SSP.

2.6.3 For ground-to-air calls, the ground party initiates the call using a network access number. The access number country code for the appropriate SATVOICE system is provided by the International Telecommunication Union (ITU) and is designated as global mobile satellite systems (GMSS). See **Table 2-2** for an example of ground-to-air call.

Note.— The Inmarsat voice communication service uses a single network access code (SNAC) – 870. The Iridium voice communication service employs telephone number ITU sub-blocks and optionally a United States-based telephone number. Some CSPs may implement network extensions for local routing access in the country of the caller, and manage the routing of these calls to the aircraft.

2.6.4 Once connected to the network access switch, the ground party/system provides at least the following information to route the call to the aircraft:

- a) user identification (ID) [Iridium only];
- b) personal identification number (PIN);
- c) priority level as defined in **Table 2-1**; and
- d) aircraft address in octal code (derived from the hexadecimal aircraft address or, in some cases maintained in a data base that is correlated with aircraft registration, in the flight plan).

2.6.5 The user ID [Iridium only] and/or PIN are provided by the CSP when obtaining access to the network and is used to secure the call.

2.6.6 The priority level will conform to the provisions of Doc 9925, which are reproduced in **Table 2-1**. The priority level is used by dedicated networks and the aircraft system to pre-empt calls of a lower priority, if necessary, and establish precedence for an incoming call of a higher priority. In some cases, the priority level may be determined by the network access switch based on the CLI from the ground party.

Table 2-1. Priority levels for SATVOICE calls

Priority level	Application category	SATVOICE call examples
1 / EMG / Q15 Emergency (highest) Safety of Flight	Distress and urgency For use by either ANSP or AOC.	Rapid descent, Urgent weather deviation
2 / HGH / Q12 Operational High (second highest) Safety of Flight	Flight safety Typically assigned to calls for ANSP.	Altitude request
3 / LOW / Q10 Operational Low (third highest) Safety of Flight	Regularity of flight, meteorological, administrative Typically assigned to calls for aeronautical operational control (AOC).	Air traffic information service, redispatch, maintenance
4 / PUB / Q9 Nonoperational (lowest) Nonsafety	Public correspondence	Public phone calls

2.6.7 The SATVOICE number consists of an octal representation of the aircraft address, which is provided in the flight plan expressed in the form of an alphanumerical code of six hexadecimal characters. In cases where aircraft registration is used, the ground party/system uses a means to correlate the aircraft registration with the aircraft address represented in octal code.

2.6.8 The network access switch may use and provide to the receiving party the caller line identification (CLI) provided by the PSTN network. However, some countries may not allow its use.

Table 2-2. Example of ground-to-air call

Step	Description
Network access	All ground initiated calls will have to route through a network access switch via an access number.
User ID [Iridium only]	For Iridium, the SSP assigns a user ID, which the CSP provides to the aircraft operating agency, aeronautical station or ATSU. Each caller will have to input a 4 digit user ID. The call will be dropped after three invalid entries.
Personal identification number (PIN)	The SSP assigns a PIN, which the CSP provides to the aircraft operating agency, aeronautical station or ATSU. Each caller will have to input a 4 digit PIN code. The call will be dropped after three invalid entries.
Call priority level	A priority level per Table 2-1 is assigned to the call, typically by a default value. The caller may be able to override the default value at the time the call is made.

Step	Description
Aircraft address	The caller enters the aircraft address – represented in octal code – of the aircraft they wish to call. This aircraft address is typically selected from a data base through human-machine interface. The call will be dropped after three invalid entries.
Call attempt	The network access switch initiates the call to the aircraft. The network access switch will provide appropriate information (e.g. CLI, facility name, priority level) for use by the aircraft system.
Call connect	The aircraft receives incoming call and provides indication to the flight crew. The aircraft system may pre-empt a lower priority call to establish precedence for a higher priority incoming call.
Call answer	The flight crew answers the incoming call.

2.6.9 For air-to-ground calls, the aircraft initiates the call by providing the SATVOICE number (e.g. short code assigned to the aeronautical station or air traffic service unit (ATSU), or the long code for the ground party, and the priority level for the call). Calls may be restricted by aircraft operator policy. See **Table 2-3** for example of air-to-ground call.

Table 2-3. Example of air-to-ground call

Step	Description
Network access	The flight crew can initiate the call through the control/display unit or handset. For the SATVOICE number, the flight crew can elect to use a short code assigned to the aeronautical station/ATSU or long number to place call. The aircraft operator may implement policies that restrict calls.
Call priority level	A priority level per Table 2-1 is assigned to the call, typically by a default value. The caller may be able to override the default value at the time the call is made. The aircraft system may pre-empt a lower priority call to establish precedence for a higher priority outgoing call.
Call attempt	The aircraft satellite data unit (SDU) initiates the call to the network access switch. If a short code is used for the SATVOICE number to place the call, the network access switch will translate the short code to the long number to connect the call to the PSTN. The network access switch will provide appropriate information (e.g. CLI, aircraft address, priority level) for use by the aeronautical station/ATSU.
Call connect	The aeronautical station/ATSU receives incoming call and provides indication to the radio operator/controller.
Call answer	The radio operator/controller answers the incoming call.

Chapter 3. Administrative provisions related to SATVOICE operations

3.1 General

3.1.1 The principle of certification and subsequent continued surveillance (or “oversight”) of aviation operators is established in Annexes to the Chicago Convention, for example, Annex 6 Part I for commercial air transport operators.

3.1.2 Annex 11 (Air Traffic Services) requires States to establish a State safety programme, which clarifies that States need to establish effective mechanisms to inspect and audit ANSPs in order to ensure effective safety oversight.

3.1.3 Chapter 2 (i.e. Administrative provisions for the international telecommunication service) of Annex 10, Volume II, also contains standards for the “supervision” of the communication services by the appropriate authority designated by the State. Annex 11, paragraph 2.27.4, Note 2, clarifies that, when communication services are directly provided by an ANSP, their oversight is through the State safety programme and the safety management system (SMS) established by the ANSP. If communication services are contracted to an entity other than the ANSP, the SMS requirement applies to those services with direct operational implications (e.g. communications used for ATS purposes).

3.1.4 In accordance with specific ICAO standards, an aviation organization (commercial air transport operator, aerodrome operator, ANSP) is under safety oversight by the appropriate authority. Organizations under safety oversight should take responsibility for the safe, regular and efficient conduct of operations, including for the services provided by any contractors.

Note.— For instance, this latter ICAO provision is transposed in the EU by so called “EU-OPS” in respect of commercial air transport operators and by so called “common requirements ” for ANSPs.

3.1.5 When communication services are negotiated, as depicted in **Figure 3-1**, the ANSP or aircraft operator should demonstrate to the appropriate authority that proper mechanisms exist to oversee the contracted CSP.

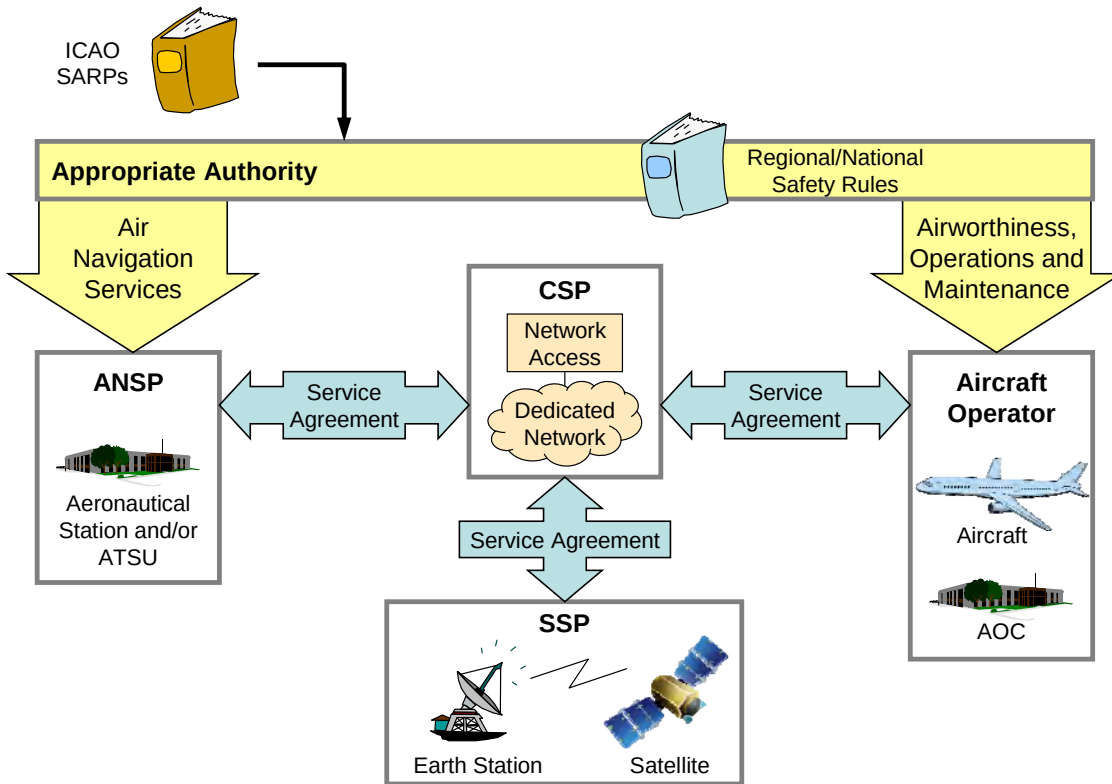


Figure 3-1. SATVOICE communication services contracted by organizations

3.2 ANSP SATVOICE service provision

3.2.1 When providing SATVOICE services whether through an aeronautical station or an ATSU, the ANSP should provide these services consistent with voice communication standards and recommended practices, in accordance with Doc 4444, Doc 7030, Doc 9432 and Annex 10, Volume II.

3.2.2 ANSP SATVOICE system validation and operational readiness

3.2.2.1 The ANSP should ensure a validation process that confirms their equipment and procedures and/or its aeronautical stations/ATSUs provide reliable and adequate SATVOICE services for the intended use. This process should include:

- a) A system safety assessment which demonstrates that the service provision meets the safety objectives. The ANSP should conduct a system safety assessment through a functional hazard analysis or a documented system safety case for initial implementation as well as for future enhancements; and
- b) Integration test results confirming interoperability for operational use of the aircraft and ground systems.

3.2.2.2 Following the safety assessment, the ANSP should institute measures including its aeronautical stations, ATSUs, CSPs and SSPs, to ensure acceptable mitigation of the identified failure conditions.

3.2.2.3 When SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP or RSP, the ANSP should ensure that the SATVOICE services it provides meets the performance specifications provided at **Appendix B** for RCP specifications and **Appendix C** for RSP specifications, and that its aeronautical stations, ATSUs, CSPs and SSPs meet their performance allocations under expected capacity and loading conditions.

Note.— Per Doc 9869, paragraph 3.2.7, RCP-400 is intended to be applicable to the SATVOICE capability for controller intervention. RSP-400, which is an adaptation of the RCP concept defined in Doc 9869 and the operational performance criteria defined in the GOLD, is intended to be applicable to the SATVOICE capability for surveillance.

3.2.2.4 The ANSP should ensure that the controllers and radio operators receive appropriate training in accordance with ICAO Annex 1 taking into account the guidance material contained in this document, and obtain any necessary approval from the State.

3.2.2.5 The ANSP should ensure that the SATVOICE service provision meets applicable security requirements, considering its ATSUs/controllers and/or its aeronautical stations/radio operators.

Note.— This guidance includes means to secure SATVOICE calls through SSPs authorizing CSPs to provide SATVOICE services, CSPs administering accounts to authorized subscribers with PIN and priority level calling, restricting calls to the flight deck and/or alerting the flight crew of call priority.

3.2.2.6 The ANSP should ensure that the SATVOICE services provided by its ATSUs, aeronautical stations, CSP(s) and SSP(s) meet applicable safety requirements. Where SATVOICE is subject to performance specifications provided in **Appendix B** and **Appendix C**, **Appendix D** provides guidance on post-implementation monitoring, problem reporting, analysis and corrective action.

3.2.2.7 In accordance with Annex 11, paragraph 6.1.1.2 and 6.1.1.3, and Annex 10, Volume II, paragraph 3.1.1.5, the ANSP should determine recording requirements and ensure that its ATSUs, aeronautical stations, CSP(s) and SSPs, as appropriate, retain records of SATVOICE for at least 30 days to allow for accident/incident investigation purposes. The ANSP, including their CSP(s) and SSP(s), should make these records available for air safety investigative purposes.

3.2.3 Aeronautical information, notifications, and interfacility agreements

3.2.3.1 The ANSP should ensure that aircraft operators are notified of SATVOICE services using the AIP (or equivalent publication), which includes:

- a) SATVOICE number(s) for each air traffic services unit and aeronautical station equipped to receive SATVOICE calls ;
- b) Requirements for use (e.g. criteria for when to contact the ATS unit or aeronautical station); and
- c) Flight planning requirements.

3.2.3.2 The ANSP should establish procedures to provide aeronautical stations, ATS units and aircraft operators with notifications of SATVOICE service outages, performance degradation, and restoration.

Note.— See **paragraph 3.2.5.5** for CSP guidance to provide notifications, as appropriate. For example, based on notifications received from CSP, the ANSP would use NOTAMs for short term notifications and AIP (or equivalent publication) for longer term notifications. Per Annex 10, Volume II, NOTAMs are required for planned system shutdown of the communications network.

3.2.3.3 When the controller uses SATVOICE for DCPC, the ANSP may need to establish interfacility agreements with the aeronautical station concerning coordination of communications with the aircraft. If applicable, such agreements should specify whether and how ATC clearances and instructions provided via DCPC should be copied to the aeronautical station for their information.

3.2.4 Considerations for the aeronautical station/ATSU

3.2.4.1 To provide SATVOICE communication services, the aeronautical station/ATSU should be able to accept or place a SATVOICE call given the necessary infrastructure to handle the expected SATVOICE traffic demand and in accordance with performance specifications as prescribed in Regional SUPPs, AIP (or equivalent publication).

Note.— This document considers that sufficient HF/VHF voice infrastructure will remain in service and that the aircraft will be equipped with at least one operational HF/VHF voice system.

3.2.4.2 When supporting SATVOICE, the aeronautical station/ATSU should establish procedures and/or provide ATC automation, networks and infrastructure that allow the radio operator/controller to:

- a) Maintain access numbers for satellite services and SATVOICE numbers for aircraft with SATVOICE capability (See also **paragraph 3.2.2.5**);
- b) Provide SATVOICE services in accordance with **Chapter 4**;
- c) Dial the appropriate access number(s);
- d) Prioritize, preempt and establish precedence on an outgoing SATVOICE call using the personal identification number (PIN) for networks, priority level accordance with **Table 2-1**, and SATVOICE number for the aircraft converted from the aircraft address obtained from the flight plan;
- e) Receive a SATVOICE call from an aircraft and route the call to the appropriate radio operator/controller;
- f) If CLI is used to display an incoming SATVOICE call, display the aircraft identification to the radio operator/controller;
- g) Report in-service difficulties and to resolve identified problems; and
- h) Exchange air traffic control information in accordance with any interfacility agreements as per **paragraph 3.2.3.3**.

Note.— Concerning item c), if the aircraft address is not available from the flight plan, the SATVOICE number may be determined by a database lookup using the aircraft registration as the key. However, in such cases, if the octal code/aircraft registration is not in the data base or the octal code/aircraft registration changes after that last data base update, the SATVOICE number may not be obtainable.

3.2.5 Considerations for the communication service provider (CSP)

3.2.5.1 The CSP should ensure that the SATVOICE service meets the performance criteria as specified by the aeronautical station or ANSP.

3.2.5.2 The CSP should ensure that the network access switch only processes authorized calls.

3.2.5.3 The CSP should ensure that the network access switch processes priority calls in accordance with **Table 2-1**.

3.2.5.4 The CSP should establish means for aeronautical stations, ATSUs and aircraft operators to report in-service difficulties and to resolve identified problems.

3.2.5.5 The CSP should provide notification of SATVOICE service outages, performance degradation, and restoration in accordance with procedures established by the ANSP and/or aircraft operator.

3.2.5.6 For those situations when SATVOICE communication services cannot continue to be provided, the CSP should inform the involved ANSPs, aircraft operators and, if appropriate, aeronautical data providers.

3.2.5.7 The CSP should ensure service agreements, such as with the SSP as shown in **Figure 3-1**, include relevant specifications for services and associated systems that are owned and operated by other parties.

3.2.6 Considerations for the satellite service provider (SSP)

3.2.6.1 The SSP should ensure that the SATVOICE service meets the performance criteria as specified by the CSP.

3.2.6.2 The SSP should ensure that it only processes calls from authorized sources.

3.2.6.3 The SSP should ensure that the SATVOICE service prioritizes SATVOICE calls in accordance with **Table 2-1** and provides an indication of the priority level of the call to the recipient's system.

3.2.6.4 The SSP should provide notification of SATVOICE service outages, performance degradation, and restoration to its CSPs.

3.3 Aircraft operator eligibility

3.3.1 Operational authorization to use SATVOICE communications

3.3.1.1 When using SATVOICE equipment, the aircraft operator should address flight crew training and qualification, maintenance, MEL, user modifiable software and service agreements with the CSP. In addition, the aircraft operator should ensure that aircraft equipment has been approved, and that the AIP (or equivalent publication) indicates that the SATVOICE service has been approved for the intended use in the particular FIRs for the flight.

Note.— A specific or written operational authorization from the State of Registry or State of the Operator is typically not required to use SATVOICE equipment. However, a State may under certain circumstances require explicit approval.

3.3.2 Long range communication systems (LRCS) to be carried on board

3.3.2.1 The State of the Operator and/or State of Registry establish the minimum number of LRCSs to be carried on board. In principle, where two LRCSs are required, one SATVOICE system and

one HF voice system could be approved for flight operations where both services are available for routine communications, as follows:

- a) An HF radio is considered to be LRCS; and
- b) Other (e.g. SATVOICE) two-way radio equipment may be used if allowed by the relevant airspace procedures.

Note 1.— EASA is considering rules and means of compliance that would allow for one SATVOICE system and one HF communication system, providing that said services are available for routine communications.

Note 2.— The FAA Policy Letter (PL)-106 provides MMEL relief that allows one HF communication system, if the SATVOICE system is approved as a LRCS.

3.3.2.2 When intending to use SATVOICE to satisfy requirements for communications equipage, the aircraft operator should ensure that installed equipment is operational when commencing a flight and there are no notifications of SATVOICE service outage on the route of flight. However, experience has demonstrated that temporary unserviceable equipment may be tolerated in some cases. Several ICAO Contracting States hence require aircraft manufacturers to provide a Master MEL (MMEL). The MMEL contains a list of which equipment can be tolerated as unserviceable at commencement of flight and for how long. The MMEL is approved by the authority designated by the State of Design.

Note.— For example, the State of Design is the FAA for the United States and EASA for European Union States.

3.3.2.3 The aircraft operator should establish a Minimum Equipment List (MEL), based upon, but no less restrictive than the relevant MMEL. The aircraft operator obtains approval of the MEL from the State of the Operator or State of Registry.

Note.— For example, see rule OPS 1.030 in the EU.

3.3.2.4 If changes to the Minimum Equipment List (MEL) are desired to allow dispatch with one SATVOICE system and only one HF radio system, the aircraft operator should obtain approval or acceptance from the State of the Operator or State of Registry. However, regardless of MEL, the aircraft operator will need to carry radio equipment required by the applicable airspace requirements as provided in AIP (or equivalent publication).

3.3.3 Considerations for aircraft operations and maintenance

3.3.3.1 The aircraft operator should establish policy and procedures for flight crews and other staff (e.g. dispatchers, maintenance personnel) involved in SATVOICE operations, and incorporate them in appropriate operation manuals, maintenance manuals and training material. These materials should include:

- a) Description of the SATVOICE system;
- b) Flight manual operating procedures, including operating and maintenance manuals for the system, and any limitations;
- c) Master minimum equipment list/minimum equipment list (MMEL/MEL) and implications of flights departing under MEL relief
- d) Flight planning requirements for SATVOICE per **paragraph 3.4;**

e) Procedures for SATVOICE operations taking into account guidance for the flight crew provided in **Chapter 5**;

f) Procedures for notifying flight operations, the flight crews and the appropriate ANSPs of failures with the aircraft SATVOICE system or the service;

g) Implications of planned and unplanned SATVOICE service outages, service degradation and aircraft SATVOICE system failures on operations; and

h) Procedures for flight crews and dispatchers to report to the CSP in-service difficulties with the SATVOICE capability and means to resolve identified problems. See **Appendix D, section D.2** for additional guidance on problem reporting and resolution.

3.3.3.2 The aircraft operator should ensure the flight crews and relevant staff receive appropriate training in accordance with ICAO Annex 1 and Annex 6, taking into account the guidance contained in this document, and are licensed, as appropriate.

3.3.3.3 Prior to return to service, the aircraft operator should verify that SATVOICE system installations are operating normally and activated by sending and receiving calls to and from the aircraft in accordance with established operating procedures (e.g. using the aircraft address represented in octal code). The aircraft operator should ensure the aircraft equipage operates per **paragraph 3.3.4** and perform verification tests under the following conditions:

a) new SATVOICE system installation;

b) after performing maintenance (e.g. SIM card change, upgrade or repair) on an existing SATVOICE system installation; and

c) after the aircraft has changed aircraft registration or aircraft address.

Note.— The aircraft operator contacts their CSP to activate the SATVOICE system installation.

3.3.3.4 The aircraft operator should deactivate any SATVOICE system on aircraft sold or otherwise removed from the fleet.

Note.— The aircraft operator contacts their CSP to deactivate the SATVOICE system installation.

3.3.3.5 The aircraft operator should negotiate the requirements for SATVOICE services in service agreements with their CSP(s) that meet the guidelines in **paragraph 3.2.5**.

3.3.3.6 When SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP or RSP, the aircraft operator should ensure that its SATVOICE operations meet the requirements allocated to the aircraft operator per performance specifications provided at **Appendix B** and **Appendix C**.

3.3.4 Aircraft equipage

3.3.4.1 The installations should be approved by the State of Registry or State of the Operator in accordance with FAA AC 20-150A (or equivalent). When SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP or RSP, the requirements allocated to the aircraft system per performance specifications provided at **Appendix B** and **Appendix C**, and verified to comply with the following, as appropriate, for the type of system installed:

a) RTCA DO-210D, Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS);

- b) RTCA DO-262A, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS);
- c) ARINC 741, Aviation Satellite Communication System;
- d) ARINC 761 (Iridium & Inmarsat-2G); and
- e) ARINC 781 (Inmarsat-3G).

Note 1.— The above criteria apply to the SATVOICE system installation intended for ATS communications.

*Note 2.— Some legacy aircraft SATVOICE systems do not provide alerts of equipment failures to the flight crew. In such cases, flight crew procedures may provide a means to determine system status (e.g. review of signal strength and “log on” status) to comply with MMEL/MEL requirements and AIP (or equivalent publication). See **paragraph 5.1.4**.*

3.3.4.2 If CLI function is provided, the SATVOICE equipment should translate the reported number and display the facility name or the facility designator for the aeronautical station or ATS unit to the flight crew.

3.3.4.3 The SATVOICE equipment should configure the flight deck default priority to level 2 / HGH / Q12 for outgoing ATC calls per **Table 2-1** and automatically pre-empt cabin communications, if necessary to establish the ATC call. Level 4 / PUB / Q9 incoming calls should be restricted to the flight deck. If the aircraft SATVOICE system does not restrict incoming calls, the SATVOICE system should provide an indication (aural or visual) for the flight crew to confirm the call priority level.

Note 1.— The SATVOICE equipment may configure the flight deck default priority to level 3 / LOW / Q10 or allow the flight crew to select priority level 1 / EMG / Q15 for outgoing AOC calls, and accept incoming AOC calls at level 3 / LOW / Q10 or level 1 / EMG / Q15. Default priority levels and policies on routing calls to the flight deck are typically determined by the satellite data unit’s owners requirement table (SDU ORT).

*Note 2.— Some aircraft operators may have aircraft that allow public calls to be routed to the flight deck. See **paragraph 5.3.2** for guidance on flight deck procedures that apply to these aircraft.*

3.3.4.4 The SATVOICE equipment should have the capability for the flight crew to:

- a) override the default priority level when making a call, unless the aircraft SATCOM system provides the appropriate priority level(s) with the SATVOICE number for the aeronautical station, ATSU or AOC for access by the flight crew; and

- b) preempt a passenger cabin call at any time.

3.3.4.5 The aircraft manufacturer or avionics supplier should evaluate the general arrangement and operation of controls, displays, circuit breakers, annunciators, alerts, and any placards for the SATVOICE system. Specifically, the aircraft manufacturer should:

- a) verify that the installation will enable the flight crew to easily initiate and receive calls;
- b) evaluate any self-test features and failure mode displays and annunciators;
- c) evaluate the installation for acceptable identification, accessibility, and visibility;
- d) verify the system is robust by purposely inserting input errors;
- e) evaluate the SATVOICE installation and other aircraft systems for mutual non-interference, which may be associated with radio frequency emissions;

- f) evaluate the integration of the SATVOICE system with other systems;
- g) evaluate other systems, as necessary, to show the SATVOICE system does not interfere with their operation; and
- h) determine whether the SATVOICE system can be used within acceptable workload limits.

3.3.4.6 The aircraft manufacturer or avionics supplier should include in the flight manual, or equivalent, the following:

- a) a description of normal and non-normal procedures for the use of the system, including what actions are expected by the flight crew for each case; and
- b) criteria and intended uses that provide the basis and means of compliance for the airworthiness approval. For example, "The [appropriate authority] has evaluated the SATVOICE system as a supplement to other means of communication, in accordance with FAA AC20-150A. This does not constitute operational approval."

3.4 Flight planning

3.4.1 When filing SATVOICE capability in the flight plan, the aircraft operator should ensure that the planned use of SATVOICE for the flight will be in accordance with regulations, policies and procedures applicable in individual countries and/or FIRs for the flight, as published in documents such as regional supplementary (SUPPs) procedures and AIPs (or equivalent publication).

Note.— Some ANSPs may allow the flight crew to use SATVOICE only for certain types of communications (e.g. of an urgent nature) or may place limitations on use of SATVOICE directly to the controller. Other ANSPs may allow its use only as an additional capability to existing radio equipment carriage requirements (Refer to [paragraph 2.1](#) and [paragraph 3.2.3](#)).

3.4.2 The aircraft operator should ensure that the proper information is included in the ICAO flight plan, which includes one or more type(s) of SATVOICE capability, the aircraft registration and the aircraft address.

3.4.3 After Amendment 1 becomes applicable, the aircraft operator should insert the appropriate indication(s), as follows:

- a) in item 10, insert one or more of "M1" for an INMARSAT RTF capability, "M2" for an MTSAT RTF capability and/or "M3" for an Iridium RTF capability; and .
- b) insert in Item 18, insert:
 - 1) the indicator REG/ followed by the aircraft registration; and
 - 2) the indicator CODE/ followed by the aircraft address expressed in the form of an alphanumerical code of six hexadecimal characters.

Note.— Example: "F00001" is the lowest aircraft address contained in the specific block administered by ICAO. See other examples as shown above.

Example:

(FPL-ACA101-IS
-B773/H-SHXWM1M3/S
-EGLL1400
-N0450F310 L9 UL9 STU285036/M082F310 UL9 LIMRI
52N020W 52N030W 50N040W 49N050W
-CYQX0455 CYYR
-EET/EISNN0026 EGGX0111 020W0136 CYQX0228 040W0330
050W0415 REG/CFIUV EET/EINN0204 SEL/FQHS CODE/C0173E)

Chapter 4. Controller and radio operator procedures

4.1 General

4.1.1 The underlying SATVOICE technology (duplex mode/open mic) lends itself to a conversational mode of communications. Therefore, such use can create misunderstanding and confusion. When using SATVOICE, the radio operator or controller should follow RTF conventions identical to HF/VHF communications in accordance with applicable standards and regulations pertaining to aeronautical communications,

Note. In addition to State and/or Regional standards and requirements, RTF conventions are defined in, for example, Annex 10, Volume II, Chapter 5, Doc 4444, Chapter 12, Doc 9432 and Doc 8400. The communication procedures and examples contained in this document further clarify radio operator and controller procedures when using SATVOICE.

4.1.2 The controller or radio operator should always use full radiotelephony call sign when establishing communication. The controller or radio operator should consider the response, using the calling aeronautical station's call sign followed by the answering aeronautical station's call sign, as the invitation to proceed with transmission by the station calling.

Note.— Caller ID is not currently available in aircraft avionics; however, manufacturers will consider this human factors element for ease of use in future designs.

4.1.3 After contact has been established, the controller or radio operator should permit continuous two-way communication without further identification until termination of the call, except when the call is between more than 2 parties (see **paragraph 4.2.1.3**). Furthermore, when issuing ATC clearances and receiving readbacks for such clearances, the controller or radio operator should adhere to the rules set in Annex 10 Volume II, chapter 5, paragraph 5.2.1.7.3 Radiotelephony Procedures.

4.1.4 When communication between flight crew and ATS is routed via a radio operator, the controller procedures with a radio operator should be the same regardless of the means of communication (e.g. VHF, HF, or SATVOICE) the radio operator uses to communicate with the aircraft.

4.1.5 The controller may use SATVOICE to establish DCPC with an aircraft depending on the policies and procedures established by the ANSP. Refer to **paragraph 3.2**.

Note.— Some ANSPs have SATVOICE capability, but limit the use to emergency and non-routine types of communication, whereas others may accept routine uses. The ANSP will notify aircraft operators of SATVOICE services provided by the controller per AIP (or equivalent publication).

4.1.6 The method of establishing controller or radio operator-initiated calls will be dependent on the technical/operational implementation at each one of the ATSUs and aeronautical stations. However, some steps should be common to each ATSU or aeronautical station regardless of the technical/operational methodology employed. These are:

- a) Identify the aircraft SATVOICE capability (e.g. Iridium, Inmarsat, or MTSAT) and determine the appropriate access number(s) to contact the aircraft;
- b) Derive the SATVOICE number from the information contained in the CODE sub-field of item 18 of the flight plan.

Note.— If the aircraft address is not available from the flight plan, the SATVOICE number may be determined by a database lookup using the aircraft registration as the key. However, in such cases, if the

octal code/aircraft registration is not in the data base or the octal code/aircraft registration changes after that last data base update, the SATVOICE number may not be obtainable.

- c) Initiate the dialing sequence ensuring CLI/PIN and security measures to access the ground earth station are in place;
- d) Use priority levels defined in **Table 2-1**;
- e) Wait for the flight crew to answer the call;
- f) Confirm the aircraft identification/call sign prior to delivering the message;
- g) Initiate the radio telephony conversation and deliver the message;
- h) Advise the aircraft as to the assigned communications media and frequencies, if necessary, upon termination of the SATVOICE call; and
- i) Terminate the call after the conversation is finished.

*Note.— See **paragraph 3.2.4** for guidance on considerations for SATVOICE provisions at the ATSU/aeronautical station.*

4.2 Controller procedures

4.2.1 Outgoing SATVOICE call – controller-initiated call

4.2.1.1 When using SATVOICE for DCPC, the controller should use standard radio telephony procedure to ensure accuracy and clarity. Normally, these messages will be sent at the priority designated as Level 2 / HGH / Q12 per **Table 2-1**.

*Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

Controller	<Initiates call and line rings in flight deck>
Flight crew	United 863
Controller	United 863, Oakland Center, <message>
Flight crew	Oakland Center, United 863, <message response>
Controller	United 863, Oakland Center, <acknowledgement>, <issue communication instructions>, OUT

4.2.1.2 If an ATS unit recognizes that an aircraft is in imminent danger, an ATC instruction is urgent or delivery time is critical, the controller should use the most expeditious means of communications. If SATVOICE is used as the first option, the controller should call the aircraft at the highest priority Level 1 / EMG / Q15 per **Table 2-1**, if possible, and state the threat or deliver the ATC instruction to the aircraft as part of the initial communication. If unable to contact the aircraft via SATVOICE, then the controller should revert to any other means of voice communication, including HF, VHF, or CPDLC, to establish positive communications for that flight and state the threat to the aircraft as part of the initial communication.

*Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

Controller	<Initiates call and line rings in flight deck>
Flight crew	Air France 465
Controller	Air France 465, Auckland Centre, For Severe Weather avoidance, <message>
Flight crew	Auckland Centre, Air France 465, <message response>
Controller	Air France 465, Auckland Centre, <acknowledgement>, <issue communication instructions>, OUT

4.2.1.3 At times it may be necessary for the controller to establish a conference call with more than one aircraft at a time. When this procedure is used the aircraft must be advised that they are on a conference call with more than one aircraft participating.

Note.— When using SATVOICE services to conduct conference calls, it is important that the controller/radio operator and flight crew adhere to proper RTF conventions to mitigate potential confusion owing to inherent delays in SATVOICE transmissions. See paragraphs [4.1.2](#), [4.1.3](#) and [5.1.4](#) for guidance on the use of call-sign and readback.

Example:

Controller	<Initiates calls and line rings in flight deck>
Flight crew	Air France 465
Controller	Air France 465, Oakland Center, Standby we are initiating a conference call with Delta 123 who is initiating an emergency descent in your vicinity due to severe turbulence
Flight crew	Oakland Center, Air France 465, Roger
Controller	<Initiates second calls and line rings in flight deck>
Flight crew	Delta 123
Controller	Delta 123, Oakland Center, You are on conference call with Air France 465 who is in your vicinity at flight level 320. Say your current position and altitude
Flight crew	Oakland Center, Delta 123, Roger, We are 20 miles north of JMROY descending out of flight level 340 for 305
Controller	Delta 123, Oakland Center, Roger, BREAK Air France 465 say current position
Flight crew	Oakland Center, Air France 465, Roger we are currently 5 miles south of JMROY
Controller	Air France 465, Oakland Center, Roger, BREAK Delta 123, say altitude
Flight crew	Oakland Center, Delta 123, Roger, We are maintaining flight level 305
Controller	Delta 123, Oakland Center, Roger, Now Clear of traffic, Descend to flight level 300, Report maintaining flight level 300 on CPDLC
Flight crew	Oakland Center, Delta 123, Roger, Descend to flight level 300, Report Maintaining
Controller	Delta 123, Oakland Center, readback correct, BREAK Air France 465, Traffic is no longer a factor
Flight crew	Oakland Center, Air France 465, Roger

Controller Delta 123, and Air France 465, Oakland Center, <issue communication instructions>, OUT

4.2.1.4 **Figure 4-1** provides a flow chart for SATVOICE calls initiated by the controller to the flight crew. **Table 4-1** provides a table for SATVOICE calls initiated by the controller to the flight crew.

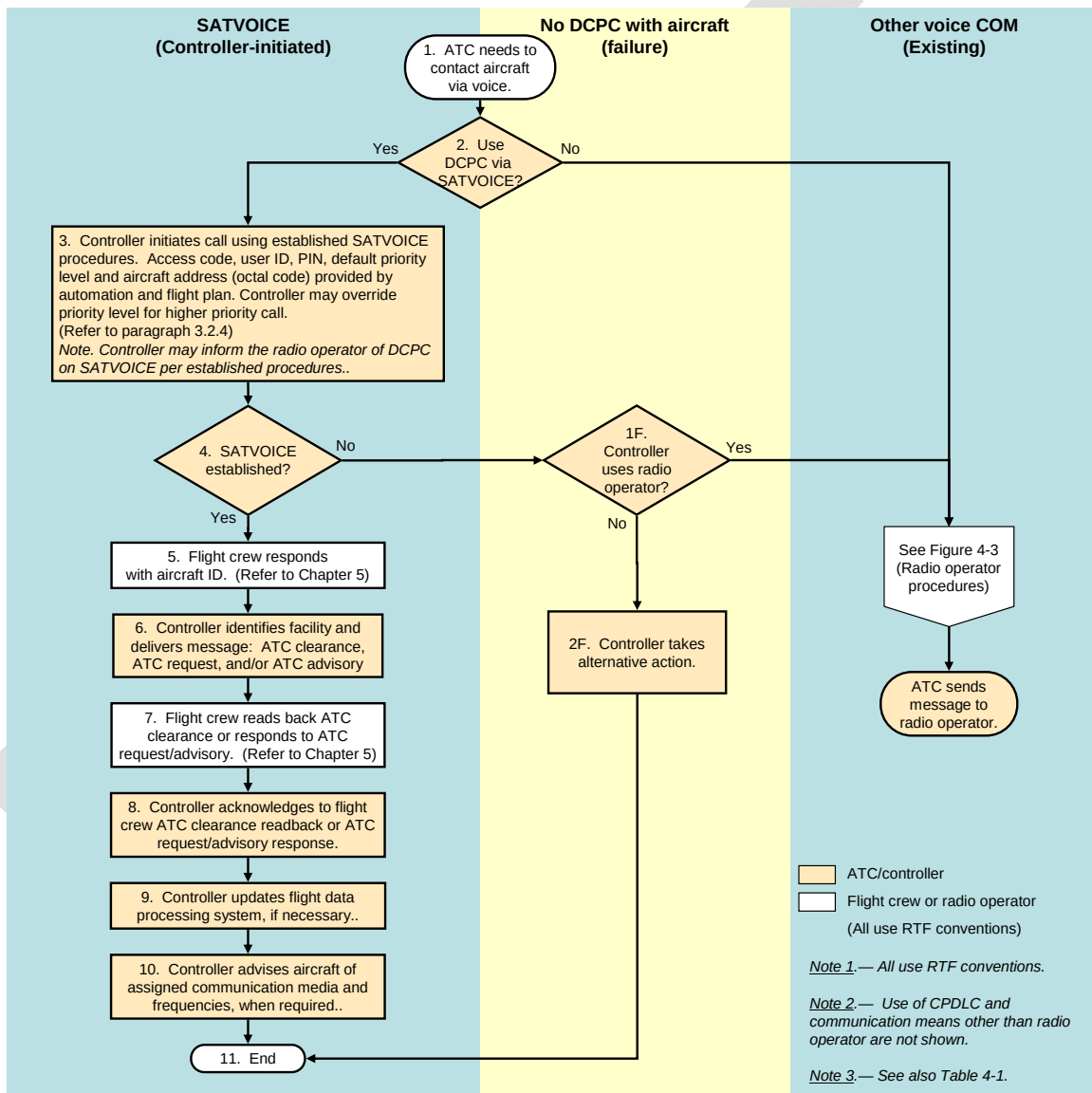


Figure 4-1. Controller-initiated to flight crew SATVOICE call procedures

Table 4-1. Controller-initiated to flight crew SATVOICE call procedures

Ref	Controller-initiated Communication Process	What is done
1	ATC needs to contact an aircraft via voice.	The controller needs to communicate with an aircraft.
2	Use DCPC via SATVOICE?	Decision point – The controller determines that it would be appropriate to contact aircraft using DCPC via SATVOICE. Otherwise, the controller uses the radio operator.
3	ATC initiates call with aircraft using SATVOICE.	The controller initiates the communication using established SATVOICE procedures. The access number, the user ID, if relevant, the PIN, default priority level (level 2 / HGH / Q12 per Table 2-1) and SATVOICE number (aircraft address represented in octal code) are typically provided by automation, data bases and flight plan information. The controller may override the default priority level to initiate a higher priority call (Refer to paragraph 3.2.4). <i>Note.— Controller may inform the radio operator of DCPC on SATVOICE per agreements and established procedures per paragraph 3.2.3.3.</i>
4	SATVOICE established?	Decision point – The controller establishes contact with the aircraft using SATVOICE. If contact with the aircraft cannot be established using DCPC via SATVOICE, the controller may use the radio operator or take alternative action. <i>Note.— If contact with the aircraft cannot be established using DCPC via SATVOICE, the controller follows procedures provided below in the table following step 11.</i>
5	Flight crew responds with aircraft identification.	The flight crew answers the call by stating the aircraft identification/callsign (Refer to Chapter 5).
6	Controller identifies facility and delivers message • ATC Clearance • ATC Request • ATC Advisory	The controller identifies facility and delivers the message – ATC clearance, ATC request or ATC advisory.
7	Flight crew reads back ATC clearance or responds to ATC request/advisory.	For an ATC clearance, the flight crew reads back the clearance verbatim to the controller. For an ATC request or advisory, the flight crew responds to it, as appropriate.
8	Controller acknowledges to flight crew ATC clearance readback or ATC request/advisory pilot response.	The controller acknowledges to the flight crew receipt of the response, as appropriate.
9	ATC updates flight data processing system.	The controller updates the flight data processing system as soon as practicable, if necessary.

Ref	Controller-initiated Communication Process	What is done
10	Controller terminates SATVOICE call.	The controller advises the aircraft as to the assigned communication media and frequencies, when required.
11	End.	End communication either due to successful delivery or controller took alternative action (See below).
Procedures when DCPC using SATVOICE fails		
1F	Controller uses radio operator?	Decision Point – When attempts to establish contact with an aircraft fail using DCPC via SATVOICE, the controller may use the radio operator or take alternative action.
2F	Controller takes alternative action.	The controller may take another action to provide safe and efficient flow of air traffic.

4.2.2 Incoming SATVOICE call – controller receives call

4.2.2.1 When receiving a direct pilot-to-controller communication SATVOICE call, the controller should follow radio telephony practices in responding to the call. Since the flight crew called the controller, the call will generally be ATC priority level 2 / HGH / Q12, but it may be an emergency call priority level 1 / EMG / Q15, depending upon flight status (Refer to **Figure 4-2**, **Table 4-2** and **Table 2-1**).

4.2.2.2 When receiving a SATVOICE call, the controller should:

- a) answer the call by stating the facility designation;
- b) receive the aircraft identification and message;
- c) state the aircraft identification, the facility designation and respond appropriately to the flight;
- d) acknowledge message; read back the message or selected contents, as required; and;
- e) advise the aircraft as to the assigned communications media and frequencies, if necessary, upon termination of the SATVOICE call, when required.

*Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

Flight crew	<Initiates call and line rings at the ATC>
Controller	New York Center
Flight crew	New York Center, Speedbird 255, <message>
Controller	Speedbird 255, New York Center <message response> or <acknowledgement>, <issue communication instructions>, OUT
Flight crew	New York Center, Speedbird 255, <message response>
Controller	Speedbird 255, New York Center, <acknowledgement>, <issue communication instructions>, OUT

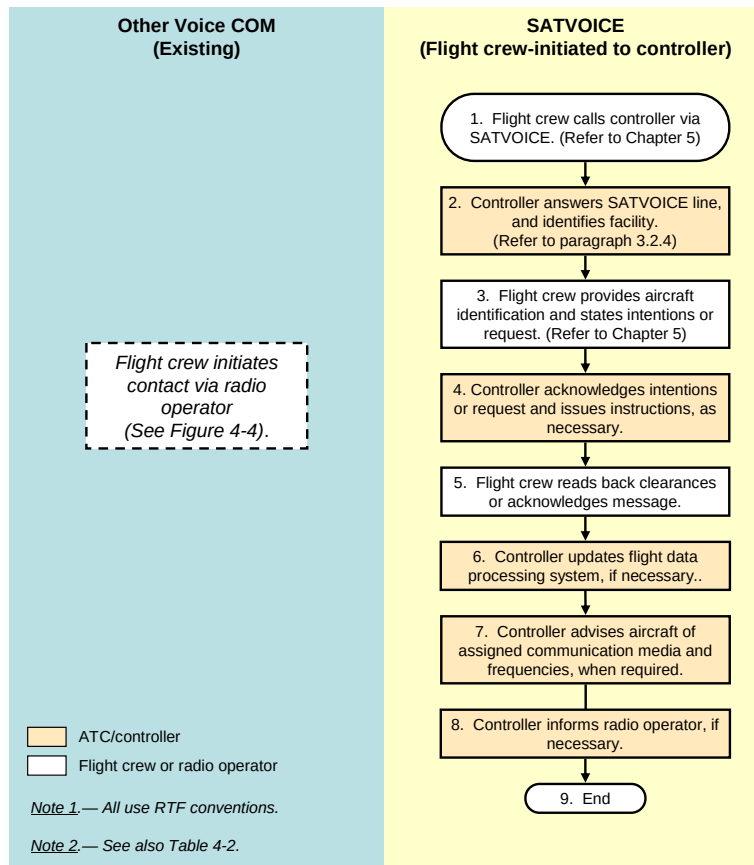


Figure 4-2. Controller receives SATVOICE call procedures

Table 4-2. Controller receives SATVOICE call procedures

Ref	Incoming SATVOICE call communication process	What is done
1	Flight crew calls controller via SATVOICE (Refer to Chapter 5).	The flight crew may decide to call the controller directly.
2	Controller answers SATVOICE line and identifies facility (Refer to paragraph 3.2.4).	The controller answers SATVOICE line and identifies facility. When incoming calls are not automatically routed directly to the controller, the ATSU may establish procedures consistent with intended uses.
3	Flight crew provides aircraft identification and states intentions or request (Refer to Chapter 5).	The flight crew provides aircraft identification and states intentions or request to the controller.
4	Controller acknowledges message and issues instructions as necessary.	The controller responds to the intention or request from the flight crew.

Ref	Incoming SATVOICE call communication process	What is done
5	Flight crew reads back clearances or acknowledges message (Refer to Chapter 5).	When clearances are issued in the instructions, the flight crew reads back the clearance. Otherwise, the instructions are acknowledged.
6	ATC updates flight data processing system.	The controller updates the flight data processing system as soon as practicable, if necessary.
7	Controller terminates SATVOICE call.	The controller advises the aircraft as to the assigned communications media and frequencies, when required.
8	Controller informs radio operator.	The controller informs the radio operator, if necessary, in accordance with agreements and established procedures.
9	End.	End communication activities by acceptance of flight crew's position report or request, and/or update of ATSU flight data processing system.

4.3 Radio operator procedures

4.3.1 Outgoing SATVOICE call – radio operator–initiated call

4.3.1.1 The radio operator may initiate a SATVOICE call to an aircraft in order to transmit ATC instructions on behalf of the controller. These messages generally consist of clearances, requests, or advisories. Normally, these messages will be sent at the priority reserved for ATC traffic, designated as Level 2 / HGH / Q12 per **Table 2-1**. Given the high priority of ATC instructions, the radio operator will use the most expeditious means possible to deliver the messages to meet ATC performance criteria. The conversations will also maintain a standard of radio telephony procedure to ensure accuracy and clarity.

*Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

Radio operator <Initiates call and line rings in flight deck>
 Flight crew Air France 465
 Radio operator Air France 465, Gander Radio, <message>
 Flight crew Gander Radio, Air France 465, <message response>
 Radio operator Air France 465, Gander Radio, <acknowledgement>, <issue communication instructions>, OUT

4.3.1.2 If a radio facility or ATS unit recognizes that an aircraft is in imminent danger, an ATC instruction is urgent or delivery time is critical, the radio operator or controller should use the most expeditious means of communications. If SATVOICE is used as the first attempt, the radio operator or controller should call the aircraft at the highest priority Level 1 / EMG / Q15 per **Table 2-1**, if possible, and state the threat or deliver the ATC instruction to the aircraft as part of the initial communication. If

unable to contact the aircraft via SATVOICE, then the radio operator or controller should revert to any other means of communication, including HF, VHF, or CPDLC, to establish positive communications for that flight and state the threat to the aircraft as part of the initial communication.

*Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

Radio operator	<Initiates call and line rings in flight deck>
Flight crew	Air France 465
Radio operator	Air France 465, Gander Radio, Due to traffic, ATC clears <message>
Flight crew	Gander Radio, Air France 465, <message response>
Radio operator	Air France 465, Gander Radio, <acknowledgement>, <issue communication instructions>, OUT

4.3.1.3 **Figure 4-3** provides a flow chart for SATVOICE calls initiated by the radio operator to the flight crew. **Table 4-3** provides descriptions associated with each number flowchart item.

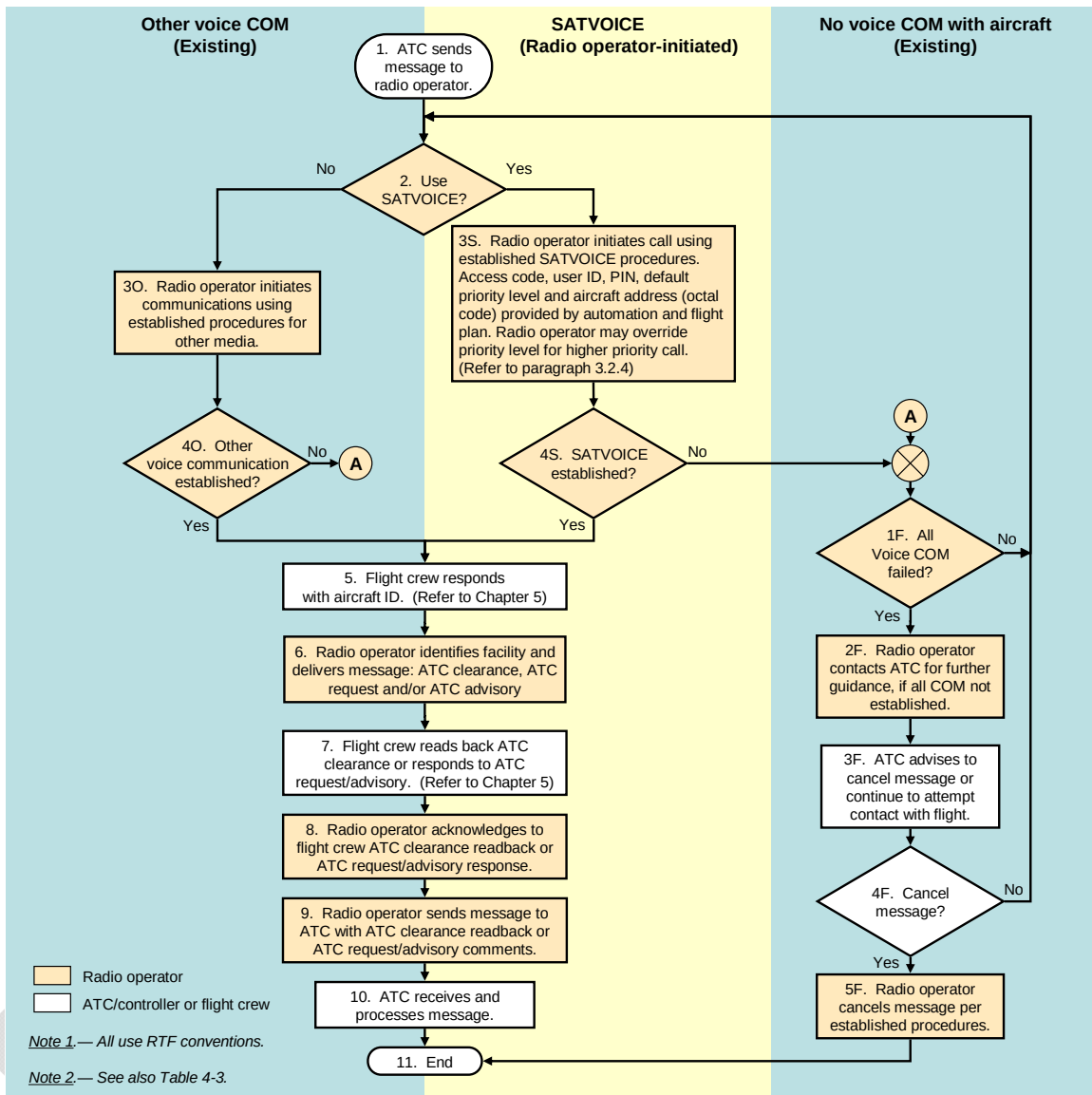


Figure 4-3. Radio operator-initiated to flight crew SATVOICE call procedures

Table 4-3. Radio operator-initiated to flight crew SATVOICE call procedures

Ref	Radio operator-initiated call communication process	What is done
1	ATC sends message to radio operator.	ANSP/ATC (controller) sends a message via ground network to aeronautical station / radio operator for delivery to an aircraft.

Ref	Radio operator-initiated call communication process	What is done
2	Use SATVOICE?	Decision point – This decision occurs when: - the radio operator receives a message from ATC for delivery to an aircraft; - when the radio operator previously was unable to establish contact with an aircraft, considering all voice COM capability; or - when ATC instructs the radio operator to continue making attempts to contact an aircraft after advising ATC that all previous attempts had failed. The radio operator determines whether or not to use SATVOICE to contact the aircraft. In addition to business considerations, other factors are relevant, such whether or not the aircraft is SATVOICE capable, the type of SATVOICE capability, the urgency of the communication, and other available voice COM capabilities. The SATVOICE capability is another COM capability for the radio operator to contact the aircraft using standard RTF conventions and phraseology. The radio operator decides to attempt contact with the aircraft using SATVOICE or other voice COM capabilities.
3S 3O	Radio operator initiates call with aircraft using SATVOICE.	The radio operator initiates the communication using established SATVOICE procedures. The access number, the user ID, if relevant, the PIN, default priority level (level 2 / HGH / Q12 per Table 2-1) and SATVOICE number (aircraft address represented in octal code) are typically provided by automation, data bases and flight plan information. The radio operator may override the default priority level to initiate a higher priority call (Refer to paragraph 3.2.4). <i>Note.— The radio operator may have initiated communications using established procedures for other media (Ref Step 3O) (e.g. HF or VHF voice).</i>
4S 4O	SATVOICE established?	Decision point – The radio operator establishes communications with the aircraft using SATVOICE. If contact with aircraft cannot be established using SATVOICE, the radio operator may attempt contact by using other voice COM capability. <i>Note.— If contact with the aircraft cannot be established using SATVOICE or other voice COM capability, the radio operator follows procedures provided below in the table following step 11.</i>
5	Flight crew responds with aircraft identification.	The flight crew answers the call and responds by stating the aircraft identification (Refer to Chapter 5).

Ref	Radio operator-initiated call communication process	What is done
6	Radio operator delivers message: • ATC Clearance • ATC Request • ATC Advisory	The radio operator delivers one of three types of messages – ATC clearance, ATC request or ATC advisory.
7	Flight crew reads back ATC clearance or responds to ATC request/advisory.	For an ATC clearance, the flight crew reads back the clearance verbatim to the radio operator. For an ATC request or advisory, the flight crew responds to it, as appropriate.
8	Radio operator acknowledges to flight crew ATC clearance readback or ATC request/advisory pilot response.	The radio operator acknowledges to the flight crew receipt of the response, as appropriate. For an ATC clearance, the radio operator monitors the flight crew readback for correctness and includes it in a message intended for ATC. For an ATC request or ATC advisory, the radio operator includes any comments from the flight crew in a message intended for ATC.
9	Radio operator sends message to ATC with ATC clearance readback or ATC request/advisory comments.	Since this message activity started with a message from ATC, the radio operator completes the communication by sending another message back to ATC with the flight crew's response – containing either the flight crew's readback to the clearance or any comments from the flight crew to the request or advisory.
10	ATC receives and processes message.	ATC receives the message sent from the radio operator with the flight crew's response. ATC processes the message, as appropriate.
11	End.	End communication either due to successful delivery or cancellation direction by ATC after all voice COM fails with the aircraft (See below).
Procedures when all voice COM fails		
1F	All Voice COM failed?	Decision Point – When attempts to establish contact with an aircraft using one type of voice COM have failed, the radio operator may attempt to establish contact using voice COM capability that had not been previously used, such as SATVOICE. Otherwise, the radio operator concludes that all attempts have failed.
2F	Radio operator contacts ATC for further guidance, if all COM not established.	If all means of communication are unsuccessful, then the radio operator will contact ATC to report failed communication attempt and obtain further guidance.
3F	ATC advises to cancel message or continue to attempt contact with flight.	Given the radio operator provided a previous status report, ATC provides additional guidance on message delivery – either to cancel the message or to continue attempted delivery.

Ref	Radio operator-initiated call communication process	What is done
4F	Cancel message?	Decision Point – If ATC instructs the radio operator to continue attempts to contact the aircraft, the radio operator uses all voice COM capabilities available. Otherwise, the radio operator cancels the message.
5F	Radio operator cancels message per established procedures.	Radio operator cancels message per established procedures, which completes the communication. These procedures may include logging the actions taken and results of ATC coordination to close it out.

4.3.2 Incoming SATVOICE call – radio operator receives call

4.3.2.1 When a SATVOICE call is received from the flight crew, the radio operator should follow radio telephony practices in responding to the call. The radio operator serves to relay messages to the controller. Since the flight crew called the radio operator, the call will generally be ATC priority level 2 / HGH / Q12, but it may be an emergency call priority level 1 / EMG / Q15, depending upon flight status (Refer to **Table 2-1**).

4.3.2.2 For SATVOICE calls made to an aeronautical station, the radio operator should:

- a) confirm the identification of the calling flight;
- b) acknowledge message; read back the message or selected contents, as required; and;
- c) if not already completed, provide primary and secondary HF/VHF frequencies and ensure flight establishes HF/VHF and SELCAL check, when required by the appropriate ATS authority.

*Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

Flight crew <Initiates call and line rings at aero radio>
Radio operator Shanwick Radio
Flight crew Shanwick Radio, Speedbird 255, <message>
Radio operator Speedbird 255, Shanwick Radio, <message response> or <acknowledgement>, <issue communication instructions>, OUT
Flight crew Shanwick Radio, Speedbird 255, <message response>
Radio operator Shanwick Radio, <acknowledgement>, <issue communication instructions> OUT

4.3.2.3 If the initial call from the flight crew to an aeronautical station is made using SATVOICE, the radio operator should:

- a) receive and read-back the message, if required; and
- b) allocate the primary and secondary HF/VHF frequencies and perform a SELCAL check on HF, when required by the appropriate ATS authority.

4.3.2.4 **Figure 4-4** provides a flow chart for SATVOICE calls received by the radio operator from the flight crew. **Table 4-4** provides descriptions associated with each number flowchart item.

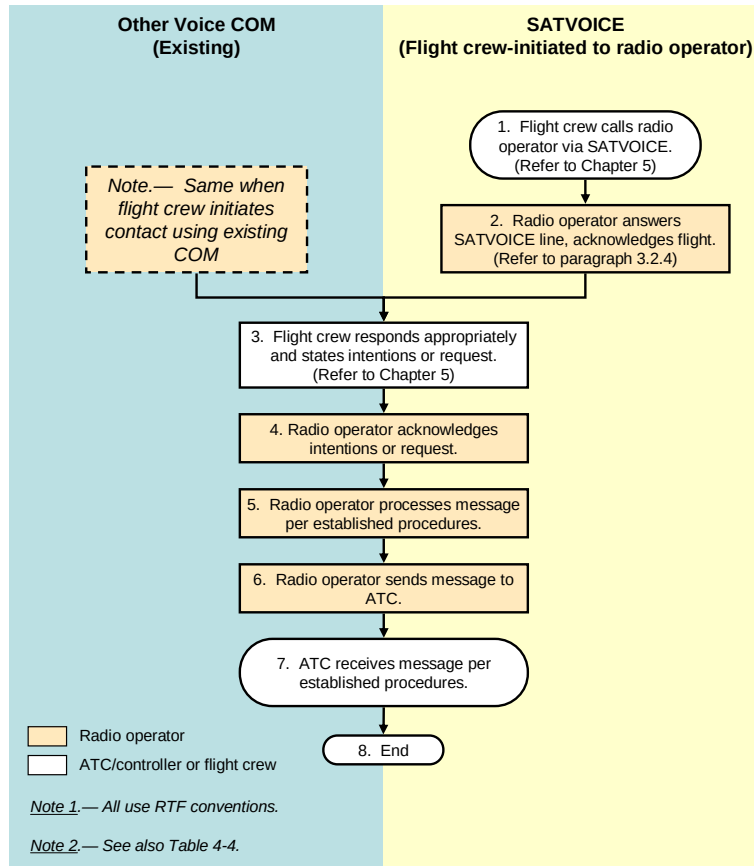


Figure 4-4. Radio operator receives SATVOICE call procedures

Table 4-4. Radio operator receives SATVOICE call procedures

Ref	Incoming SATVOICE call communication process	What is done
1	Flight crew calls radio operator via SATVOICE, (Refer to Chapter 5)	Flight crew calls the radio operator via SATVOICE.
2	Radio operator answers SATVOICE line; acknowledges flight (Refer to paragraph 3.2.4)	Radio operator answers the call by stating the facility designation..
3	Flight crew responds appropriately and states intentions or request (Refer to Chapter 5)	Flight crew restates facility designation, provides aircraft identification and states intentions or request, which could be an initial check-in, a guard change, a request, or to provide a position report.

Ref	Incoming SATVOICE call communication process	What is done
4	Radio operator acknowledges intentions or request	Radio operator acknowledges the flight crew's intentions or request.
5	Radio operator processes message per established procedures	Radio operator relays intentions or request to ATC per established procedures.
6	Radio operator sends message to ATC	Radio operator sends a message to ATC. The radio operator may also call the ATC controller depending upon local procedures.
7	ATC receives message per established procedures	The ATC controller will receive the flight crew's intentions or request from the radio operator.
8	End	End communication flow due to completion of communications activities, such as delivery of flight crew's position report or request, and/or update of radio operator's flight information database.

4.4 Communication failures

4.4.1 Loss of SATVOICE Connection

4.4.1.1 If the SATVOICE connection is lost during a communication, the party that initiated the original call should initiate the process to reestablish communications.

4.4.2 Notification of SATVOICE aircraft failure

4.4.2.1 When the flight crew contacts the aeronautical station to notify ATC (and/or AOC) of changes to aircraft SATVOICE capability per paragraph 5.4.2.1, the radio operator should relay that information as requested by the flight crew.

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Chapter 5. Flight crew procedures

5.1 General

5.1.1 An aircraft operator with data link equipped aircraft (CPDLC, ADS-C, and FMC WPR) operating in airspace where data link services are provided should use data link as the normal means of communications. Some normal ATC communications and most non-normal communications will require use of voice communications. The flight crew may use SATVOICE or HF/VHF voice at their discretion, provided the use is in accordance with airspace requirements established by Regional SUPPs, AIPs (or equivalent publication) for the flight (Refer to [paragraph 2.1](#) and [paragraph 3.2.3](#)). Urgency, type of message being communicated, current atmospheric conditions, and company standard operating procedures are all factors in determining which voice system to use.

5.1.2 The aircraft operator should ensure the aircraft SATVOICE system installation complies with criteria of [paragraph 3.3.4](#), and procedures/training programs are established in accordance with [section 3.3](#).

5.1.3 Although the underlying technology lends itself to a conversational mode of communications, such use can create misunderstanding and confusion. Therefore, when using SATVOICE, the flight crew should follow RTF conventions identical to HF/VHF communications in accordance with applicable standards and regulations pertaining to aeronautical communications.

Note. In addition to State and/or Regional standards and requirements, RTF conventions are defined in, for example, Annex 10, Volume II, Chapter 5, Doc 4444, Chapter 12, Doc 9432 and Doc 8400. The communication procedures and examples contained in this document further clarify radio operator and controller procedures when using SATVOICE.

5.1.4 The flight crew should read back safety-related parts of certain ATC clearances and instructions as listed in Doc 4444, paragraph 4.5.7.5. The flight crew should acknowledge other clearances and instructions in a manner to clearly indicate that they have been understood and will be complied with.

5.1.5 When SATVOICE is required for the flight, such as for extended operations or to meet airspace communication requirements, then during pre-flight or prior to entry into the relevant airspace, the flight crew should ensure the aircraft SATVOICE system is operational and there are no notifications of SATVOICE service outage in that airspace.

Note.— The flight crew will typically receive an alert for aircraft SATVOICE system failures. For aircraft SATVOICE systems that do not provide alerts of equipment failures, the flight crew verifies system status in accordance with established procedures (e.g. by reviewing signal strength and “log on” status). The aircraft satellite communication system needs to be automatically or manually logged on to a satellite and ground earth station (GES) before SATVOICE call can be made. See [paragraph 3.3.4](#).

5.1.6 If a call is dropped during a communication, the party that initiated the original call should initiate the process to reestablish communications.

5.1.7 On initial contact with a radio station, the flight crew should provide aircraft identification and request frequency assignment and perform a successful SELCAL check on HF, when required by the appropriate ATS authority. Subsequent communications with that radio station may then be performed via SATVOICE or HF/VHF voice, in accordance with applicable airworthiness, operating and airspace requirements.

5.1.8 The flight crew should normally make calls to the radio facility serving the airspace in which the aircraft is flying. If that airspace has not yet been entered, the flight crew should attempt contact with the radio facility serving the first area control centre. If communications are lost with the current aeronautical station, the flight crew should attempt contact with any other aeronautical station to relay.

5.1.9 If a SELCAL check is required before or after entering a FIR, the flight crew should request a SELCAL check in accordance with ICAO Annex 10, Volume II, paragraph 5.2.4.

5.2 Flight crew-initiated SATVOICE call

5.2.1 The SATVOICE numbers (e.g. short codes) for aeronautical stations and ATSUs are published in State AIPs and some charts. SATVOICE numbers together with the appropriate priority level may be stored in an aircraft SATVOICE system for easy access by the flight crew.

5.2.2 The flight crew should initiate calls to the aeronautical station/ATSU using the appropriate priority level 2 / HGH / Q12 or priority level 1 / EMG / Q15 in accordance with **Table 2-1**.

*Note 1.— The flight crew would normally use 3 / LOW / Q10 to contact AOC. However, under some urgent situations, the flight crew may opt to initiate a level 1 / EMG / Q15 call to AOC to avoid the possible preemption of an incoming call from ATC. See **paragraph 3.3.4.3** for priority level default settings and **paragraph 3.3.4.4** for flight crew capability to set priority level and preempt calls.*

*Note 2.— See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

<line rings at aeronautical station>
Radio operator Arctic Radio
Flight crew Arctic Radio, Continental 99, <message>
Radio operator Continental 99 Arctic Radio, <message response> or <acknowledgement>, OUT
Flight crew Arctic Radio, Continental 99, <message response>
Radio operator Continental 99, Arctic Radio, <acknowledgement>
Flight crew Arctic Radio, Continental 99, OUT

5.3 Flight crew receives SATVOICE call

5.3.1 The flight crew should respond to an ATC call using standard RTF conventions and phraseology (see **paragraph 5.1.3**).

5.3.2 The flight crew should act only on ATC clearances/instructions from SATVOICE calls with priority level 2 / HGH / Q12 or priority level 1 / EMG / Q15 per **Table 2-1**, and if in doubt terminate the call and initiate a new call for confirmation.

Note 1.— The aircraft SATVOICE system may configure the flight deck default priority to level 3 / LOW / Q10 or allow the flight crew to select priority level 1 / EMG / Q15 for outgoing AOC calls, and accept incoming AOC calls at level 3 / LOW / Q10 or level 1 / EMG / Q15.

*Note 2.— The aircraft SATVOICE system confirms the priority level of the call by restricting level 4 / PUB / Q9 incoming calls to the flight deck (Refer to **paragraph 3.3.4.3**). If the aircraft SATVOICE system does not restrict incoming calls, the flight crew may use an indication (aural or visual) provided by the SATVOICE system to confirm the call priority level.*

5.4 Contingencies

5.4.1 SATVOICE busy signal or no answer

5.4.1.1 Normally, when initiating a SATVOICE call to a radio facility that supports SATVOICE services, the flight crew should receive an answer. When a SATVOICE call returns a busy signal or there is no answer, the flight crew should use other means of communications.

5.4.2 Aircraft SATVOICE system failure

5.4.2.1 If the aircraft SATVOICE system has malfunctioned or for any other reason the SATVOICE system is unavailable the flight crew should:

- a) revert to other means of communication; and
- b) notify ATC of the SATVOICE failure per established procedures.

Note.— The flight crew may request the aeronautical station to notify their AOC of the SATVOICE failure.

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Appendix A Future SATVOICE concept of operation and considerations

This document provides guidance material on SATVOICE communications for aeronautical use taking into account legacy implementations and uses at the time of publication. It is intended to facilitate globally consistent implementation of SATVOICE services and support a variety of uses including ATS and AOC communications. ANSPs, aircraft operators, CSPs, SSPs, and other relevant parties are encouraged to use this guidance material to ensure current implementations comply with the SARPS and PANS for SATVOICE services and uses.

The uses of CPDLC and ADS-C are increasing and seen as supporting a more efficient and safer air traffic management. However, SATVOICE can provide a complement to further enhance safety and efficiency. In most cases, aircraft that are equipped with CPDLC and ADS-C are also equipped with SATVOICE. Aircraft that are not equipped CPLDC and ADS-C may still be equipped with SATVOICE. SATVOICE provides an interactive communication capability with greater flexibility than data link to communicate in some situations, such as in negotiating flight crew requests or in emergency and non-routine situations. SATVOICE can diversify the means a radio operator uses to communicate with an aircraft, improving overall reliability, and it can also provide DCPC. However, this document is only intended to facilitate harmonization in the provision and use of SATVOICE and does not address cost and benefit.

SATVOICE services should evolve toward allowing full integration of SATVOICE capability into workstations for the controller and the radio operator, and communication systems on board aircraft for the flight crew. ANSPs, aircraft operators, commercial SATVOICE service providers (CSPs and SSPs) and other relevant parties should employ standards that ensure a common infrastructure that enables ground facilities to make SATVOICE calls to an aircraft regardless of which commercial satellite/ground station the aircraft is logged on to. Flight crews should be able to contact ground stations by their facility name or code, and controllers/radio operators should be able to contact aircraft by their call sign or aircraft identification, as filed in the flight plan.

It is anticipated that SATVOICE will become a LRCS that will be used for future air traffic management. The aviation community should collaborate on program plans for this purpose and consider:

- a) Developing a “Single Dial Access Point” (SDAP) to enable ANSPs and AOCs to call a single number to initiate two-stage dialing which will reach any aircraft logged onto any commercial SATVOICE system, which is approved as part of the common infrastructure;
- b) Developing a common and sufficiently robust infrastructure to enable use of SATVOICE services even when local PSTNs are overloaded due to natural disasters;
- c) Means to minimize or eliminate the likelihood of priority, pre-emption and precedence, such as through the use of multi-channel radios and conference calling;
- d) Means to display caller ID to the recipient of an incoming SATVOICE call (e.g. display of facility name or facility code for the flight crew and display of call sign or aircraft identification for the controller/radio operator); and
- e) Developing additional SATVOICE capabilities such as a “virtual VHF” capability using VoIP applications and group call broadcast function.
- f) Means for the flight crew to initiate a call to a facility by reference to its facility name or facility code rather than a PSTN phone number or a 6 digit short code.
- g) Clarification and/or standardization on the nomenclature of priority levels and their use. Consider dedicating priority 2 / HGH / Q12 for ATC use only and if the flight crew or AOC had a justifiable urgent call, then 1 / EMG / Q15 would be a valid use. See **Table 2-1**.

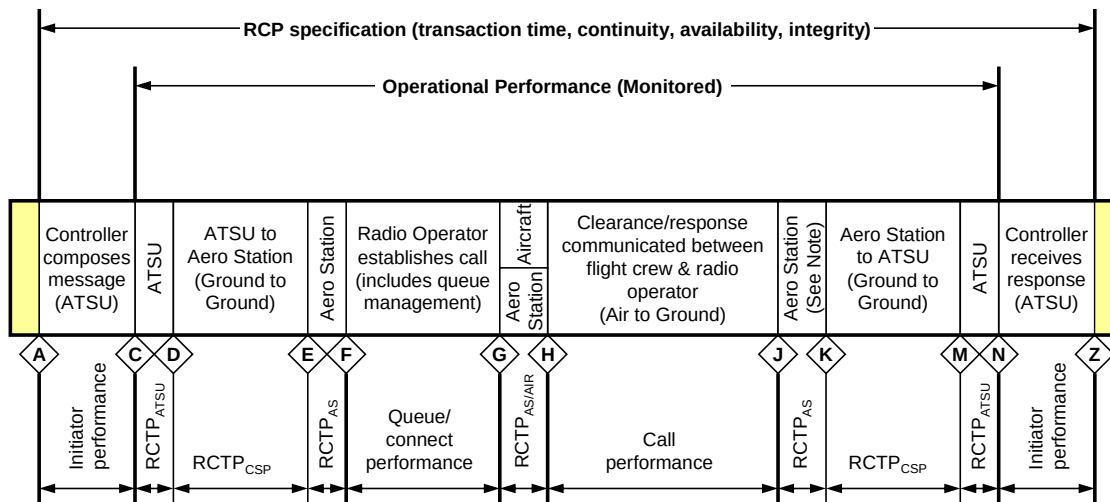
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Appendix B RCP specifications – allocations for SATVOICE communications

This appendix provides a supplement to the RCP 400 specification provided in the Global Operational Data Link Document (GOLD) and is applicable when SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP. The supplement includes the RCP allocations for SATVOICE communications, consistent with the RCP 400 operational performance specification provided in **paragraph B.3**. The RCP 400 specification, provided by Doc 9869, provides performance-based criteria based on intervention capabilities. The V_{RO} designator is used in this specification to indicate the RCP allocations associated with controller intervention via a radio operator and V_{ATO} designator is reserved for RCP allocations associated with controller intervention via DCPC. As it is difficult to compare the actual performance of different technologies, the RCP 400 operational performance specification provides a common basis for assessing SATVOICE capability or any new technology that may emerge, including data link capabilities such as CPDLC.

B.1 Terms and definitions

Refer to GOLD, Appendix B, paragraph B1 for general terms and definitions applicable to RCP specifications. This section provides additional terms and definitions to describe the RCP allocations for radio operator SATVOICE communications. **Figure B- 1** provides a model of a typical voice communication transaction allocation for controller-initiated communication via a radio operator using SATVOICE communication.



Note: The (J to K) component includes two concurrent processes:

- (1) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
- (2) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by $RCTP_{AS}$.

Figure B- 1 Typical voice communication transaction allocation – controller-initiated via a radio operator using SATVOICE communication

RCP specification	
Term	Description
Operational communication transaction	The process a human uses to initiate the transmission of an instruction, clearance, flight information, and/or request, and is completed when that human is confident that the transaction is complete.
Required communication performance	A statement of the performance requirements for operational communication in support of specific ATM functions.
RCP specification	A specification (e.g. RCP 400) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP and operator.
RCP expiration time (ET)	The maximum time for the completion of the operational communication transaction after which the initiator is required to revert to an alternative procedure.
RCP nominal time (TT 95%)	The maximum nominal time within which 95% of operational communication transactions are required to be completed.
RCP continuity (C)	The required probability that an operational communication transaction can be completed within the communication transaction time, either ET or TT 95%, given that the service was available at the start of the transaction. Voice communications: This translates into 1 out of 1,000 or 5 out of 100 calls for ET 99.9% and TT 95%, respectively, not being able to conclude their voice transactions within the allotted time or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call.
RCP availability (A)	The required probability that an operational communication transaction can be initiated when needed. Voice communications: This translates to any failure prohibiting the call to be initiated to include congestion (much like the analogy of a terrestrial mobile phone network). However, this definition does not apply to a busy condition whereby the entity being called is already on the phone and does not have a way to put the existing call on hold or if able to, rejects the additional incoming call.

RCP specification	
Term	Description
RCP integrity (I)	The required probability that an operational communication transaction is completed with no undetected errors. <i>Note.— Whilst RCP integrity is defined in terms of the “goodness” of the communication capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}), consistent with RNAV/RNP specifications.</i> Voice communications: This translates to the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

RCP /V _{RO} transaction time	
Term	Description
Operational performance (monitored)	The portion of the transaction time (used for intervention) that does not include the times for message composition or recognition of the operational response. Voice communications: Operational Performance (C to N) = RCTP+ Queue/Connect Performance (F to G) + Call Performance (H to J)
Required communication technical performance (RCTP)	The portion of the (intervention) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response. Voice communications: $RCTP = RTCP_{ATSU} + RCTP_{AS} + RCTP_{AS/AIR} + RCTP_{CSP}$
RCP initiator performance	The operational portion of the transaction time for the controller to compile the voice clearance message and send it to the radio operator. Voice communications: Initiator performance = (A to C), where “A” denotes when the time that the controller needs to send a clearance and “C” denotes when the controller sends the message to the radio operator.

RCP /V_{RO} transaction time	
Term	Description
Call performance	The operational portion of a communication from when an indication of an incoming call begins to when the parties on the call have completed the communication and the radio operator sends the message to ATSU. Voice communications: Call Performance = (H to J), where “H” denotes when the aircraft indicates an incoming call to the flight crew and “J” denotes when the parties on the call operationally complete the call and the radio operator sends the message to the ATSU.
Queue/connect performance	The operational portion of the transaction time to organize and place the call either via a manual or automated dialing sequence depending on equipment at the aeronautical station. Voice communications: Queue/Connect Performance = (F to G), where “F” denotes when the message from the ATSU via the network is sent to the queue, and “G” denotes when the last digit of the dialing sequence is finished.
RCTP _{ATSU}	The summed critical transit times for an ATC intervention message and a response message, allocated to the ATSU system. Voice communications: $RCTP_{ATSU} = (C \text{ to } D) + (M \text{ to } N)$
RCTP _{CSP}	The summed critical transit times for an ATC intervention message and a response message, allocated to the CSP system. Voice communications: $RCTP_{CSP} = (D \text{ to } E) + (K \text{ to } M)$
RCTP _{AS/AIR}	The technical time for the air-ground network and associated components to set up a ground-to-air call. Voice communications: $RCTP_{AS/AIR} = (G \text{ to } H)$, where “G” denotes when the last digit of the dialing sequence is finished and “H” denotes when the aircraft indicates an incoming call to the flight crew.

RCP /V _{RO} transaction time	
Term	Description
RCTP _{AS}	The summed critical transit times for an ATC intervention message and a response message allocated to the aeronautical station. Voice communications: $RCTP_{AS} = (E \text{ to } F) + (J \text{ to } K)$, where (J to K) includes two concurrent processes: a) the aircraft and aeronautical station technically disconnect the call; which is assumed Operationally, the call is disconnected when the flight crew and radio operator complete the call; and b) the aeronautical station sends the response to the ATSU via the ground-ground network; the performance is denoted by RCTP_{AS}.

RCP continuity	
Term	Description
C for operational performance	The proportion of clearance transactions that can be completed within the specified operational performance time. Voice communications: Continuity would take into consideration any dropped calls.
C for RCTP	The proportion of intervention messages and responses that can be delivered within the specified RCTP for intervention. Voice communications: Continuity would take into consideration any dropped calls.
C for RCTP _{ATSU}	The proportion of intervention messages and responses that can be delivered within the specified RCTP_{ATSU} for intervention.
C for RCTP _{CSP}	The proportion of intervention messages and responses that can be delivered within the specified RCTP_{CSP} for intervention.

RCP continuity	
Term	Description
C for RCTP _{AS/AIR}	The proportion of intervention messages and responses that can be delivered within the specified RCTP_{AS/AIR} for intervention. Voice communications: The proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.
C for RTCP _{AS}	The proportion of intervention messages and responses that can be delivered within the specified RCTP _{AS} for intervention.

RCP availability	
Term	Description
Service availability (A _{CSP})	The required probability that the communication service is available to all users in a specific airspace when desired.
Unplanned outage duration (minutes)	The time from when an unplanned outage begins to when the ATSU receives notification that the service has been restored.
Unplanned outage duration limit (minutes)	A criterion applied to a given operational airspace or FIR that defines the maximum time for the duration of an unplanned outage at which time there is an operational impact.
Maximum number of unplanned outages (per year)	A criterion applied to a given operational airspace or FIR that defines the maximum number allowed for unplanned outages in any twelve month period.
Maximum accumulated unplanned outage time (min/yr)	A criterion applied to a given operational airspace or FIR that defines the maximum time allowed for the total sum of the unplanned outages that exceed the unplanned outage duration limit in any twelve month period. <i>Note.— The criterion does not apply to unplanned outages that are less than the unplanned outage duration limit or planned outages. Unplanned outages that are less than the unplanned outage duration limit are considered against the criterion for continuity.</i>
Unplanned outage notification delay (min)	Notification to the ATSU of an unplanned outage. Measured from when the unplanned outage begins to when the ATSU receives notification.
Aircraft system availability (A _{AIR})	The required probability of available capability on an aircraft. <i>Note.— The actual aircraft system availability is computed assuming that the service is available in the relevant airspace.</i>
Grade of service	The rate at which calls are rejected due to network congestion.

RCP integrity	
Term	Description
Diagnostic Rhyme Test (DRT)	A test and scoring system for speech intelligibility using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar. (ANSI/ASA S3.2-2009) <i>Note 1.— Speech intelligibility is a vital factor in aeronautical safety communications. The DRT is specifically designed to test intelligibility of speech using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar (e.g. goat/coat). They are then played the same word pairs processed through the condition (e.g. codec) under test and the success rate is scored. Intelligibility is largely dependent on consonant recognition; vowel recognition is less important. The target users for aeronautical communications are, as for the DRT listening panels, trained listeners (pilots, air traffic controllers) who use standard phrases.</i>

B.2 RCP 240 specification

(reserved)

B.3 RCP 400 specification

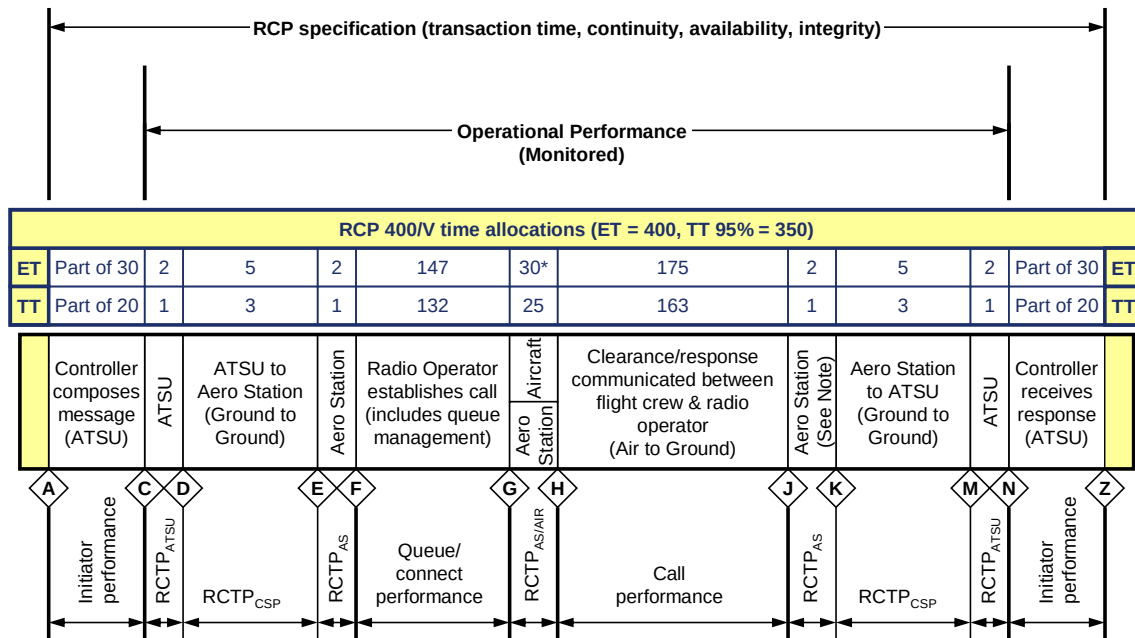
RCP Specification			
RCP specification		RCP 400	
Airspace specific considerations			
Interoperability	Specify interoperability criteria (e.g. FANS 1/A, SATVOICE Iridium, Inmarsat, and/or MTSAT communications).		
ATS Function	Specify ATS function(s) (e.g. applicable separation standard), if necessary.		
Application	Specify controller-pilot ATC communication intervention capability (e.g. CPDLC, SATVOICE communications).		
RCP parameter values			
Transaction time (sec)	Continuity (C)	Availability (A)	Integrity (I)
ET = 400	C(ET) = 0.999	0.999	Malfunction = 10 ⁻⁵ per flight hour
TT 95% = 350	C(TT 95%) = 0.95		
RCP monitoring and alerting criteria			
Ref:	Criteria		
CMA-1	The system shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP specification for the intended function.		
CMA-2	When the communication service can no longer meet the RCP specification for the intended function, the flight crew and/or the controller shall take appropriate action.		
Notes			
Note 1— Rationale for the criteria provided in this specification can be found in Annex 11, Doc 4444, Doc 9689, and RTCA DO-306/ED-122.			
Note 2— The values for transaction times are to be applied to transactions that are representative of communication capability for the controller to intervene with a specific operator, aircraft type, and/or aircraft identification.			
Note 3— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the RCP specification, this would be considered a change in system configuration.			

B.3.1 (reserved)

B.3.2 RCP 400/V_{RO} allocations

The RCP 400/V_{RO} allocations are applicable controller-initiated communications via a radio operator using SATVOICE communications. **Figure B- 2** provides an overview of the communication transaction

time allocations for RCP 400/V_{RO}. Actual performance is monitored and time allocations are measured against the criteria provided from C to N. The remaining allocations are targets and used only when actual performance from C-N does not meet the specified criteria.



Notes:

- 1) The (G to H) component is not defined at the continuity requirement for ET; however the operational performance specification assumes the total performance for technical components (C to F), (G to H) and (J to N) is 48 seconds.
- 2) The (J to K) component includes two concurrent processes:
 - a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
 - b) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by RCTP_{AS}.

Figure B- 2 Overview of RCP 400/V_{RO} time allocations

Table B- 1 provides safety requirements related to the RCP parameters for the RCP 400/V_{RO} specification. The allocation of these requirements to ANSP, CSP/SSP, aircraft SATVOICE system and the aircraft operator are provided in the relevant sections of the specification.

Table B- 1 Safety requirements related to RCP 400/V_{RO} parameters

Reference	Related RCP Parameter	RCP safety requirements
SR-1	A, C	The controller shall be capable of contacting the aircraft.
SR-2	A, C	The flight crew shall be capable of contacting the radio operator and/or controller.
SR-3	I	The ANSP and aircraft operator shall ensure adequate means to mitigate against voice communication errors leading to incorrect execution of clearances.
SR-4	A, C, I	The SATVOICE system shall be capable of detecting loss of service, equipment failures and/or logon failures and provide indication to the controller / radio operator or flight crew of system status.
SR-5	C, ET	The ATSU system shall provide an indication to the controller when the transaction time for response of clearance issued via radio operator exceeds the specified time (ET _{TRN}).
SR-6	All	The ANSP and aircraft operator shall ensure means are in place to monitor for compliance to RCP specification and provide alert(s) for appropriate action.

B.3.2.1 Air navigation service provider (ANSP)

Note 1.— The ANSP includes the specification criteria allocated to the aeronautical station.

Note 2.— Automation may employ autodial capability, data bases and other features to meet performance specifications.

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE		Component: ANSP
Transaction Time Parameter	ET (sec) C = 99.9%	TT (sec) C = 95%	Compliance Means
Transaction Time (A to Z)	400	350	Analysis, CSP/SSP contract/service agreement. See also paragraph B.3.2.2.
RCP Time Allocations			
Initiator (A to C) + (N to Z)	30	20	Analysis, simulations, safety and human factors assessments.

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE		Component: ANSP
Transaction Time Parameter	ET (sec) C = 99.9%	TT (sec) C = 95%	Compliance Means
Operational Performance (C to N)	370	330	Post-implementation monitoring, CSP/SSP contract/service agreement. See also paragraph B.3.2.2.
Operational Performance Time Allocations			
Queue/connect performance (F to G)	147	132	Initially, by analysis, simulations, safety human factors assessments.
Call performance (H to J)	175	163	Initially, by analysis, simulations, safety human factors assessments.
RCTP ($RCTP_{ATSU} + RCTP_{CSP} + RCTP_{AS} + RCTP_{AS/AIR}$)	48	35	Estimated, CSP/SSP contract/service agreement. See paragraph B.3.2.2.
RCTP Time Allocation			
$RCTP_{ATSU}$ (C to D) + (M to N)	4	2	Pre-implementation demonstration.

RCP availability criteria			
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE		Component: ANSP
Availability parameter	Efficiency	Safety	Compliance means
Service availability ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms <i>Note.</i> — For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.3.2.2. , RCP 400/V _{RO} allocation to CSP/SSP for RCP availability criteria.

RCP integrity criteria		
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE	Component: ANSP
Integrity parameter	Integrity value	Compliance means
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level commensurate with integrity level, (compliance shown prior to operational implementation). See related safety requirements SR-3 and SR-4 for the ANSP. CSP/SSP contract/service agreement. See RCP integrity criteria for CSP/SSP, paragraph B.3.2.2.

RCP monitoring and alerting criteria		
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE	Component: ANSP
Ref	Criteria	Compliance means
CMA-1 CMA-2	<i>Note.— RCP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6.</i>	Review.

RCP related safety requirements		
Specification: RCP 400/V _{RO}		Application: Controller intervention, SATVOICE
		Component: ANSP
Ref	Related RCP Parameter	Safety requirement
SR-1	A, C	a) The ANSP shall use the aircraft address from the flight plan to contact the aircraft. b) The ANSP shall use 2 / HGH / Q12 priority to contact the aircraft. c) The ANSP shall ensure that access number(s) support the commercial SATVOICE services (e.g. Inmarsat, MTSAT, Iridium) it provides in its airspace.
SR-2	A, C	a) The ANSP shall provide PSTN phone numbers to SSP for short code assignment. b) The ANSP shall publish its SATVOICE number(s) (e.g. short code(s)) for its ATSUs and aeronautical stations in aeronautical publications/charts.
SR-3	I	a) The ANSP shall establish procedures that use RTF conventions and provide training for the controller. b) The ANSP shall ensure the SATVOICE system at its aeronautical stations and ATSUs provide a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment. c) The ANSP shall ensure that its CSP/SSP maintains acceptable voice call quality for contracted SATVOICE services.
SR-4	A, C, I	a) The ANSP shall indicate to the radio operator / controller of detected SATVOICE equipment failure. b) ANSP shall notify operators of service outages, degradation and restoration by NOTAM (or equivalent publication).
SR-5	C, ET	a) The ATSU system shall indicate to the controller when a required response for a message sent by the ATSU is not received within the required time (ET _{TRN}).
SR-6	All	a) The ANSP shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP specification for the intended uses. b) The ANSP shall ensure that when the communication service can no longer meet the RCP specification for the intended uses, the controller shall take appropriate action. <i>Note.— Compliance with the RCP specification is determined by initial approvals of system components, compliance with safety requirements, and means for the flight crew and controller to report problems and for ANSPs to conduct post-implementation monitoring, analysis and corrective actions.</i>

B.3.2.2 Communication/satellite service provider (CSP/SSP)

RCP communication transaction time and continuity criteria				
Specification: RCP 400/V_{RO}	Application: Controller intervention, SATVOICE			Component: CSP/SSP
Transaction Time Parameter	ET (sec) C = 99.9%	IT (sec) C = 99%	TT (sec) C = 95%	Compliance means
RCTP Time Allocation	44	[Not defined]	33	Contract/service agreement terms.
RCTP _{CSP} (D to E) + (K to M)	10	[Not defined]	6	Contract/service agreement terms.
RCTP _{AS} (E to F) + (J to K)	4	[Not defined]	2	Contract/service agreement terms.
RCTP _{AS/AIR} (G to H)	[Not defined]	30	25	Contract/service agreement terms. <i>Note: Criteria are shared between aircraft system, ground system and air-ground network</i>

RCP availability criteria			
Specification: RCP 400/V_{RO}	Application: Controller intervention, SATVOICE		Component: CSP/SSP
Availability parameter	Efficiency	Safety	Compliance means
Service availability (A _{CSP/SSP})	N/A	0.999	Contract/service agreement terms.
Unplanned outage duration limit (min)	N/A	20	Contract/service agreement terms.
Maximum number of unplanned outages	N/A	24	Contract/service agreement terms.
Maximum accumulated unplanned outage time (min/yr)	N/A	520	Contract/service agreement terms.
Unplanned outage notification delay (min)	N/A	10	Contract/service agreement terms.
Grade of service	N/A	1%	Contract/service agreement terms. <i>Note.— This value is the same as that defined in Annex 10.</i>

RCP integrity criteria		
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE	Component: CSP/SSP
Integrity parameter	Integrity value	Compliance means
Integrity (I)	[not defined]	Pre-implementation demonstration and contract/service agreement terms. <i>Note.— RCP integrity criteria are specified by safety requirements allocated to the CSP/SSP for SR-3 and SR-4.</i>

RCP related safety requirements		
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE	Component: CSP/SSP
Ref	Related RCP Parameter	Safety requirement
SR-1	A, C	a) The CSP/SSP shall ensure that the aircraft SATVOICE number is the aircraft address represented in octal code.
SR-2	A, C	a) The CSP/SSP shall assign a unique short code for each PSTN phone number. b) The CSP/SSP shall provide a means to distribute a SATVOICE number (e.g. short code, direct dial) directory to operators, ANSP and other stakeholders that subscribe to receive the directory.
SR-3	I	a) The CSP/SSP shall ensure the SATVOICE network provides a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment.
SR-4	A, C, I	a) The SSP shall notify its CSPs of outages, degradation and restoration. b) The CSP shall notify its subscribers (e.g. ANSPs, operators) of outages, degradation and restoration.
SR-5	C, ET	[Not applicable]
SR-6	All	a) The CSP/SSP shall provide notification to its ANSP and aircraft operator subscribers of any service impairment that would cause the SATVOICE service to no longer comply with the RCP specification.

B.3.2.3 Aircraft system

RCP communication transaction time and continuity criteria				
Specification: RCP 400/V_{RO}		Application: Controller intervention, SATVOICE		Component: Aircraft system
Transaction Time Parameter	ET (sec) C = 99.9%	IT (sec) C = 99%	TT (sec) C = 95%	Compliance Means
Operational Performance Time Allocation				
Call performance (H to J)	175	[Not defined]	163	Human-machine interface capability, pre-implementation demonstration
RCTP Time Allocation				
RCTP _{AS/AIR} (G to H)	[Not defined]	30	25	Pre-implementation demonstration <i>Note: Criteria are shared between aircraft system, ground system and air-ground network</i>

RCP availability criteria			
Specification: RCP 400/V_{RO}		Application: Controller intervention, SATVOICE	
Availability parameter		Efficiency	Safety
A _{AIR}		N/A	0.999
		Compliance means	
		Analysis, architecture, design, pre-implementation demonstration	

RCP integrity criteria		
Specification: RCP 400/V_{RO}		Component: Aircraft system
Application: Controller intervention, SATVOICE		
Integrity parameter	Integrity value	Compliance means
Integrity (I)	Malfunction = 10 ⁻³ per flight hour	Design approval of aircraft system. Analysis, safety requirements, development assurance level (e.g. Level D software), commensurate with integrity level, pre-implementation demonstration. <i>Note.— RCP integrity criteria are specified by safety requirements allocated to the aircraft system for SR-3 and SR-4.</i>

RCP monitoring and alerting criteria		
Specification: RCP 400/V _{RO}		Application: Controller intervention, SATVOICE
		Component: Aircraft system
Ref	Criteria	Compliance means
<u>CMA-1</u>	<i>Note.</i> — RCP monitoring and alerting criteria are specified by safety requirements allocated to the aircraft system for <u>SR-6</u> .	
<u>CMA-2</u>		

RCP related safety requirements		
Specification: RCP 400/V _{RO}		Application: Controller intervention, SATVOICE
		Component: Aircraft system
Ref	Related RCP Parameter	Safety requirement
<u>SR-1</u>	A, C	a) The aircraft SATVOICE system shall be properly maintained to receive calls with 2 / HGH / Q12 priority level and using the aircraft address represented in octal code.
<u>SR-2</u>	A, C	a) The aircraft SATVOICE system shall be operable prior to entering airspace where SATVOICE is used to meet LRCS requirements.
<u>SR-3</u>	I	a) The aircraft SATVOICE system shall provide a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment.
<u>SR-4</u>	A, C, I	a) The aircraft SATVOICE system shall detect logon failure and equipment failure and provide the appropriate indication to the flight crew.
<u>SR-5</u>	C, ET	[Not applicable]
<u>SR-6</u>	All	a) The aircraft SATVOICE system shall provide indication(s) for the flight crew to determine when the aircraft SATVOICE system or logon failures would cause the system to no longer comply with the RCP specification.

B.3.2.4 Aircraft operator

RCP communication transaction time and continuity criteria				
Specification: RCP 400/V_{RO}		Application: Controller intervention, SATVOICE		Component: Aircraft operator
Transaction Time Parameter	ET (sec) C = 99.9%	IT (sec) C = 99%	TT (sec) C = 95%	Compliance Means
Operational Performance Time Allocations				
Call performance (H to J)	175	[Not defined]	163	Procedural capability, flight crew training and qualification in accordance with safety requirements.
RCTP Time Allocation				
RCTP _{AS/AIR} (G to H)	[Not defined]	30	25	CSP/SSP contract/service agreement, aircraft type design approval and maintenance.

RCP availability criteria			
Specification: RCP 400/V_{RO}		Application: Controller intervention, SATVOICE	
Component: Aircraft operator			
Availability parameter	Efficiency	Safety	Compliance means
A _{AIR}	N/A	0.999	Aircraft type design approval, maintenance and properly configured user-modifiable software (e.g. ORT).
Service availability (A _{CSP/SSP})	N/A	0.999	Contract/service agreement terms. <i>Note.</i> — For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.3.2.2 , RCP 400/D allocation to CSP/SSP for RCP availability criteria.

RCP integrity criteria		
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE	Component: Aircraft operator
Integrity parameter	Integrity value	Compliance means
Integrity (I)	Malfunction = 10^{-5} per flight hour	Review of procedures, training programs, and qualification to meet safety requirements. Design approval of aircraft SATVOICE system. CSP/SSP contract/service agreement. <i>Note.</i> — RCP integrity criteria are specified by safety requirements allocated to the aircraft operator for SR-3 and SR-4 . See also RSP integrity criteria for the aircraft system, paragraph C.3.2.3 , and the CSP/SSP, paragraph C.3.2.2 .

RCP monitoring and alerting criteria		
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE	Component: Aircraft operator
Ref	Criteria	Compliance means
CMA-1 CMA-2	<i>Note.</i> — RCP monitoring and alerting criteria are specified by safety requirements allocated to the aircraft system for SR-6 .	

RCP related safety requirements		
Specification: RCP 400/V _{RO}	Application: Controller intervention, SATVOICE	Component: Aircraft operator
Ref	Related RCP Parameter	Safety requirement
SR-1	A, C	a) The aircraft operator shall file appropriate SATVOICE capability, the aircraft address and aircraft registration in the flight plan. b) The operator shall ensure that the phone number for the aircraft is activated by the CSP/SSP prior to return to service.
SR-2	A, C	a) The aircraft operator shall ensure that flight crew has means to contact the appropriate ATSU or aeronautical station for route of flight, where SATVOICE services are available. b) The aircraft operator shall ensure the flight crew uses 2 / HGH / Q12 priority.
SR-3	I	a) The aircraft operator shall establish procedures that use RTF conventions and provide training for the flight crew. b) The aircraft operator shall ensure that its CSP/SSP maintains acceptable voice call quality for contracted SATVOICE services.
SR-4	A, C, I	a) The aircraft operator shall notify flight crew of service outages, degradation, or restoration.

RCP related safety requirements		
Specification: RCP 400/V _{RO}		Application: Controller intervention, SATVOICE
Component: Aircraft operator		
Ref	Related RCP Parameter	Safety requirement
<u>SR-5</u>	C, ET	[Not applicable]
<u>SR-6</u>	All	a) The aircraft operator shall ensure that when the aircraft SATVOICE system fails such that it can no longer meet the RCP specification for the intended uses, the flight crew shall take appropriate action.

B.3.3 RCP 400/V_{ATC} allocations

(reserved)

Appendix C RSP specifications – allocations for SATVOICE communications

This appendix provides a supplement to the RSP 400 specification provided in the Global Operational Data Link Document (GOLD) and is applicable when SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RSP. The supplement includes the RSP allocations for SATVOICE communications, consistent with the RSP 400 operational performance specification provided in [paragraph C.3](#). As it is difficult to compare the actual performance of different technologies, the RSP 400 operational performance specification provides a common basis for assessing SATVOICE capability or any new technology that may emerge, including data link capabilities such as ADS-C.

These specifications support:

- a) Safety oversight of air traffic service provisions and operations;
- b) Agreements/contractual arrangements that air traffic service providers and aircraft operators make with their respective CSP/SSP(s);
- c) Operational authorizations, flight crew training and qualification;
- d) Design approval of aircraft SATVOICE systems; and
- e) Operational-monitoring, analysis, and exchange of operational data among regions and states.

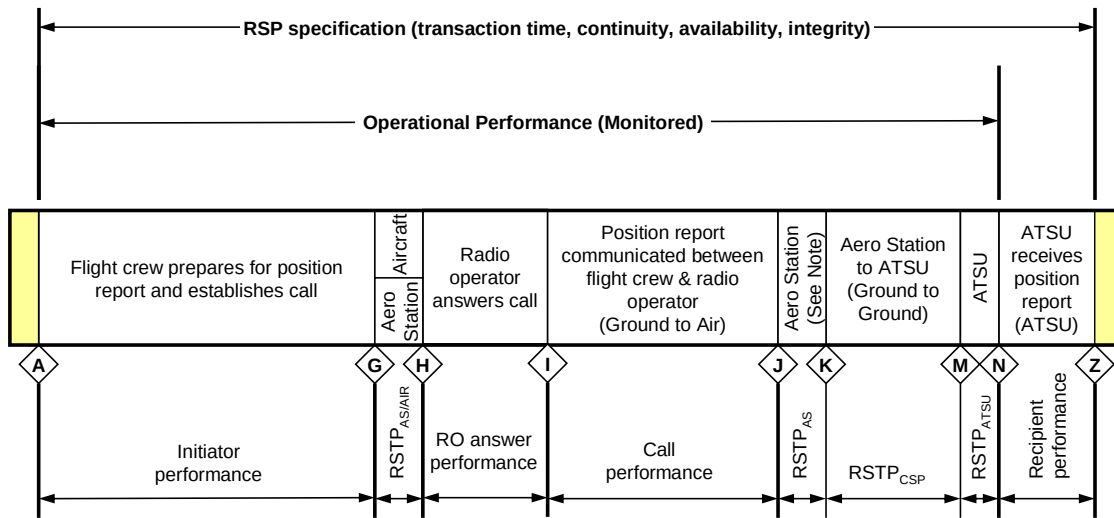
In situations where it has been determined to be beneficial, the RSP specifications may include criteria to support orderly flow of air traffic.

The specifications provide a means of compliance, in general. Additional guidance related to service provision, aircraft approval and operational authorizations can be found in [Chapter 3](#). Guidance and requirements on post-implementation monitoring can be found at [Appendix D](#).

The RSP specifications include allocations when using SATVOICE via a radio operator. The V_{RO} designator is used to indicate the RSP allocations associated with voice position reporting via a radio operator and V_{ATO} designator is reserved for RSP allocations associated with position reporting direct to the controller.

C.1 Terms and definitions

Refer to GOLD, Appendix B, paragraph B.1 for general terms and definitions applicable to RSP specifications. This section provides additional terms and definitions to describe the RCP allocations for radio operator SATVOICE communications. [Figure C- 1](#) provides a model of a typical voice communication transaction allocation for a flight crew initiated position report via a radio operator using SATVOICE communication.



Notes

- 1) The (A to G) component includes time for flight crew duties at compulsory reporting points.
- 2) The (J to K) component includes two concurrent processes:
 - a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
 - b) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by RCTP_{AS}.

Figure C-1. Typical voice communication transaction allocation – flight crew initiated position report via a radio operator using SATVOICE communication

RSP specification	
Term	Description
ATS surveillance service	A term used to indicate service provided directly by means of an ATS surveillance system. (ICAO)
Surveillance data	Information pertaining to the identification of aircraft and/or obstructions for route conformance monitoring and safety and efficient conduct of flight. <i>Note.— In this document, surveillance data applies to voice position reports similar in nature to HF voice position reports, except it is conducted using SATVOICE.</i>
Operational communication transaction	The process a human uses to initiate the transmission of an instruction, clearance, flight information, and/or request, and is completed when that human is confident that the transaction is complete.
Required surveillance performance (RSP)	A statement of the performance requirements for operational surveillance in support of specific ATM functions.

RSP specification	
Term	Description
RSP specification	A specification (e.g. RSP 400) that represents the values assigned to RSP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP/SSP and operator.
RSP overdue delivery time (OT)	The maximum time for the successful delivery of surveillance information after which the initiator is required to revert to an alternative procedure.
RSP nominal delivery time (DT 95%)	The maximum nominal time within which 95% of surveillance information is required to be successfully delivered.
RSP continuity (C)	The required probability that surveillance information can be delivered within the RSP delivery time parameter, either OT or DT 95%, given that the service was available at the start of delivery. Voice communications: This translates into 1 out of 1,000 calls or 5 out of 100 calls not being able to conclude their voice delivery within the allotted time (OT or DT 95%, respectively) or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call.
RSP availability (A)	The required probability that surveillance information can be provided when needed. Voice communications: This translates to any failure prohibiting the call to be initiated to include congestion (much like the analogy of a terrestrial mobile phone network). However, this definition does not apply to a busy condition whereby the entity being called is already on the phone and does not have a way to put the existing call on hold or if able to, rejects the additional incoming call.

RSP specification	
Term	Description
RSP integrity (I)	The required probability that the surveillance information is delivered with no undetected errors. <i>Note.</i>— RSP integrity is defined in terms of the “goodness” of the communication capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}), consistent with RNAV/RNP specifications. Voice communications: This translates to the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

RSP /V _{RO} transaction time	
Term	Description
Operational performance (monitored)	The portion of the transaction time (used for position reporting) that does not include the times for message composition or recognition of the operational response. Voice communications: Operational Performance (A to N) = RSTP + Initiator Performance (A to G) + Radio Operator Answer Performance (H to I) + Call Performance (I to J).
Required surveillance technical performance (RSTP)	The portion of the (position reporting) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response. Voice communications: $RSTP = RSTP_{AS/AIR} + RSTP_{AS} + RSTP_{CSP} + RSTP_{ATSU}$

RSP /V_{RO} transaction time	
Term	Description
RSP initiator performance	The operational portion of the transaction time to prepare the operational response, and includes the necessary flight deck tasks to compile the voice message position report, finding & selecting the SATVOICE number (e.g. short code) from the aircraft's telephone directory, confirming the correct priority for the call and pressing the "call/send" button. Voice communications: Initiator performance = (A to G), where "A" denotes when the flight crew has reached their designated reporting interval and "G" denotes when the last digit (call/send) button is pushed in the aircraft to initiate the call.
RSP answer performance	The operational portion of the transaction time to represent when the radio operator is able to answer the incoming call given the other duties that the radio operator may concurrently be performing. Voice communications: RSP answer performance = (H to I), where "H" denotes when the telephone at the radio operator indicates an incoming call and "I" denotes when the call is actually picked up.
RSP call performance	The operational portion of a communication from when the radio operator answers an incoming call to when the parties on the call have completed the communication and the radio operator sends the message to the ATSU. Voice communications: Call performance = (I to J), where "I" denotes when the radio operator picks up the phone to answer the incoming call from the aircraft. "J" denotes when the callers operationally completes the call (I to J) includes any tasks for the radio operator to send the message to the ATSU.
RSTP _{ATSU}	The overdue (OD) or nominal (DT) transit time for surveillance information from the CSP interface to the ATSU's flight data processing system. Voice communications: RSTP_{ATSU} = (M to N)

RSP /V_{RO} transaction time	
Term	Description
RSTP _{CSP}	The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the CSP. Voice communications: RSTP_{CSP} = (K to M)
RSTP _{AS/AIR}	The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the air-ground network and associated aircraft components to initiate an air-to-ground call. Voice communications: RSTP_{AS/AIR} = (G to H), where “G” denotes when the last digit of the dialing sequence is finished (eg: “call/send” button onboard the aircraft) and “H” denotes when the radio operator receives an indication of an incoming call.
RSTP _{AS}	The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the aeronautical station. Voice communications: RSTP_{AS} = (J to K), where (J to K) includes two concurrent processes: a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and b) the aeronautical station sends the response to the ATSU via the ground-ground network; the performance is denoted by RSTP_{AS}.

RSP continuity	
Term	Description
C for operational performance	The proportion of position reports that can be delivered within the specified operational performance time. Voice communications: Continuity would take into consideration any dropped calls.

RSP continuity	
Term	Description
C for RSTP	The proportion of intervention messages and responses that can be delivered within the specified RSTP for intervention. Voice communications: Continuity would take into consideration any dropped calls.
C for RSTP _{ATSU}	The proportion of surveillance messages that can be delivered within the specified RSTP _{ATSU} .
C for RSTP _{CSP}	The proportion of surveillance messages that can be delivered within the specified RSTP _{CSP} .
C for RSTP _{AS/AIR}	The proportion of surveillance messages that can be delivered within the specified RSTP_{AS/AIR}. Voice communications: The proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.
C for RSTP _{AS}	The proportion of surveillance messages that can be delivered within the specified RSTP _{AS} .

C.2 RSP 180 specification

(reserved)

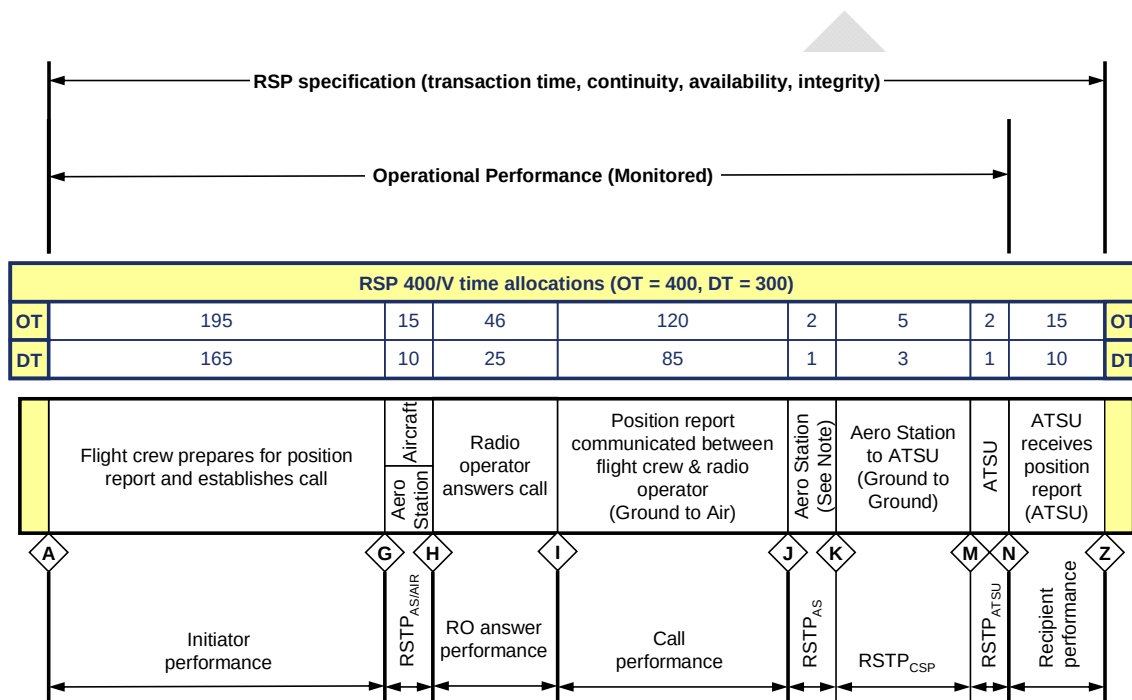
C.3 RSP 400 specification

RSP Specification					
RSP specification			400		
Airspace specific considerations					
Interoperability	Specify interoperability criteria (e.g. FANS 1/A or SATVOICE Iridium, Inmarsat, and/or MTSAT communications).				
ATS Function	Specify ATS function(s) (e.g. use or required for applicable separation standard).				
Application	Specify the required surveillance capability. For position reporting, specify the ATS function (e.g. periodic contract at [nn] min, waypoint change event contract, lateral deviation event contract at [n] NM).				
RSP parameter values					
Transit time (sec)	Continuity (C)		Availability (A)	Integrity (I)	
OT = 400	C(OT) = 0.999		0.999	Navigation FOM	See <u>Note 3</u>
DT 95% = 300	C(DT 95%) = 0.95			Time at position accuracy	+/- 30 sec (UTC)
		Data integrity		Malfunction = 10 ⁻⁵ per flight hour	
RSP monitoring and alerting criteria					
Ref	Criteria				
SMA-1	The system shall be capable of detecting failures and configuration changes that would cause the SATVOICE service to no longer meet the RSP parameter values for the intended function.				
SMA-2	When the SATVOICE service can no longer meet the RSP parameter values for the intended function, the flight crew and/or the controller shall take appropriate action.				
Notes					
<u>Note 1</u> — Rationale for the criteria provided in this specification can be found in ICAO Annex 11, ICAO Doc 4444, ICAO Doc 9689, and RTCA DO-306/ED-122.					
<u>Note 2</u> — If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the RSP parameter values, this would be considered a change in system configuration.					
<u>Note 3</u> — The navigation figure of merit (FOM) is specified based on the navigation criteria associated with this spec. For example, if RNP 10 is prescribed, then for ADS-C service, the FOM level would need to be 3 or higher. In all cases, when the navigation capability no longer meets the criteria specified for the operation, the flight crew is responsible for reporting the non-compliance to ATC in accordance with ICAO procedures.					

C.3.1 (reserved)

C.3.2 RSP 400/V_{RO} allocations

The RSP 400/V_{RO} allocations are applicable flight crew-initiated communications via a radio operator using SATVOICE communications to report position at compulsory reporting points. Figure C- 2 provides an overview of the communication transaction time allocations.



Notes

- 1) The (A to G) component includes time for flight crew duties at compulsory reporting points.
- 2) The (G to H) component is not defined at the continuity requirement for ET; however the operational performance specification assumes the total performance for technical components (C to F), (G to H) and (J to N) is 24 seconds.
- 2) The (J to K) component includes two concurrent processes:
 - a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
 - b) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by RCTP_{AS}.

Figure C- 2. Overview of RSP 400/V_{RO} time allocations

Reference	RSP safety requirements
All	Safety requirements for RSP 400/V _{RO} are the same as the safety requirements for RCP 400/V _{RO} (See Appendix B, paragraph B.3.2).

C.3.2.1 Air navigation service provider (ANSP)

RSP data transit time and continuity criteria			
Specification: RSP 400/V_{RO}	Application: Position reporting via radio operator using SATVOICE		Component: ANSP
Data latency parameter	OT (sec) C = 99.9%	DT 95%(sec) C = 95%	Compliance means
Radio operator answer performance (H to I)	46	25	Initially, by analysis, simulations, safety human factors assessments.
Call performance (I to J)	120	85	Initially, by analysis, simulations, safety human factors assessments.
Recipient performance (N to Z)	15	10	Initially, by analysis, simulations, safety human factors assessments.
RSTP ($RSTP_{AS/AIR} + RSTP_{AS} + RSTP_{CSP} + RSTP_{ATSU}$)	24	15	Estimated, CSP/SSP contract/service agreement. See paragraph C.3.2.2.
RSTP time allocation			
RSTP _{ATSU} (M to N)	2	1	Pre-implementation demonstration

RSP availability criteria			
Specification: RSP 400/V_{RO}	Application: Position reporting via radio operator using SATVOICE		Component: ANSP
Availability parameter	Efficiency	Safety	Compliance means
Service availability (A _{CSP/SSP})	N/A	0.999	Contract/service agreement terms. <i>Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph C.3.2.2, RSP 400/V_{RO} allocation to CSP/SSP for RSP availability criteria.</i>

RSP integrity criteria		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: ANSP
Integrity parameter	Integrity value	Compliance means
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level commensurate with integrity level, (compliance shown prior to operational implementation). See related safety requirement SR-3 and SR-4 for the ANSP. CSP/SSP contract/service agreement. See RSP integrity criteria for CSP/SSP, paragraph C.3.2.2.

RSP monitoring and alerting criteria		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: ANSP
Ref:	Criteria	Compliance means
SMA-1 SMA-2	<i>Note.</i> — RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6.	Review.

RSP related safety requirements		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: ANSP
Ref	Related RSP parameter	Safety requirement
All	A, C, I, ET	<i>Note.</i> — Safety requirements related to RSP 400/V _{RO} are the same as those related to RCP 400/V _{RO} . See Appendix B, paragraph B.3.2.

C.3.2.2 Communication/satellite service provider (CSP/SSP)

RSP data transit time and continuity criteria				
Specification: RSP 400/V_{RO}		Application: Position reporting via radio operator using SATVOICE		Component: CSP/SSP
Data latency parameter	OT (sec) C = 99.9%	IT (sec) C = 99%	DT 95% (sec) C = 95%	Compliance means
RSTP time allocation				
RCTP _{AS/AIR} (G to H)	[Not defined]	15	10	Pre-implementation demonstration.
RCTP _{AS} (J to K)	2	[not defined]	1	Pre-implementation demonstration.
RCTP _{CSP/SSP} (K to M)	5	[not defined]	3	Contract/service agreement terms. Pre-implementation demonstration.

RSP availability criteria			
Specification: RSP 400/V_{RO}		Application: Position reporting via radio operator using SATVOICE	
Availability parameter		Efficiency	Safety
Service availability (A _{CSP/SSP})		N/A	0.999
Unplanned outage duration limit (min)		N/A	20
Maximum number of unplanned outages		N/A	24
Maximum accumulated unplanned outage time (min/yr)		N/A	520
Unplanned outage notification delay (min)		N/A	10
Grade of service		N/A	1%
<i>Note.</i> — The RSP 400/V _{RO} availability are the same as the for RCP 400/V _{RO} . See Appendix B, paragraph B.3.2.2.			

RSP integrity criteria		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: CSP/SSP
Integrity parameter	Integrity value	Compliance means
Integrity (I)	[not defined]	Pre-implementation demonstration and contract/service agreement terms. <i>Note.</i> — RSP integrity criteria are specified by safety requirements allocated to the CSP/SSP for SR-3 and SR-4 .

RSP related safety requirements		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: CSP/SSP
Ref	Related RSP parameter	Safety requirement
All	A, C, I	<i>Note.</i> — Safety requirements related to RSP 400/V _{RO} are the same as those related to RCP 400/V _{RO} . See Appendix B, paragraph B.3.2.2 .

C.3.2.3 Aircraft system

RSP data transit time and continuity criteria				
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE			Component: Aircraft system
Data latency parameter	OT (sec) C = 99.9%	IT (sec) C = 99%	DT 95%(sec) C = 95%	Compliance Means
Operational Performance Time Allocation				
Call performance (I to J)	120	[not defined]	85	Human-machine interface capability, pre-implementation demonstration
RSTP Time Allocation				
RCTP _{AS/AIR} (G to H)	[not defined]	15	10	Pre-implementation demonstration

RSP availability criteria			
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE		Component: Aircraft system
Availability parameter	Efficiency	Safety	Compliance means
A _{AIR} (probability)	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration
<i>Note.</i> — The RSP availability criteria for type 400/V _{RO} are the same as the criteria for RCP 400/V _{RO} . See Appendix B, paragraph B.3.2.3 .			

RSP integrity criteria		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: Aircraft system
Integrity parameter	Integrity value	Compliance means
Integrity (I)	Malfunction = 10 ⁻³ per flight hour	Design approval of aircraft system. Analysis, safety requirements, development assurance level (e.g. Level D software), commensurate with integrity level, pre-implementation demonstration. <i>Note.</i> — RCP integrity criteria are specified by safety requirements allocated to the aircraft system for SR-3 and SR-4 .

RSP monitoring and alerting criteria		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: Aircraft system
Ref:	Criteria	Compliance means
SMA-1 SMA-2	<i>Note.</i> — RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6 .	Review.

RSP related safety requirements		
Specification: RSP 400/V _{RO}	Application: Position reporting via radio operator using SATVOICE	Component: Aircraft system
Ref	Related RSP parameter	Safety requirement
All	A, C, I	<i>Note.</i> — Safety requirements related to RSP 400/V _{RO} are the same as those related to RCP 400/V _{RO} . See Appendix B, paragraph B.3.2.3 .

C.3.2.4 Aircraft operator

RSP data transit time and continuity criteria			
Specification: RSP 400/V_{RO}	Application: Position reporting via radio operator using SATVOICE		Component: Aircraft operator
Data latency parameter	OT (sec) C = 99.9%	DT 95% (sec) C = 95%	Compliance means
Initiator performance (A to G)	195	165	Procedural capability, flight crew training and qualification in accordance with safety requirements.
Call performance (I to J)	120	85	Contract/service agreement terms. Pre-implementation demonstration.
RCTP _{AS/AIR} (G to H)	15	10	Pre-implementation demonstration.

RSP integrity criteria		
Specification: RSP 400/V_{RO}	Application: Position reporting via radio operator using SATVOICE	Component: Aircraft operator
Integrity parameter	Integrity value	Compliance means
Integrity (I)	Malfunction = 10^{-5} per flight hour	Review of procedures, training programs, and qualification to meet safety requirements. Design approval of aircraft SATVOICE system. CSP/SSP contract/service agreement. <i>Note.</i> — RSP integrity criteria are specified by safety requirements allocated to the aircraft operator for SR-3 and SR-4 . See also RSP integrity criteria for the aircraft system, paragraph C.3.2.3 , and the CSP/SSP, paragraph C.3.2.2 .

RSP monitoring and alerting criteria		
Specification: RSP 400/V_{RO}	Application: Position reporting via radio operator using SATVOICE	Component: Aircraft operator
Ref:	Criteria	Compliance means
SMA-1 SMA-2	<i>Note.</i> — RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6 .	Review.

RSP related safety requirements		
Specification: RSP 400/V _{RO}		Application: Position reporting via radio operator using SATVOICE
		Component: Aircraft operator
Ref	Related RSP Parameter	Safety requirement
All	A, C, I	<i>Note.</i> — Safety requirements related to RSP 400/V _{RO} are the same as those related to RCP 400/V _{RO} . See Appendix B, paragraph B.3.2.4.

C.3.3 RSP 400/V_{ATC} allocations

(reserved)

Appendix D Post-implementation monitoring

This appendix is intended to provide guidelines on post-implementation monitoring when the specifications provided in **Appendix B** and **Appendix C** are applicable.

The ICAO Global Plan calls for the implementation of a performance based system and ICAO Annex 11 requires that communication system performance is monitored to verify that an acceptable level of safety continues to be met. Annex 11 at paragraph 2.27.5 states:

“Any significant safety-related change to the ATC system, including the implementation of a reduced separation minimum or a new procedure, shall only be effected after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. When appropriate, the responsible authority shall ensure that adequate provision is made for post-implementation monitoring to verify that the defined level of safety continues to be met.”

Oversight of the compliance to the Annex 11 requirements is a matter for the States. However, States participate in planning and implementation regional groups (PIRGs), and most use a regional monitoring agency to facilitate monitoring activities within their respective region. The individual states/ANSPs will need to provide the data and information and analysis that will portray regional performance measures. The ANSPs, operators, CSPs, airframe manufacturers, and equipment suppliers all need to participate in reporting and resolving problems associated among the ANSPs and with aircraft.

Monitoring of SATVOICE communications in terms of RCP is an important part of the performance based system described in the ICAO global plan. To successfully achieve this performance monitoring on a global scale will require the use of common practices and data. It is only through this common performance monitoring that RCP data can be aggregated from an ANSP level through to a regional monitoring agency level and then to global level. This aggregation of performance data is in accordance with the guidelines provided in Doc 9883 Manual on Global Performance of the Air Navigation System.

This appendix contains the following guidance material:

- a) ANSP data collection and analysis - This section defines a common data reporting format. Guidance material is included on how to obtain the required data points and measure actual SATVOICE call performance.
- b) Problem reporting and resolution – This section provides guidance on the problem identification and resolution process.
- c) Regional/global performance monitoring – This section provides guidance on providing a repository for exchange actual SATVOICE communication performance and problem report/resolutions at a regional and global level.

D.1 ANSP data collection and analysis

SATVOICE performance requirements are defined in Annex 10 and various ICAO documents. **Appendix B** and **Appendix C** provide these requirements in RCP specifications for controller intervention and RSP specifications for flight crew position reporting and provide the basis for post-implementation monitoring guidance provided in this appendix.

The ANSP data collection is intended to be executed at the ATSU. Data collection by the aeronautical stations, CSPs and SSPs may be necessary as determined by service agreements to support analysis of problems found on a case-by-case basis.

D.1.1 ANSP data collection for controller intervention via radio operator using SATVOICE

This section provides guidance on data collection and performance measurement for the communication application.

D.1.1.1 Measuring communication performance

Communication performance analysis is based on the calculation of actual communication performance (ACP) used to monitor RCP time allocation for communication transaction (TRN). The analysis uses the measurement of transit and response times related to clearance sent via SATVOICE, containing “ATCC” for ATC clears, that receive a single readback response. The rationale behind this is that the critical communications requirement is provided by intervention messages.

The ACP is calculated by taking the difference between the time that the clearance message is originated at the ANSP and the time that the corresponding response read-back is received at the ANSP.

D.1.1.2 Recording the data points for each clearance transaction

The data points listed in **Table D- 1** are recommended as the minimum set that should be extracted from ANSP system recordings to enable RCP analysis and provide sufficient information for problem analysis. This does not preclude individual ANSP from extracting additional data points for their own analysis requirements, some possibilities of which are listed below. ANSP should note that they may require additional database information to enable the aircraft type to be obtained by correlation to the aircraft registration extracted from the ANSP system recordings. All other data points can be extracted from either the ACARS header or the ACARS application message.

Table D- 1 Clearance transaction collection points

Ref	Label	Description and/or remarks
1	ANSP facility	The four letter ICAO designator of the FIR (e.g. NZZO).
2	Aircraft callsign	<i>Note.</i> — Extracted from ACARS header or application message (e.g. UAL12).
3	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). <i>Note.</i> — Extracted from aircraft callsign.
4	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). <i>Note.</i> — Extracted from ANSP database using aircraft registration as key. May not be possible if registration number is not available.
5	Date	In YYYYMMDD format (e.g. 20081114). <i>Note.</i> — Extracted from ANSP system data recording time stamp.
6	Clearance media	Designator of the media type through which the clearance was sent (e.g. SAT Iridium, Inmarsat or MTSAT, or HF). <i>Note.</i> — This is extracted from the ACARS header or application message.
7	Clearance send time	The timestamp on the clearance message sent by the ANSP in HH:MM:SS format (e.g. 13:43:25). <i>Note.</i> — Extracted from ANSP system data recording time stamp.

Ref	Label	Description and/or remarks
8	ANSP timestamp on the receipt of the readback response	In HH:MM:SS (e.g. 13:44:45). <i>Note.— Extracted from ANSP system data recording time stamp.</i>
9	ACP	Actual communications performance in seconds measured as the difference between time the clearance is sent (#7) and time operational readback response is received (#8) (e.g. 80).

The ANSP may find that the following additional data may be useful for performance analysis:

- a) The aircraft registration in ICAO Doc 4444 format (e.g. with no hyphens, packing dots, such as N104UA); and
- b) The aircraft address in ICAO Doc 4444 format represented in hexadecimal code (e.g. C0173E)

D.1.1.3 Data record for each clearance transaction

If required for regional monitoring agency analysis clearance transaction data as described above may be sent to the regional/State monitoring agency at as a comma delimited text file. The format for each record will at minimum contain the 10 data points specified in **Table D- 1**. Using the examples in **Table D- 1**, the data record for the associated transaction in comma delimited format would be as follows:

NZZO,UAL12,UAL,B744,20081114,SAT,13:43:25,13:44:45,80

Guidance on the type of analysis carried out at an ANSP or regional level is provided later in **paragraphs D.1.3 and D.3**.

D.1.2 ANSP data collection for flight position reports via radio operator using SATVOICE

This section provides guidance on data collection and performance measurement for the surveillance application.

D.1.2.1 Measuring surveillance performance

The analysis of surveillance performance is based on the measurement of the transit times of the position reports sent from the aircraft to the ANSP ground system. This is measured as the difference between the time-over-position extracted from the decoded ACARS message, representing an estimation of when the message originated from the air and the time the message is received at the ANSP. Because the accuracy of the time-over-position within the ACARS position report message is only to the minute (e.g. 15:11) while the accuracy of the timestamp of receipt at the ANSP is to the second (e.g. 15:11:11) the accuracy of the measurement of the surveillance performance will be limited to the minute.

D.1.2.2 Recording the data points for each position report

The data points listed in **Table D- 2** are recommended as the minimum set that should be extracted from ANSP system recordings to enable an analysis of surveillance performance and provide sufficient information for problem analysis. This does not preclude individual ANSP from extracting additional data points for their own analysis requirements, some possibilities of which are listed below. ANSP should note that they may require additional database information to enable the aircraft type to be obtained by correlation to the aircraft callsign or registration extracted from the ANSP system recordings, as well as to enable decoding of the latitude and longitude from an airspace fix name. All other data points can be extracted from either the ACARS header or the ACARS application message.

Table D- 2 Position report collection points

Ref	Label	Description and/or remarks
1	ANSP	The four letter ICAO designator for the FIR of the reporting ANSP (e.g. NZZO).
2	Aircraft callsign	<i>Note.</i> — Extracted from ACARS header or application message (e.g. UAL12).
3	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). <i>Note.</i> — Extracted from aircraft callsign.
4	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). <i>Note.</i> — Extracted from ANSP database using aircraft registration as key. May not be possible if registration number is not available.
5	Date	In YYYYMMDD format (e.g. 20081114). <i>Note.</i> — Extracted from ANSP system data recording time stamp.
6	Position report media	Designator of the media type through which the position report was sent (e.g. SAT Iridium, Inmarsat or MTSAT, or HF). <i>Note.</i> — This is extracted from the ACARS header or application message.
7	Report Type	The type of position report extracted from the ACARS header (e.g. POS or AEP).
8	Latitude	The reported latitude decoded from the ACARS position report message. The format is “+” for North or “-” for South followed by a decimal number of degrees (e.g. -33.456732).
9	Longitude	The reported longitude decoded from the ACARS position report message. The format is “+” for East or “-” for West followed by a decimal number of degrees (e.g. +173.276554).
10	Position Time	The time contained within the ACARS position report message that was sent from the aircraft in HH:MM (e.g. 03:44).
11	ANSP Receipt Time	The ANSP timestamp on the receipt of the ACARS position report message in HH:MM:SS (e.g. 03:44:45). <i>Note.</i> — Extracted from ANSP system data recording time stamp.
12	Transit Time	The transit time of the position report in seconds calculated as the difference between position time (#10) and ANSP Receipt Time (#11) (e.g. 45).

ANSP may find that the following additional data may be useful for performance analysis:

- a) The aircraft registration in ICAO Doc 4444 format (e.g. no hyphens, packing dots, such as N104UA); and
- b) The aircraft address in ICAO Doc 4444 format represented in hexadecimal code (e.g. C0173E).

D.1.2.3 Data record for each position report

If required for regional/State monitoring agency analysis position report data as described above may be sent to the regional/State monitoring agency at as a comma delimited text file. The format for each record will at minimum contain the 12 data points specified in table D-2. Using the examples in table D-2, the data record for the associated transaction in comma delimited format would be as follows:

`NZZO,UAL12,UAL,B744,20081114,SAT,POS,-33.456732,+173.276554,03:44,03:44:45,45`

Guidance on the type of analysis carried out at an ANSP or regional level is provided later in **paragraphs D.1.3 and D.3.**

D.1.3 ANSP performance analysis

It is recommended that the analysis of the communication and surveillance performance over SATVOICE be conducted by the ANSP on at least a monthly basis to enable adequate system performance monitoring. This will ensure that the system is meeting expected performance and facilitate continuous improvement in performance by aiding in the detection of specific aircraft or fleets not meeting the performance standards.

While it is possible for this analysis to be carried out by a regional monitoring agency, it will be more efficient if done by the ANSP. The operational expertise and local area knowledge of the ANSP will help with identifying problems in the data analysis. In addition, the ANSP already possesses the considerable amount of data required for the analysis.

It is more appropriate for a regional monitoring agency to manage problems reported from the ANSP analysis, and to develop regional performance figures from information supplied by the ANSP.

At least one region has had considerable success by using some of the regional ANSP to complete a monthly data analysis and reporting the identified problems to the regional monitoring agency for resolution.

D.1.3.1 Graphical performance analysis

It is recommended that ANSP begin with a graphical analysis of the collected performance data. Depicting the analysis results in graphical form has proven a useful technique for evaluating various aspects of performance and identifying problems.

Monitoring may be completed at several levels for both the communication and surveillance performance. The following structure is recommended:

- a) Monitoring performance by communication media - an analysis of:
 - 1) Voice data from all aircraft.

- 2) Voice data from all aircraft via SAT (Iridium, Inmarsat and MTSAT).
- 3) Voice data from all aircraft via HF, as appropriate.
- b) Monitoring performance by airline fleet - an analysis of:
 - 1) Observed performance of each type of aircraft operated by an operator for:
 - i) All voice data.
 - ii) Voice data via SAT (Iridium, Inmarsat and MTSAT).
 - iii) Voice data via HF, as appropriate.
 - 2) Comparative analysis of the observed performance for an aircraft type used by different operators.

D.1.3.2 Data filtering

The performance specifications are intended to provide criteria for “operational” performance, so to not necessarily filter out failed attempts. However, in some cases filtering may be appropriate. It is important that consistent data filtering is employed to ensure that all ANSP measure against the same baseline.

Raw data obtained from the ANSP recordings will include delayed transactions, which are affected by conditions affecting availability, such as system outages and congestion. These transactions should not be used when assessing clearance transaction time or position report delivery time, as they will be considered when assessing the service availability. This data should be filtered from the raw data before any performance assessment is made.

When SATVOICE is used after failed attempts on HF, the observed performance may indicate excessive delays in the SATVOICE performance. The analysis should include these data to reflect actual operational performance from the controller perspective and then determine whether procedures could potentially mitigate the effects of these delays (e.g. the radio operator may consider using the SATVOICE directly when it can be determined to provide a more reliable communication than HF).

D.1.3.3 Communication analysis

Monitoring controller intervention (i.e. clearances) via radio operator using SATVOICE involves an assessment of ACP by a graphical analysis of data using the structure outline in **paragraph D.1.3.1**.

D.1.3.3.1 Monitoring communication performance

A graph illustrating the cumulative distribution of ACP is used to assess SATVOICE communication performance. The purpose of the graph is to depict measured performance against the RCP400 requirements at the 95% and 99.9% levels.

Figure D- 1 illustrates a typical graph of ACP constructed using a spreadsheet application. The observed performance of the 7,404 HF voice transactions in October 2011 is shown against the RCP400 performance measures.

Figure D- 2 illustrates an ACP chart showing the performance over a 12-month period. The tight spread of the data shows relatively stable performance in this example.

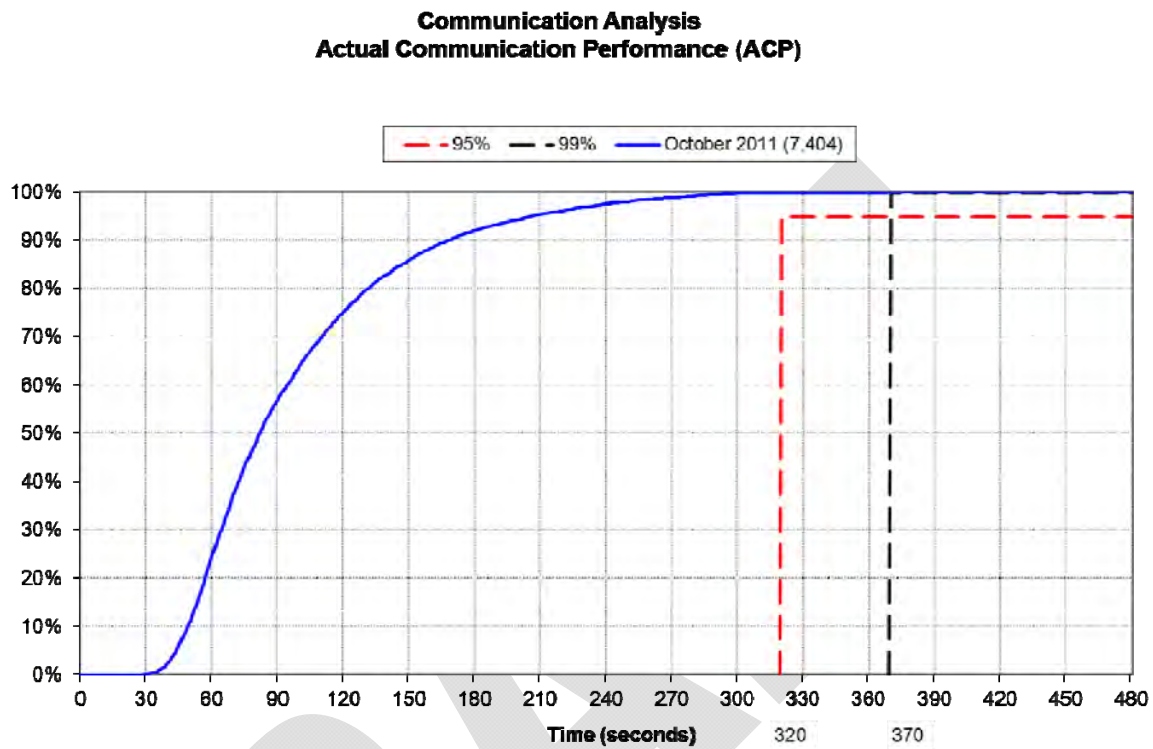


Figure D- 1 SATVOICE communication performance – ACP

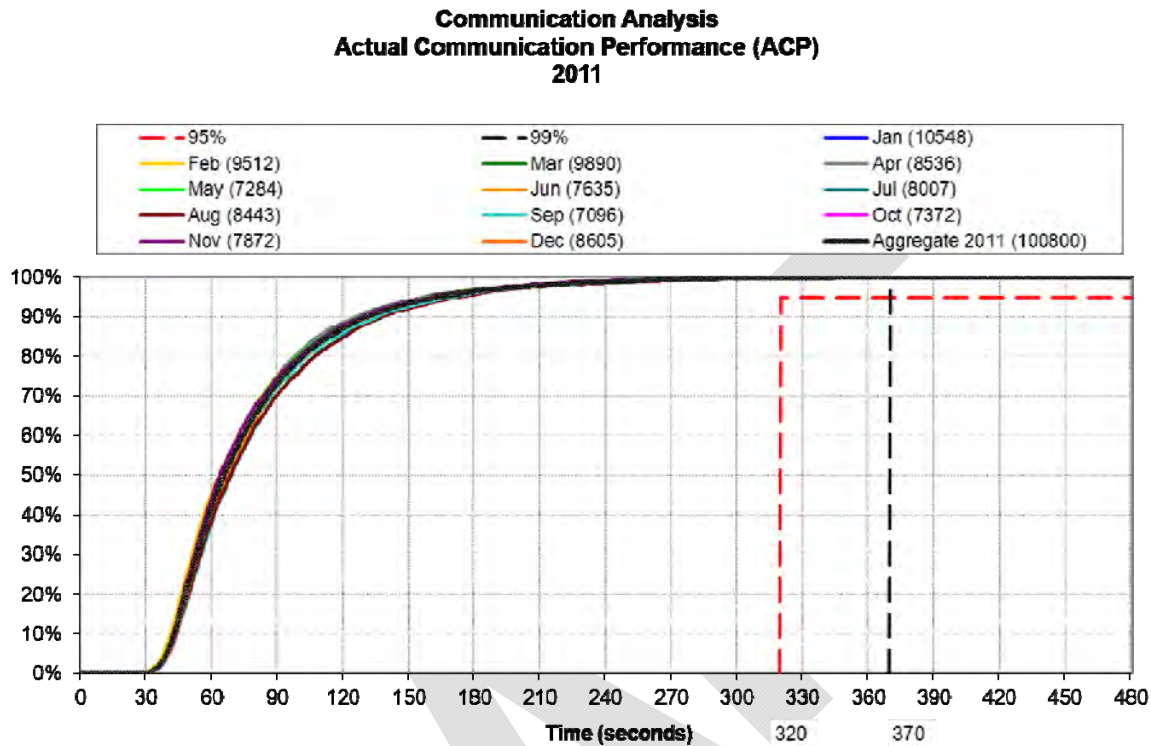


Figure D- 2 SATVOICE communication performance – ACP – 12 months

D.1.3.3.2 Monitoring aircraft operator fleet performance

Graphs illustrating ACP can be used to monitor the performance of each aircraft type in an operator's fleet. These should be generated on a monthly basis. Considerable performance variation may be seen month to month and significant degradation in any month may be the result of poor performance from an individual aircraft or may be the result of routes changing from the previous month with varying weather patterns. These may be investigated further using an analysis of individual tails in a fleet.

A comparative analysis of the performance of different fleets operating in an FIR, particularly fleets of the same type is useful. Poorly performing fleets can be identified for further analysis and a picture of typical performance from all fleets operating in a FIR can be shown in comparison. These can be compared with the same fleets operating in other regional FIR.

D.1.3.4 Surveillance analysis

Monitoring position report delivery via radio operator using SATVOICE involves an assessment of position report delivery times through a graphical analysis of data using the structure outline in [paragraph D.1.3.1](#).

D.1.3.4.1 Monitoring surveillance performance

A graph illustrating the cumulative distribution of position report delivery times is used to assess surveillance performance over SATVOICE. The purpose of the graph is to depict measured performance

against the RSP400 requirements at the 95% and 99.9% levels. To account for the lack of resolution of the time at position in the report, the data is organized into bins of 60 seconds.

Figure D- 3 illustrates a typical graph of position report delivery times constructed using a spreadsheet application. The observed performance of the 10,217 voice position reports is shown against the RSP400 performance criteria.

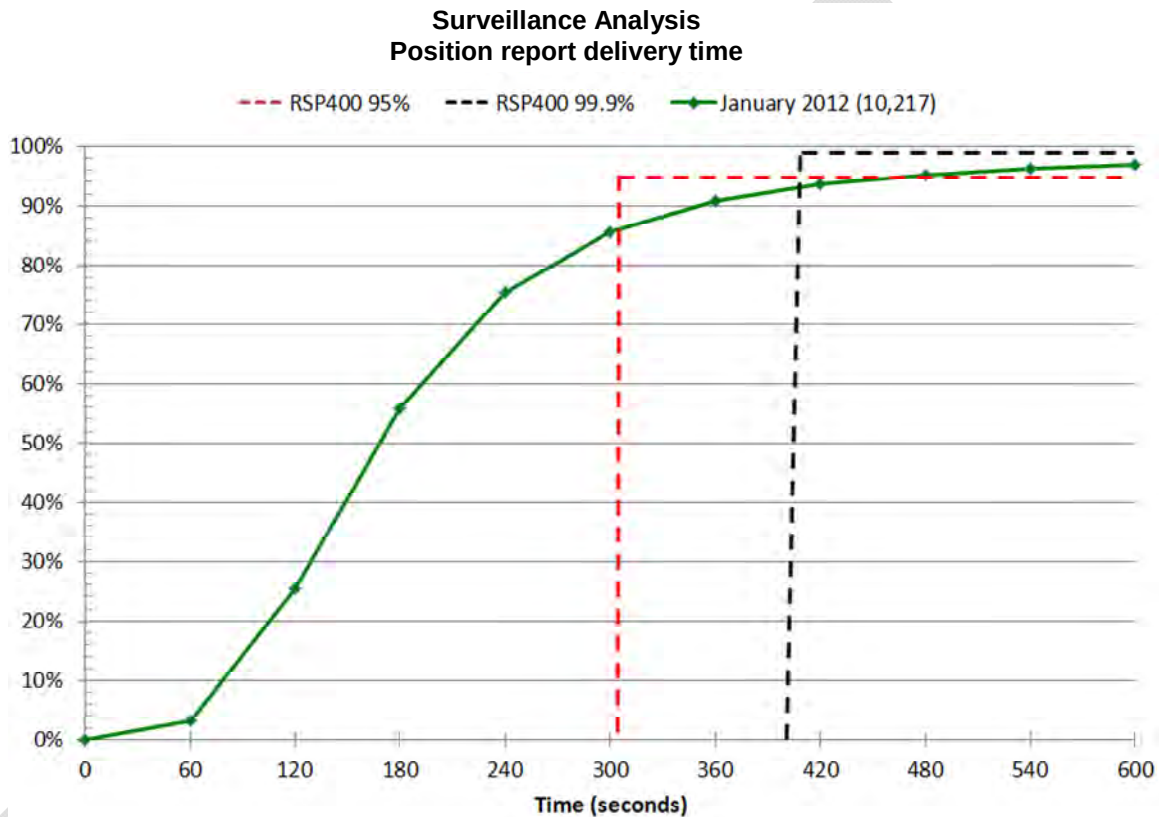


Figure D- 3 Position report delivery time

D.1.3.4.2 Monitoring operator fleet performance

Graphs illustrating observed surveillance data transit time can be used to monitor the performance of each aircraft type in an operator's fleet. These should be maintained on a monthly basis and can be used to observe the performance of each type when using different media.

Considerable performance variation may be seen month to month on some fleets and significant degradation in any month may be the result of poor performance from an individual aircraft or may be the result of routes changing month to month with varying weather patterns. These may be investigated further using an analysis of individual tails in a fleet as discussed in **paragraph D.1.3.5**. The fleet illustrated shows little variation between the months and for clarity only the high and low months are depicted.

A comparative analysis of the performance of different fleets operating in an FIR particularly of fleets of the same type is useful. Under performing fleets can be identified for further analysis and a picture of

typical performance from all fleets operating in a FIR can be built up. These can be compared with the same fleets operating in other regional FIR.

D.1.3.5 Identifying poor performers

The reasons behind degraded performance are many and varied. Considerable analysis may be required before the reasons behind poor performing fleets are identified and it is difficult to provide guidance for all situations.

On a number of occasions poor performance has been attributed to a specific aircraft in a fleet. Usually these poor-performing aircraft can be identified by the visual inspection of monthly data ordered in terms of transit time, or more accurately by graphing the monthly data for a fleet by aircraft registration.

Techniques such as graphing the positions of all delayed messages on a geographical display have identified areas for further investigation.

D.2 Problem reporting and resolution

D.2.1 General

Typically, aircraft operators and ANSPs that experience SATVOICE problems should contact their CSP that provides the SATVOICE service for investigation. However, many regions have a regional monitoring agency to manage the problem reporting and resolution process for components that support air traffic management. These regional monitoring agencies may also assist in resolving SATVOICE problems.

The problem identification and resolution process, as it applies to an individual problem consists of a data collection phase, followed by problem analysis and coordination with affected parties to secure a resolution, and recommendation of interim procedures to mitigate the problem in some instances.

D.2.2 Problem report form

The problem identification task begins with receipt of a report from a stakeholder, usually an operator or ANSP. Standard reporting forms should be developed and regions should investigate the use of a website to receive and store problem reports. The fields used in the form are as follows:

- a) Originator's Reference Number: Originators problem report reference (e.g. ANZ_2009-23);
- b) Title: A short title which conveys the main issue of the reported problem (e.g. SATVOICE connection);
- c) Date UTC: Date in YYYYMMDD format (e.g. 20090705);
- d) Time UTC: Time in HHMM (e.g. 2345);
- e) Aircraft registration: ICAO flight plan aircraft registration (e.g. ZKADR);
- f) Aircraft identification: ICAO flight plan call sign if applicable (e.g. NZA456);
- g) Flight Sector: If applicable the departure and destination airfield of the flight (e.g. NZAA-RJBB);
- h) Organization: Name of the originators organization (e.g. Airways NZ);

- i) Active Center: Controlling Centre at time of occurrence if applicable (e.g. NZZO);
- j) Next Center: Next controlling centre at time of occurrence if applicable (e.g. NFFF);
- k) Position: Position of occurrence (e.g. 3022S16345E);
- l) Problem Description: Detailed description of problem;
- m) Attach File: Originator and assigned stakeholders can attach data files or other detailed information such as geographic overlays; and
- n) Additional Data: Area set aside for feedback from stakeholders assigned by the regional/State monitoring agency. This will include the results of the investigation and the agreed action plan.

Note.— A number of regional monitoring agencies may develop websites to manage the problem reporting process.

D.2.3 Problem assessment

D.2.3.1 Data collection

The data collection phase consists of obtaining operational data logs from the appropriate parties (which will depend on which ANSPs and CSPs/SSPs were being used and operator service contracts). This usually means obtaining operational data logs for the appropriate period of time from the ANSPs, CSPs and SSPs involved. Usually, a log for a few hours before and after the event that was reported will suffice, but once the analysis has begun, it is sometimes necessary to request additional data, (perhaps for several days prior to the event if the problem appears to be an on-going one).

Additionally, some aircraft-specific recordings may be available that may assist in the data analysis task. These are not always requested initially as doing so would be an unacceptable imposition on the operators, but may occur when the nature of the problem has been clarified enough to indicate the line of investigation that needs to be pursued. These additional records include:

- a) Aircraft maintenance system logs;
- b) Built-In Test Equipment data dumps for some aircraft systems;
- c) SATCOM activity logs; and
- d) Logs and printouts from the flight crew and recordings/logs from the ATS provider(s) involved in the problem may also be necessary. It is important that the organization collecting data for the analysis task requests all this data in a timely manner, as much of it is subject to limited retention.

D.2.3.2 Data analysis

Once the data has been collected, the analysis can begin. It may be necessary to use support tools to analyze operational data. The analysis requires a thorough understanding of the SATVOICE system and the situation in which it was used.

The analyst must also have a good understanding of how the aircraft systems operate and interact to provide the ATS functions, as many of the reported problems are aircraft system problems.

This information will enable the analyst to determine a probable cause by working back from the area where the problem was noticed to where it began. In some cases, it may require lab testing using the airborne equipment (and sometimes the ground networks) to reliably determine the cause of the problem.

Once the problem has been identified, then the task of coordination with affected parties begins. The stakeholder who is assigned responsibility for fixing the problem must be contacted and a corrective action plan agreed. The stakeholder who initiated the problem report shall be provided with regular updates on the progress and resolution of the problem.

This information (the problem description, the results of the analysis and the plan for corrective action) is then entered into a database covering SATVOICE problems, both in a complete form to allow continued analysis and monitoring of the corrective action and in a de-identified form for the information of other stakeholders. These de-identified summaries are reported at the appropriate regional management forum and made available to other regional central reporting/monitoring agencies on request.

D.2.4 Mitigating procedures – problem resolution

Because a considerable period may elapse while software updates are applied to all aircraft in a fleet, the regional monitoring agency in coordination with the relevant ANSPs may have to develop procedural methods to mitigate the problem until the solution is implemented. The regional monitoring agency may serve to identify the need for such procedures and develop recommendations for implementation by the ANSPs, CSPs/SSPs and operators involved.

D.3 Regional performance analysis and reporting

This section provides guidance on periodic reporting by individual ANSP of observed system performance in their FIR that will enable regional performance metrics to be developed for the availability, transaction time for interventions via SATVOICE and position report delivery time requirements specified in **Appendix B** and **Appendix C**.

These regional performance metrics should be made available to all interested stakeholders. The use of regional websites to enhance the distribution of these metrics for SATVOICE should be considered. For example, a website used for data link can be viewed at <http://www.ispacg-cra.com>.

D.3.1 Periodic reporting

It is recommended that regions implement monthly performance reporting to obtain system performance metrics. These reports will provide data on observed availability, transaction time for interventions via SATVOICE and position report delivery time.

a) The ANSP should report on CSP/SSP notified system outages and on detected outages that have not been notified as described in **paragraph D.1.3.2**. For each outage the following information should be reported:

- 1) Time of CSP/SSP outage notification: In YYYYMMDDHHMM format or “Not Notified” if no CSP/SSP notification received.
- 2) CSP/SSP Name: Name of CSP and SSP providing outage notification if applicable.
- 3) Type of outage: Report media affected SATCOM, VHF, HF, ALL.
- 4) Outage start time: In YYYYMMDDHHMM format

- 5) Outage end time: In YYYYMMDDHHMM format
- 6) Duration of outage: In minutes.

b) The ANSP should report observed ACP for controller intervention via the radio operator using SATVOICE as described in **paragraph D.1.3**.

c) The ANSP should report observed position report delivery time as described in **paragraph D.1.3**.

A tabular reporting format can be used to capture the observed performance at the 95% and 99.9% surveillance performance types 180 and 400 times.

In addition to the tabular performance reporting, regions should consider presenting performance data using graphical means, such as depicted in **Figure D- 1** and **Figure D- 2**. Performance graphs illustrating regional communications and surveillance performance for SATVOICE can be readily obtained by aggregating spreadsheet data from individual ANSP. The relevant data can be included in an ANSP monthly report to enable regional aggregation of agreed performance information to allow it to be presented in graphical form. Regions could present all or some of the data reported in tabular and graphical form, if desired. This method of reporting would also assist global aggregation.

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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 will be available by end 2012 and Category II and III operations by 2015;
- f) ILS is capable of meeting the majority of requirements for precision approach and landing in the Asia-Pacific Region;
- 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.
- i) single-frequency GNSS may be susceptible to radio frequency interference and ionospheric disturbances

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) [rationalize terrestrial navigation aids, retaining a minimum network of terrestrial aids necessary to maintain safety of aircraft operations.](#)
- f) protect all the Aeronautical Radio Navigation Service (ARNS) frequencies; and

** APV includes BARO-VNAV, RNP, RNP-AR, APV(SBAS)

- g) ensure civil-military interoperability.

**THE REVISED TERMS OF REFERENCE OF
ADS-B STUDY AND IMPLEMENTATION TASK FORCE**

- Compare currently available 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);
- Develop an implementation plan for near term ADS-B applications in the Asia Pacific Region including implementation target dates taking into account:
 - available equipment standards
 - readiness of airspace users and ATS providers
 - identifying sub-regional areas (FIRs) where there is a positive cost/benefit for near-term implementation of ADS-B OUT
 - developing a standardised and systematic task-list approach to ADS-B OUT implementation; and
 - holding educational seminars and provide guidance material to educate States and airspace users on what is required to implement ADS-B [IN & OUT](#).
- Study and identify applicable multilateration applications in the Asia and Pacific Region considering:
 - Concept of use/operation
 - Required site and network architecture
 - Expected surveillance coverage
 - Cost of system
 - Recommended separation minimums; and
 - If multilateration can be successfully integrated into an ADS-B OUT-system for air traffic control.
- 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, EUROCAE, RTCA and Industry.

Note: The Task Force, while undertaking the tasks, should take into account of the work being undertaken by SAS, AS Panels with a view to avoid any duplication.

The Task Force should report to the APANPIRG, through the CNS/MET Sub-group and provide briefing to the ATM/AIS/SAR Sub-group.

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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
	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~~
	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~~
	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~~	~~USA Closed~~
	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~~
	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~~
	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~~
	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~~
	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 Completed~~
	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 12~~	~~Myanmar & India Completed~~
	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~~
	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 Completed~~
	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 13~~	~~Singapore Completed~~
	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 12~~	~~Australia & CANSO Completed~~

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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
	37	~~Guidance material addressing 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 Completed~~
	39	~~Comparing the changes brought by DO260B and identifying any potential impacts on ATC systems.~~	~~A. Safety~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Prepare a working paper~~	~~April-12~~	~~Hong Kong China & Singapore Completed~~
1	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/ Dec-13	SEA/BOB WG - On going
2	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.	April-09/ December-13	South Pacific States On-going
3	21	Study application of ADS-B and mutilate for precision runway monitoring.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	April-13	All Members On-going
4	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	April-13	All Members On-going
5	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.	April-09/ December-13	Bay of Bengal States
6	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-13	China and Myanmar On-going
7	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	Report status at the Task Force meetings	April-13	All Members

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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
8	38	Bring attention of States concerned to the integrity requirement as specified in the ICAO Document (Circular 326) and the risk that ADS-B data without integrity (such as NUC=0) should not be used to support either separation or situation awareness.	A. Safety	GPI01/05/06/09/14/16/17/21/22	Letter to States	September-12	Regional Office

**GUIDANCE MATERIAL ON
GENERATION, PROCESSING & SHARING of ASTERIX
CATEGORY 21 ADS-B MESSAGES
(Including Attachments A, B, C & D)**

1. INTRODUCTION

1.1 The “All Purpose Structured Eurocontrol Surveillance Information Exchange” (ASTERIX) Category 21 is a data format standard globally accepted by the Air Traffic Management (ATM) system manufacturing industry for sharing of ADS-B data with ATM automation system. Asterix Category 21 data is used to convey ADS-B data from ADS-B ground stations to ATC processing and display system. This guidance material discusses various aspects of this process. Since the ASTERIX Category 21 version 0.23 was issued in November 2003, it has undergone continuous revisions with some 14 subsequent versions. The focus of this guidance material is to concentrate on 1090ES ADS-B data using:

- a) DO260;
- b) DO260A; and
- c) DO260B

1.2 The ASTERIX Category 21 version 1.0 issued in August 2008 has fully incorporated the DO260A standard while the latest version 2.1 issued in May 2011 has fully incorporated the latest DO260B standard.

2. ASTERIX CAT 21 IN ASIA AND PACIFIC REGIONS

2.1 To ensure interoperability of ADS-B ground stations in the Asia Pacific (ASIA/PAC) Regions, during the 16th APANPIRG Meeting held in August 2005, the ASTERIX Category 21 version 0.23 which had incorporated DO260 standard was adopted as the baselined ADS-B data format for deployment of ADS-B ground stations and sharing of ADS-B data in the ASIA/PAC Regions. At this time DO260A and DO260B standards were not defined.

3. CHOICE OF ASTERIX VERSION NUMBER

3.1 The Asterix standard has been developed over many years. Stability in the standard is desirable so that ADS-B ground station designers and ATM automation designers and manufacturers can build interoperable systems with confidence. Because ADS-B technology has been evolving over the years, and will continue to do so, it is not surprising that the Asterix standard has also developed along with the ADS-B link technology standards to grasp the best benefits of its intended design.

3.2 During 2005, Asia Pacific decided to use V0.23 as the version for sharing ADS-B data between states. This version provides adequate information so that useful ATC operational services can be provided including ATC 3 nautical mile and 5 nautical mile separation services. V0.23 can be used with DO260, DO260A and DO260B ADS-B avionics/ground stations to provide basic ATC operational services. However, V0.23 cannot fully support all the capabilities offered by DO260A and DO260B.

3.3 Nearly all V0.23 data items can be “re-constructed” from a received V2.1 data stream. However, most of the special DO260A/B data items cannot be “re-constructed” from a V0.23 data stream. In terms of domestic use and data sharing with other ANSPs concerning ADS-B data, several options exist for ANSPs as follows:

Option	Domestic use	Data sharing
1	V0.23	V0.23. This is the default and basic standard.
2	V2.1	V0.23. This will require some conversions to occur, probably through an ADS-B format conversion and filter system (see Paragraph 11), between a domestic system and a foreign system. Difficulties may exist if the domestic system requires special DO260A/B data items, since they cannot all be re-constructed from the external foreign V0.23 data stream.
3	V2.1	V2.1. Must negotiate bilaterally with data sharing partner regarding exact version to be used to achieve the intended functions.

Note: In this table, V2.1, the latest Asterix Cat 21 version, is chosen as a representation of an Asterix Cat 21 version after V0.23. There exists other Asterix CAT 21 versions (e.g. 0.26, 1.3. and etc.) after V0.23 that could be used by ANSPs for domestic and data sharing use.

4. SPECIFICATION OF ASTERIX MESSAGE PROCESSING

4.1 Care is needed to understand the difference in specifications :

4.2 **Asterix Cat 21:** Defines the characteristics of the data ON the interface including fields that are mandatory on the interface.

4.3 **ADS-B ground station specifications:** To define the Asterix standard, must also define which optional Asterix data items are required to be delivered on the Asterix interface, when the appropriate data is received from the aircraft. It is desirable that suppliers be required to :

- a) indicate how the ground station processes and outputs every received DO260, DO260A and DO260B data element into an Asterix data element/field; and
- b) indicate which and how each Asterix data element and field presented at the output are populated.

4.4 **ATM automation system specifications:** Defines which received Asterix data element and fields are processed and how they are processed. Also defines which Asterix optional data fields are required by the ATM automation systems (if any). ANSPs that specify ADS-B ground stations and ATM automation systems need to consider carefully and clearly about what they desire to achieve. Specifications which simply require compliance with a particular Asterix standard will be inadequate in most circumstances. In particular ANSPs, together with their suppliers should :

- a) Specify the Asterix standard version to be used. This defines the message formats that are placed on the link between ADS-B ground station and downstream systems like ATM automation, recording & analysis systems, bypass ATC systems and foreign ANSPs. The standard will define which messages elements are mandatory in each message (very few fields) and a large number of optional fields. The optional fields can only be filled if relevant data is received from the aircraft. The optional fields will only be filled if the ground station specification requires them to be filled.
- b) Specify the ADS-B ground station behaviour so that when data is received from the aircraft, the ground station is required to fill appropriate optional Asterix data fields.
- c) Specify the ATM automation system behaviour including appropriate semantic and syntax checks applied to the Asterix data, including any triggers for the system to discard data. The processing applied to each received Asterix data field.

5. MANDATORY FIELDS : ASTERIX AND 1090ES ADS-B

5.1 Asterix Cat 21 has been designed to support multiple datalinks. It has been defined to support data fields which are not available in the 1090ES standards. Therefore some data items and fields are not relevant when 1090ES is used.

5.2 The standard itself defines various items as optional or mandatory. This is defining what is ON the interface. It does NOT specify the behaviour of the transmitting ground station nor the behaviour of the receiving ATM automation system.

5.3 When a single link technology has been chosen it may be sensible to diverge from the formal V0.23 standard to reduce the required Asterix datalink bandwidth. E.g.: in an environment with only 1090ES, it is unnecessary to transmit “Link Technology Indicator”. Asterix Cat 21 Version 2.1 allows this selection.

Data Items	Description	Mandatory (M) or Optional (O) items as per ASTERIX Category 21	
		Version 0.23 Specification	Version 2.1 Specification
I021/010	Data Source Identification	M	M
I021/030	Time of Day	M	N/A
I021/071 or I021/073	Time of Applicability of Position or Time of Message reception for position	N/A	One of these is must be transmitted
I021/040	Target Report Descriptor	M	M
I021/080	Target Address	M	M
I021/210	Link Technology Indicator/ MOPS version	M	O

6. GENERATION OF ASTERIX AT AN ADS-B GROUND STATION

6.1 The following general principles should be adopted:

6.2 Commensurate with link bandwidth availability transmit all mandatory Asterix data items and also transmit those Asterix data items that are operationally desirable. That is, when the appropriate aircraft transmission is received by the ADS-B ground station, the data should be transmitted to the ATC system for operational use or for technical recording and analysis use. If no aircraft transmission data is received to fill an Asterix data item during any update cycle, the data item should not be included in the Asterix data stream to reduce bandwidth requirements.

6.3 **Group 1 (Mandatory Data Items):** An Asterix Cat21 message should not be transmitted unless the mandatory data items defined in Appendix A are all present.

6.4 **Group 2 (Desirable Data Items) :** The data items defined in Appendix B are operationally desirable which should always be transmitted in the Asterix Cat 21 messages whenever the data are received by the 1090ES ground station from aircraft (if allowed by the relevant Asterix standard chosen).

6.5 **Group 3 (Optional Data Items) :** The data items defined in Appendix C are considered optional and may or may not need to be transmitted depending on availability of such data from aircraft and/or other specific operational needs.

6.6. **Group 4 (Future Data Items):** The following data are defined in the DO260A and DO260B standards but are not yet defined in the Asterix standard. This group is provided for information only. It illustrates the need for system designers to provide for future adaptability when possible and when cost effective to do so. Not only will the Asterix standard continue to evolve, but changes to DO260 can also be anticipated within the decade.

- a) Target heading: Information from DO260A/B Target state and status messages (On condition messages). These could be used for detection of pilot errors in selection of heading/altitude; and
- b) GPS Offset: Could be used to more accurately display aircraft position on an airport surface, or better detect that an aircraft has passed an airport hold point.

6.7 When developing a specification for an ADS-B ground station, it is considered necessary that the specification requires the transmission of all data items that are operationally desirable (Group 2), when such data are received from the aircraft, in addition to the data items that are mandatory (Group 1) in Asterix messages. Whether Group 3 optional data items will need to be transmitted or not should be configurable on item-by-item basis within the ADS-B ground station depending on specific operational needs.

7. PROCESSING OF ASTERIX ADS-B DATA AT ATC SYSTEM

7.1 An Asterix Cat21 message should not be accepted by the ATC system for processing unless it includes at least all the Group 1 data items.

7.2 The ATC system should process all received Asterix Cat21 message data items that bring operational benefits (i.e. Group 2 data items). An ATM automation specification should require that the system appropriately process those Group 2 data items depending on specific operational need. Whether the ATC system will process Group 3 optional data items will depend on specific operational needs.

8. DATA SHARING OF ASTERIX ADS-B DATA

8.1 In principle, all data receiving from the shared ADS-B ground station should be delivered to the receiving party as far as practicable without filtering unless owing to technical reasons such as the need to convert the data from one ASTERIX format to another or it is requested by the receiving party of the data.

8.2 It is considered necessary that all data items that are mandatory in Asterix messages (i.e. Group 1 data items) and operationally desirable (i.e. Group 2 data items) when such data are received from aircraft, should be included in data sharing. In the event that the data have to be filtered, the list of optional data items (i.e. Group 3 data items) needs to be shared will be subject to mutual agreement between the two data sharing parties concerned.

9. ISSUE RELATED TO DO260A

9.1 Support of DO260A using Asterix Cat 21 V0.23

- a) DO260A was developed after V0.23 of Asterix was defined. Therefore, V0.23 does not directly support DO260A. However, ground station software can generate useful V0.23 Asterix data from DO260A reports through use of the following techniques;
- b) A useful I021/090 Figure of Merit can be generated from DO260A messages. Some implementations have a table, which defines the FOM/PA to be generated for each combination of SIL, NIC and NAC. The contents of the table can be offline defined to generate the appropriate FOM/PA values. The downstream ATC system can then process DO260A reports as if they were DO260 reports; and
- c) If there is a particular need for the ATC system to have access to the NIC/NAC or SIL or other data item that exist in DO260A (but not in DO260), then users may need to consider a more recent version of Cat 21.

9.2 Support of DO260A using Asterix Cat 21 V2.1

- a) If DO260A is used, then the ANSP could decide to use Asterix Cat 21 V1.0 (or later versions) or V2.1; and
- b) Readers are invited to carefully examine the DO260A fields (see Appendix D) to determine if the benefits of additional DO260A fields are large enough to warrant adoption of Asterix Cat 21 V1.0 (or later versions) or V2.1.

10. ISSUE RELATED TO DO260B

10.1 Support of DO260B using Asterix Cat 21 V0.23

- a) DO260B was developed some years after DO260A. Therefore, Asterix Cat 21, V0.23 does not directly support DO260B;

- b) The same techniques used for processing DO260A can be used for processing DO260B, however, the table used must account for NIC supplement B & NIC supplement C; and
- c) If there is a particular need for the ATC system to have access to the new data items offered by DO260B, then users may need to consider a more recent version of Cat 21 (e.g. V2.1).

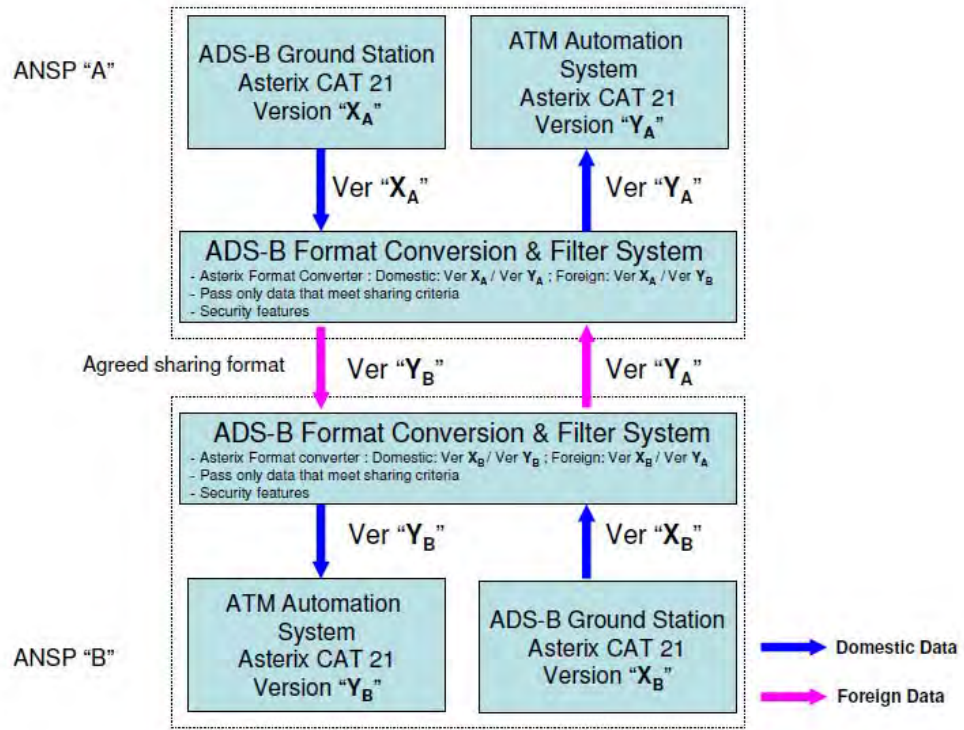
10.2 Support of DO260B using Asterix Cat 21 V2.1

- a) If DO260B is used, then the ANSP could decide to use Asterix Cat 21 V2.1; and
- b) Readers are invited to carefully examine the DO260B data items (see Appendix D) to determine if the benefits of additional DO260B data items are large enough to warrant adoption of Asterix Cat 21 Version 2.1.

11. ADS-B FORMAT CONVERSION AND FILTER SYSTEM

11.1 It is clear that the evolution of 1090ES ADS-B transmission will continue. Avionics software will be upgraded to provide additional or changed functionality. As a result Asterix standards will also continue to evolve, and ATC systems will need to be adaptable to be able to cope with new functionality requirements and new message standards.

11.2 The use of an ADS-B format conversion & filter (ADS-B FC&F) system between domestic ADS-B systems and data shared with other states is a cost-effective way to provide the necessary protection and flexibility in this evolution. Such a system provides ADS-B format conversion between domestic and foreign ADS-B systems. While decoupling one ADS-B Asterix environment from another, the system allows information that meets specific sharing criteria to be passed through for data sharing. By doing so, loading on the ATM automation systems to process ADS-B data and bandwidth requires to transmit the ADS-B data could then be reduced. The system also allows independent domestic format changes without disruption to the foreign environment. A typical structure could be as shown below:



Attachment A - Group 1 (Mandatory Data Items)

Data Items	Description	V 0.23	V 2.1	Remarks
I021/010	Data Source Identification	X	X	Identifies source of data. Important if validity checks are performed as an anti spoofing capability. Validation that the data is received from an approved ADS-B ground station. Data received from a ground station should not be processed if the position of the reported aircraft is an unreasonable distance away from the known location of the ADS-B ground station
I021/030	Time of Day	X		Necessary to extrapolate the ADS-B data to time of display. Data received with a Time of Day too far in the past should be discarded. This data is too old.
I021/071 or I021/073	Time of Applicability of Position or Time of Message reception for position		X	Necessary to extrapolate the ADS-B data to time of display. Data received with a Time of Day too far in the past should be discarded. This data is too old.
I021/040	Target Report Descriptor	X	X	Indicates if report is a duplicate, on the ground, is a simulated target, is a test target. This needs to be checked by ATC system prior to processing. If the data indicates that the report is a test target or a simulated target, it is normally processed differently to “real” targets.
I021/080	Target Address	X	X	Included in all 1090ES downlink messages, so always available. Used for report/report linkage in ATC tracking.
I021/090	Figure of Merit/Quality Indicators	X	X	Position cannot be used without quality indicator. If the quality of the positional data does not meet the requirements the data should be discarded.
I021/130	Position in WGS-84 co-ordinates	X	X	Report cannot be used without position

Attachment B - Group 2 (Desirable Data Items)

Data Items	Description	V 0.23	V 2.1	Remarks
I021/008	Aircraft operational status		X	TCAS capability, Target state reporting capability, CDTI capability, Single/dual aircraft antenna. It is desirable to have immediate knowledge of RA event.
I021/020	Emitter Category	X	X	Aircraft or vehicle type
I021/140	Geometric Altitude/Height	X	X	Useful for RVSM monitoring. Not normally used for ATC application. Could perhaps be used as an indicator of correct QNH setting in aircraft.
I021/145	Flight Level	X	X	Flight level is an important information to ATC
I021/155	Barometric Vertical Rate	X	X	Used for predictive tools and safety nets. Either Barometric vertical rate or Geometric vertical rate is provided by the aircraft – not both. However, the ATC system can calculate vertical rate from multiple flight level reports if these data items are not available.
I021/157	Geometric Vertical Rate	X	X	
I021/160	Ground Vector	X	X	Provides excellent vector to support extrapolation of positional data to time of display. However, the ATC system can calculate the velocity vector (ground vector) from multiple position reports. I021/160 however, is normally far superior that ATC system calculation.

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Data Items	Description	V 0.23	V 2.1	Remarks
I021/170	Target Identification	X	X	This is the callsign/Flight ID is extremely useful for ATC and matching to the flight plan (if any). Target identification is only sent once per 5 seconds. Some ground stations designs attach the target identification (if known from previous recent downlinks) even if not received in the last 5 seconds. The field can be missing at the edge of ADS-B coverage – for flights inbound to coverage.
I021/200	Target Status	X	X	This is the emergency type and is highly desirable.

Attachment C - Group 3 (Optional Data Items)

Data Items	Description	V 0.23	V 2.1	Remarks
I021/077	Time of report transmission		X	Time of applicability is relevant for ATC system processing. Time of transmission is less relevant.
I021/032	Time of Day Accuracy	X		Maximum error in Time of day. Normally the maximum value is known by the ANSP because of station design.
I021/095	Velocity Accuracy	X		If using GPS, velocity accuracy will be adequate if the Position quality is accurate.
I021/072	Time of applicability of velocity		X	Can be managed by a velocity data time out in Ground station.
I021/075	Time of message reception of velocity		X	Normally velocity is in the same Asterix message as position. Velocity data time out in Ground station.
I021/161	Track number		X	Tracking can be performed by ATC system. Also the 24 bit code (aircraft address) could be used as a pseudo track number.
I021/110	Trajectory Intent	X	X	Defined in DO260 but not transmitted by any known product. Not defined in DO260A or DO260B
I021/146	(Intermediate) Selected Altitude	X	X	Target altitude : Information from DO260A/B Target state and status messages (On condition messages). These could be used for detection of pilot errors in selection of heading/altitude.
I021/148	Final State Selected Altitude	X	X	
I021/015	Service identification		X	Type of Service (VDL4, Ext Squitter, UAT, TIS-B VDL4, TIS-B Ext Squitter, TIS-B UAT, FIS-B VDL4, GRAS VDL4, MLT). Not useful to most ATC systems.
I021/016	Service management		X	Update rate or whether data driven output from GS. Normally known by receiver.

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Data Items	Description	V 0.23	V 2.1	Remarks
I021/074	Time of message reception of position – high resolution		X	High resolution is designed to support MLAT system processing by receiver. Not required for pure ADS-B.
I021/076	Time of message reception of velocity – high resolution		X	High resolution is designed to support MLAT system processing by receiver. Not required for pure ADS-B.
I021/210	MOPS version/ Link Technology Indicator	X	X	Maybe useful for statistics about equipage. Not operationally relevant
I021/070	Mode 3/A code		X	Could be used for legacy ATC system that do not use Flight ID
I021/165	Rate of Turn/Track Angle rate	X	X	Not transmitted in DO260, DO260A or DO260B messages
I021/271	Surface capabilities and characteristics		X	
I021/132	Message amplitude		X	Useful for technical analysis. Not operationally relevant
I021/250	Mode S MB data		X	
I021/260	ACAS resolution advisory report		X	
I021/400	Receiver ID		X	
I021/295	Data ages		X	
I021/150	Air Speed	X	X	Defined in standards but only sent in absence Ground vector information. Can't be used for extrapolation unless wind speed known.
I021/151	True Air Speed	X	X	
I021/152	Magnetic Heading	X	X	Defined in standards but only sent in absence Ground vector information.
I021/220	Met Report	X	X	Not transmitted in DO260, DO260A or DO260B messages
I021/230	Roll Angle	X	X	Not transmitted in DO260, DO260A or DO260B messages
I021/131	Position in WGS-84 coordinates, high resolution		X	

Attachment D - Differences among DO260, DO260A, DO260B

	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Introduction of Navigation Integrity Category (NIC) to replace Navigation Uncertainty Category (NUC _P)	NUC _P is used.	NIC is used to replace NUC _P .	More level of NIC available. Vertical component removed.	NIC is shown in v1.0 and above. More level of NIC (shown as PIC) is available in v2.1.	The additional quantum levels of NIC would allow the ANSP more flexibility in deciding whether the NIC is considered as 'good' (if required) However, for 3 NM & 5 NM separation with HPL 1Nm and 2 Nm respectively, this additional quantum is not useful.
Quality Indicator for Velocity (NUC _R and NAC _V)	NUC _R is used.	Replaced with NAC _V . Definition remains the same.	Vertical component removed.	Available in v0.23 and above.	Vertical component is not available for DO260B.
Surveillance Integrity Level and Source Integrity Level (SIL)	Not available.	Surveillance Integrity Level is used.	Renamed as Source Integrity Level. Definition is changed to exclude avionics fault.	Available in v1.0 and above.	The SIL will allow the user to further assess the integrity of the reported position (if required). NB: An implied SIL exists for DO260 aircraft if they always use GPS. However DO260 aircraft do not provide SIL.
System Design Assurance (SDA)	Not available.	Not available.	To address probability of avionics fault.	Available in v2.1.	The SDA will indicate the robustness of the system. ANSPs may decide on a minimum SDA for ADS-B services. If this action is taken then DO260 aircraft will be unable to meet the criteria.

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	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Navigation Accuracy Category (NAC _P)	Not available.	Derived from HFOM and VFOM.	Relies only on HFOM.	Available in v1.0 and above.	A reported accuracy is not provided by DO260. However, an estimated accuracy can be derived from NUC – assuming that NUC is HPL based.
Geometric Vertical Accuracy (GVA)	Not available.	Not available.	Derived from VFOM.	Available in v2.1.	Geometric altitude accuracy is not normally required for operational purposes.
Barometric Altitude Integrity Code (NIC _{BARO})	Not available.	To indicate integrity of barometric altitude.	Same as DO-260A	Available in v1.0 and above.	The NIC_{BARO} indicates the integrity of the barometric height. ANSPs could indicate to the controller that Barometric data has not been verified, however, aircraft without dual barometric systems/air data computers may be unable to provide a non zero NIC_{BARO} as data could be unnecessarily discarded.
Length / Width of Aircraft	Not available.	Provide an indication of aircraft size.	Same as DO-260A	Available in v1.0 and above.	The width / length indicate the size of the aircraft. This information may be used as an input for generating alerts on airport surface movement control.

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	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Indication of capabilities	Only show status of TCAS and CDTI.	More information available including capability to send Air Reference Velocity, Target State and Trajectory Change reports. Status of Identity Switch.	Additional information on type of ADS-B in (i.e. 1090ES in or UAT in).	Available in v1.0 and above, except availability of 1090ES/UAT in and information on GPS antenna offset.	Indication on the availability of 1090ES in / UAT in may allow the controller to anticipate a potential request for in-trail procedure clearance. NB: ITP requires decision support aids which are more complex than ADS-B IN alone.
Status of Resolution Advisory	Not available.	Information on whether Resolution Advisory is active.	Same as DO-260A	Available in v1.0 and above,	Indication of the resolution advisory status allows the controller to know whether the pilots were alerted about the potential conflict.
GPS offset	Not available.	Indication on whether GPS offset is applied.	Information on GPS antenna offset is provided.	GPS offset status is available in v1.0 and above. Information on GPS offset is not available in ASTERIX	Indication on GPS offset may be one of the inputs for generating alerts on airport surface movement control.
Intention	Not available.	Able to indicate intended altitude and heading.	Same as DO-260A	Intended altitude is available in v0.23. Intended heading is not available in ASTERIX.	The intended heading and flight level can be used as an input to the trajectory prediction algorithm in the Short-Term Conflict Alert.

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	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Target Status	Not available.	Not available.	Indication of Autopilot mode, Vertical Navigation mode, Altitude Hold mode, Approach Mode and LNAV Mode.	Vertical Navigation mode, Altitude Hold mode and Approach Mode are available in v 0.23 and above LNAV Mode is available in v2.1	The target status allows the controller to know the mode that the aircraft is in. i.e.: It could be presented to ATC.
Resolution Advisory	Not available.	Not available.	Availability of Active Resolution Advisories; Resolution Advisory complement record, Resolution Terminated; Multiple Threat encounter; Threat Type indicator; and Threat Identity data.	Available in v1.0 and above.	The Resolution Advisory will help the controller know the advisories that are provided to the pilots by the ACAS. This helps prevent the controller from giving instructions that are in conflict with the ACAS.

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	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Mode A	DO260A change 1, allows this using test message in USA only. This was not implemented in actual products.	Broadcasted using test message in USA only.	Broadcasted worldwide as a regular message.	Available in v0.26 and above.	The Mode A allows flight plans to be coupled with the ADS-B tracks (supports legacy ATM automation system).

GUIDANCE MATERIAL ON ADVICE TO MILITARY AUTHORITIES REGARDING ADS-B DATA SHARING

Scope

This guidance material relates to the topic of sharing ADS-B data with adjacent ATC service providers. It does not provide guidance regarding the decision by States to adopt ADS-B or not. It assumes that the State has adopted the use of ADS-B for Civilian Air Traffic Control.

Automatic Dependent Surveillance Broadcast (ADS-B) Technology

ADS-B is a technology whereby aircraft transmit their position, altitude and identity to all listeners. This technology has been recognised by ICAO and is a major component of the future air traffic management systems for Europe, USA and Asia/Pacific.

Air Traffic Control supplier organisations have deployed receivers to collect and display ADS-B data to Air Traffic Controllers. This provides Air Traffic Control the ability to use rapid update, high integrity position, altitude, velocity and identity data to improve efficiency and safety of operations.

Why data sharing?

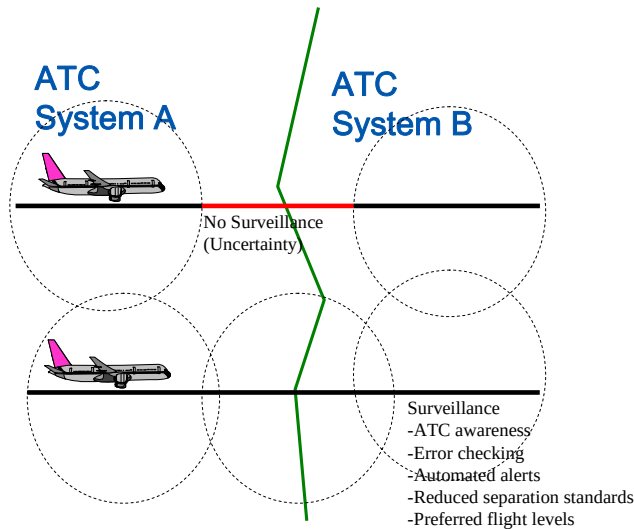
The ADS-B and radar transmissions from aircraft are limited in range by the curvature of the earth and terrain obstructions. It is not always possible for two neighbouring ATC organisations to “see” aircraft approaching their areas of responsibility. Sometimes the boundary is out of range of radar or ADS-B receivers..

As international aircraft fly around the world, they move from one ATC system to another. To maintain safety, ATC attempt to co-ordinate the time, altitude and place of crossing the common boundary, typically using voice co-ordination and received flight plan information. Sometimes errors occur in this co-ordination and this results in air safety risks.

When either ATC system does not have surveillance, there are two negative consequences :

- a) traffic is managed less efficiently using “procedural” means. Thus aircraft need to be separated by very large distances or times, or must fly at altitudes where they will burn more fuel
- b) there is increased human error and limited means to detect these errors

These negative consequences can be avoided by providing the same surveillance view of traffic to both parties. ADS-B provides a ready solution since it is inexpensive to deploy ADS-B data receivers and to share this data with ATC systems in neighbouring countries.



Surveillance data allows differences to be identified early before they become a problem. It allows the application of automated safety net tools that automatically alert controllers to a range of problems such as aircraft at the wrong flight level.

Sharing of surveillance data, such as ADS-B, is a major safety benefit to civil air traffic at the boundary. IATA strongly support ADS-B data sharing. The expected outcomes of initial data sharing include :

- reduced numbers of safety incidents at the air traffic control boundary
- earlier detection of air traffic controller and pilot errors
- increased support and confidence in data sharing to allow introduction of radar-like separation at the FIR boundary in future phases.

Radar data sharing could also be as effective as ADS-B, however it is often more difficult to obtain clearance from military authorities because :

- primary radar can measure the position of military/civil aircraft and can therefore disclose location or performance characteristics which may be of concern to military organisations.
- SSR radar can measure the position and altitude of military aircraft which have operating ATC transponders and can therefore disclose location and performance characteristics which may be of concern to military organisations.
- Radars need to be carefully aligned and monitored, and hence the data user must rely on alignment provided by the other party.

In the case of ADS-B, the ground stations are similar to a communication channel, because the actual data is broadcast by the aircraft.

Military aircraft with ADS-B

ADS-B data sharing does **not** influence the decision by Defence Authorities to equip or not equip with ADS-B. The equippage decision is usually based upon a large number of factors including :

- the regulations and policies of the State
- the age, capability and cost of equippage of particular aircraft type fleets
- the operational benefits of using ADS-B in the civilian air traffic environment (and in military ATC environments with ADS-B). These benefits include safety, efficiency, and search and rescue.
- the military advantages and disadvantages of transmitting ADS-B data

Note that many modern Mode S transponders and Mode 5 transponders support ADS-B. Some military transponders may support ADS-B based “station keeping” using encrypted DF19 ADS-B messages, but this data is not normally decoded or used at all by civil systems.

Military aircraft will not transmit ADS-B if they wish to be un-observed.

In most cases today, tactical military aircraft are not ADS-B equipped or can choose to disable transmissions. In future, increasing numbers of military aircraft will be ADS-B capable and will include the ability to disable the transmissions.

Military authorities will enable or disable ADS-B data transmission from concerned aircraft taking into account whether they wish operations to be observed by any ADS-B receiver.

Because low cost ADS-B receivers are available to the general public , ADS-B data sharing is only making available to the adjacent authority data that is already available to members of the public (ie: ¹those members of the public that have ADS-B receivers).

Military aircraft that do transmit ADS-B data must always assume they are visible because any ADS-B receiver (on the ground or in the air) can receive and process the transmitted data.

Military needs can be satisfied

ADS-B on the other hand simply only conveys information from co-operative aircraft that have chosen to equip and broadcast ADS-B messages.

Further, if required, it is possible for States to instal ADS-B filters which will prevent data about sensitive flights being shared. These filters can be based on a number of criteria and typically use geographical filtering to only provide ADS-B data to the other party if aircraft are within 150-200 NM on their side of the boundary.

Appropriate firewalls and data security measures can also be implemented.

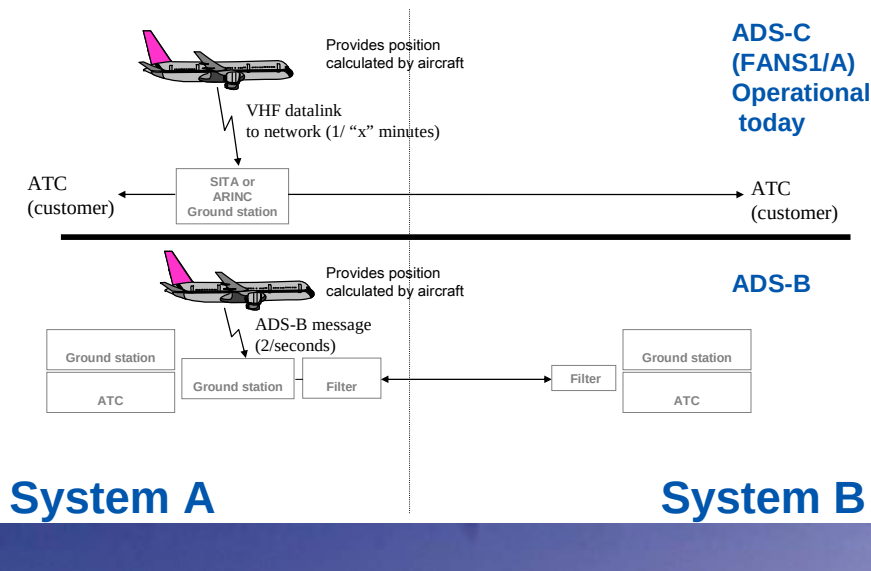
The decision to share ADS-B data or not, will have no impact on whether aircraft transmit ADS-B messages. ICAO standards already allow these transmissions and some states such as Australia have published regulations which mandate that ADS-B shall be transmitted by airliners.

¹ Low cost ADS-B receivers can be purchased on the internet

Is this concept new?

No, ADS-Contract (ADS-C) data exchange has been operational for more than 10 years for large international airliners like B747/B777 and A330/A340 aircraft. ADS-C data is received by VHF, satellite or HF receivers operated by commercial aviation communications companies in multiple countries and distributed to their ATC customers worldwide. This is a type of data sharing as a commercial service. ADS-B is different in that it is transmitted more frequently and can be received without the use of a 3rd party.

Comparison between ADS-B and ADS-C (FANS 1/A)



The concept of data sharing at the boundary between states or systems is not new and is very similar in concept to the operational use of ADS-C today.

Is there an existing precedence?

Australia and Indonesia currently share ADS-B data from 4 ground stations each. The operational experience has been overwhelmingly positive and has allowed the early recognition of ATC/pilot errors before they have become critical. A number of States in Asia-Pacific are planning ADS-B data sharing.

What is the cost?

The Air Traffic Control organisation bears a small additional cost to share ADS-B data. The ground stations to observe equipped aircraft are often already installed and operating for domestic use. The new infrastructure for sharing data includes the operation and maintenance of the link and any filtering devices.

There is normally no additional cost to the military organisation because the Air Traffic Control organisations normally fund the data sharing infrastructure.

9. Template of Harmonization Framework for ADS-B Implementation

9.1 Background

9.1.1 It is obvious that full benefits of ADS-B will only be achieved by its harmonized implementation and seamless operations. During the 6th meeting of ADS-B SEA/WG in February 2011, Hong Kong, China initiated to strengthen collaboration among concerned States/Administrations for harmonized ADS-B implementation and seamless operations along two ATS routes L642 and M771 with major traffic flow (MTF). An ad-hoc workgroup comprising concerned CAAs/ANSPs from Hong Kong, China, Mainland China, Vietnam and Singapore was subsequently formed to elaborate and agree on a framework regarding implementation timelines, avionics standards, optimal flight levels, and ATC and engineering handling procedures. As a coherent effort, ADS-B implementation along ATS routes L642 and M771 has been harmonized while Hong Kong, China and Singapore have published respective Aeronautical Information Circulars and Airworthiness Notices on ADS-B mandates for these two routes with effect on 12 December 2013.

9.1.2 It is considered that the above implementation framework for ATS routes L642/M771 would serve as a useful template for extension to other high density routes to harmonize ADS-B implementation. Paragraph 9.2 shows the detailed framework.

9.2 Template of Harmonization Framework for ADS-B Implementation

Harmonization Framework for ADS-B Implementation along ATS Routes L642 and M771			
No.	What to harmonize	What was agreed	Issue / what needs to be further discussed
1	Mandate Effective	SG, HK, CN : 12 Dec 2013 VN : to be confirmed	
2	ATC Operating Procedures	No need to harmonize	Refer to SEACG for consideration of the impact of expanding ADS-B surveillance on ATC Operating Procedures including Large Scale Weather procedures.
3	Mandate Publish Date	No need to harmonize	To publish equipment requirements as early as possible.
4	Date of Operational Approval	No need to harmonize	

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5	Flight Level	SG, HK, CN : - At or Above FL290 (ADS-B airspace) - Below FL290 (Non-ADS-B airspace) VN to be confirmed	
6	Avionics Standard (CASA/AMC2024)	SG - CASA or AMC2024 HK - CASA or AMC2024 VN - CASA or AMC2024 CN - CASA or AMC2024	ADS-B Task Force agreed that DO260B will be accepted as well. SG, HK, and CN agreed their ADS-B GS will accept DO260, DO260A and DO260B by 1 July 2014 (Note 1)
7	Flight Planning	Before 15 Nov 2012, as per AIDG On or after 15 Nov 2012, as per new flight plan format	
8	Aircraft Approval		
8a)	Procedures if Aircraft Not Approved or Aircraft without a Serviceable ADS-B Transmitting Equipment before Flight	SG, HK, CN : FL280 and Below VN to be confirmed	

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8b)	Aircraft Approved but Transmitting Bad Data (Blacklisted Aircraft)	For known aircraft, treat as non ADS-B aircraft.	Share blacklisted aircraft among concerned States/Administration
9	Contingency Plan		
9a)	Systemic Failure such as Ground System / GPS Failure	Revert back to current procedure.	
9b)	Avionics Failure or Approved Aircraft Transmitting Bad Data in Flight	Provide other form of separation, subject to bilateral agreement. From radar/ADS-B environment to ADS-B only environment, ATC coordination may be able to provide early notification of ADS-B failure.	Address the procedure for aircraft transiting from radar to ADS-B airspace and from ADS-B to ADS-B airspace.
10	Commonly Agreed Route Spacing	SEACG	Need for commonly agreed minimal in-trail spacing throughout.

Note 1: Also included two ADS-B GS supplied by Indonesia at Matak and Natuna

**SURVEILLANCE STRATEGY
FOR THE ASIA/PACIFIC REGION**

Considering that:

1. States are implementing CNS/ATM systems to gain safety, efficiency and environmental benefits, and have endorsed the move toward satellite and data link technologies;
2. The future air traffic environment will require increased use of aircraft-derived surveillance information for the implementation of a seamless automated air traffic flow management system;
3. The 11th Air Navigation Conference endorsed the use of ADS-B as an enabler of the global air traffic management concept and encouraged States to support cost-effective early implementation of ADS-B applications;
4. APANPIRG has decided to use the 1090MHz Extended Squitter data link for ADS-B air-ground and air-air applications in the Asia/Pacific Region, noting that in the longer term an additional link type may be required;
5. SSR and ADS-C will continue to meet many critical surveillance needs for the foreseeable future;
- ~~6. ACAS acts as situational awareness tool and last resort for safety conflict resolution;~~
7. SARPs, PANS and guidance material for the use of ADS-B have been developed;
8. ADS-B avionics and ground systems are available; and
9. Multilateration is a technology that can supplement SSR, ADS-B and SMR.

THE SURVEILLANCE STRATEGY FOR THE ASIA/PACIFIC REGION IS TO:

1. Minimise the reliance upon pilot position reporting, particularly voice position reporting, for surveillance of aircraft;
2. Maximise the use of ADS-B on major air routes and in terminal areas, giving consideration to the mandatory carriage of ADS-B Out as specified in Note 1 and use of ADS-B for ATC separation service;
3. Reduce the dependence on Primary Radar for area surveillance;
4. Provide maximum contiguous ATS surveillance coverage of air routes using 1090MHz Extended Squitter ADS-B and Mode S SSR based on operational requirements;
5. Make full use of SSR Mode S capabilities where radar surveillance is used and reduce reliance on 4-digit octal codes;
6. Make use of ADS-C where technical constraint or cost benefit analysis does not support the use of ADS-B, SSR or Multilateration;
7. Make use of Multilateration for surface, terminal and area surveillance where appropriate as an alternative or supplement to other surveillance systems;

8. Increase the effectiveness of surveillance and collision avoidance systems through mandatory use of pressure altitude reporting transponders;
9. Improve safety through sharing of ATS surveillance data across FIR boundaries;
10. Ensure provision of communication, navigation, and data management capabilities necessary to make optimal use of surveillance systems;
11. Enhance ATM automation tools and safety nets through the use of aircraft-derived data such as flight identification, trajectories and intentions; and
12. Ensure civil-military cooperation and interoperability.

Note 1:

- a) *Version 0 ES as specified in Annex 10, Volume IV, Chapter 3, Paragraph 3.1.2.8.6 (up to and including Amendment 82 to Annex 10) and Chapter 2 of Technical Provisions for Mode S Services and Extended Squitter (ICAO Doc 9871) (Equivalent to DO260) to be used till at least 2020.*
- b) *Version 1 ES as specified in Chapter 3 of Technical Provisions for Mode S Services and Extended Squitter (ICAO Doc 9871) (Equivalent to DO260A);*
- c) *Version 2 ES (including provisions for new set of 1 090 MHz extended squitter (ES) messages and traffic information service – broadcast (TIS-B) being developed by the Aeronautical Surveillance Panel (ASP) and scheduled to be incorporated in Annex 10 Vol. IV - Surveillance and Collision Avoidance System as part of Amendment 86 with target applicable date in November 2013. (Equivalent to DO260B and EUROCAE ED-102A which were issued in December 2009).*

APPENDIX

WRC-12 RESULTS OF RELEVANCE TO INTERNATIONAL CIVIL AVIATION

1. Agenda Item 1.1: To consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution 26 (Rev. WRC-07).

1.1 Under this agenda item, the ICAO Position supported the deletion of footnote No. **5.72** which allowed for the use of the bands 283.5 - 490 and 510 - 526.5 kHz by Norwegian fixed stations located north of 60°. Aeronautical Non-directional Beacons (NDB) operate in these bands. This footnote was deleted by the conference.

1.2 Footnotes Nos. **5.181**, **5.197** and **5.259** were introduced in about twenty countries in 1987 in view of the foreseen global transition from ILS to MLS and were intended to enable the introduction of the mobile service in the ILS bands as and when these would no longer be required for ILS. However, it has been apparent for a while that a global transition to MLS is not taking place as originally foreseen and that ILS will continue to be used by aviation for the foreseeable future. Therefore the existence of these footnotes is no longer justified. Most administrations have already removed their name from these footnotes at previous conferences, and this trend continued further during this conference.

1.3 The band 1 215 - 1 300 MHz is used by civil aviation for the provision of radionavigation services (primary radar) through footnote No. **5.331**. Footnote No. **5.330** also allocates the band in a number of countries to the fixed and mobile service. Given the receiver sensitivity of aeronautical uses of the band, ICAO does not support the continued inclusion of an additional service through country footnotes. Some country names were removed from Footnote No. **5.330** as a result of the conference, but the names of Djibouti, Egypt and Oman were added.

1.4 The ICAO Position supported the deletion of footnotes **5.362B** and **5.362C** which allocate the GNSS band 1 559-1 610 MHz on a secondary basis to the (terrestrial) fixed service in certain countries until 1 January 2015, after which time this allocation to the fixed service shall no longer be valid. The continued use by the fixed service constitutes a severe constraint on the safe and effective use of GNSS in some areas of the world, as coordination distances of up to 400 km between the stations of the fixed service and the aircraft would be required. Ten countries removed their names from footnotes **5.362B** and **5.362C** during WRC-12. This was a significant step forward towards achieving better worldwide protection of GNSS.

1.5 The band 4 200-4 400 MHz is reserved for use by airborne radio altimeters. Footnote No. **5.439** allows the operation of the fixed service in this band on a secondary basis. Radio altimeters are a critical element in aircraft automatic landing systems and serve as a sensor in ground proximity warning systems. The ICAO Position recommended deletion of this footnote. As a result of this conference, only one country now remains in this footnote, Iran (Islamic Republic of).

2 Agenda Item 1.2: Taking into account the ITU-R studies carried out in accordance with Resolution 951 (Rev. WRC-07), to take appropriate action with a view to enhancing the international regulatory framework.

2.1 The ICAO Position on this agenda item was to support new provisions or modifications to existing provisions that improve the flexibility with which spectrum allocated to aeronautical safety services can be used by aviation and/or tighten regulatory provisions that enhance the protection of aviation systems. Furthermore, the position was to ensure that any other measures taken at WRC-12 under this agenda item would not have an adverse impact on the use or protection of aeronautical systems.

2.2 No new radio regulatory measures were developed under this agenda item and Resolution 951, which described the studies to be performed under this agenda item, was suppressed. This was fully in line with the ICAO position. Also, in line with ICAO proposals, the WRC continued the trend set by the last conference, towards increased flexibility of aeronautical spectrum allocations. This was mainly achieved under agenda items 1.3 and 1.4 of this conference, by enabling the sharing of spectrum between aeronautical mobile (route) allocations and aeronautical radionavigation allocations, while limiting the use of such shared allocations to systems which operate in accordance with ICAO SARPs.

3 Agenda Item 1.3: To consider spectrum requirements and possible regulatory actions, including allocations, in order to support the safe operation of unmanned aircraft systems (UAS), based on the results of ITU-R studies, in accordance with Resolution 421 (WRC-07).

3.1 The ICAO Position was to support, based on the results of studies identified in Resolution 421, any modification to existing allocations, or new allocations required to accommodate UAS operations in non-segregated airspace while maintaining the safety and regularity of flight of all types of aircraft. Accordingly, the ICAO position was also to ensure that allocations used, in particular, for UAS command and control, ATC relay and sense and avoid in non-segregated airspace are in the aeronautical mobile (route) service (AM(R)S), aeronautical mobile satellite (route) service (AMS(R)S) and/or aeronautical radionavigation service (ARNS) and do not adversely affect existing aeronautical systems. Furthermore, the position was to oppose the use of this agenda item to seek new spectrum allocations to meet payload requirements.

3.2 In the preparations leading up to the conference, ITU-R studies, supported by ICAO, identified a requirement of 34 MHz of terrestrial spectrum and up to 56 MHz of satellite spectrum to support UAS line-of-sight (LOS) and beyond-line-of-sight (BLOS) command and control communications (C³) (the ITU equivalent terminology for C³ is Control and Non-Payload Communications (CNPC)).

3.2.1 For LOS links, the studies prior to the conference concentrated mainly on three potential candidate aeronautical safety bands: 960 – 1 164 MHz (DME band), 5 030 – 5 091 MHz (MLS band) and 15.4 – 15.5 GHz (ARNS band).

3.2.2 For BLOS links the main focus was on the 5 030 – 5 091 MHz band, which already has an appropriate AMS(R)S allocation which could support such use, and existing allocations to the Fixed Satellite Service in the 11/12/14 GHz (Ku) 20/30 GHz (Ka) bands.

3.3 The methods addressed during the conference concentrated mainly on the 5 GHz band for both LOS and BLOS, as well as existing FSS allocations in the Ku and Ka bands in support of BLOS. In the light of the mounting pressures from other services (IMT and BWA in particular) and the very limited implementation of MLS to date, aviation supported the shared use of the 5 GHz

MLS band for the provision of both LOS and BLOS services, while maintaining a priority to MLS use in this band. On the other hand, ICAO did strongly oppose the use of little modified FSS allocations, without additional special radio regulatory provisions to reflect the safety-of-life criticality of BLOS C³ links in support of UAS.

3.3.1 In addition to safety through technically robust links as defined in relevant ICAO SARPs, the provision of aeronautical safety services relies on the use of AM(R)S and AMS(R)S allocations. AM(R)S and AMS(R)S are defined in the Radio Regulations as services *used permanently or temporarily for the safeguarding of human life and property*, and as such, any frequency bands providing safety of life services enjoy special measures in the Radio Regulations to ensure freedom from interference and to mitigate any eventual interference through swift regulatory action by the responsible radio regulators. This is reflected in No. **4.10**.

3.4 On the other hand, FSS is not defined as a safety service, and, due to lack of existing and effective radio regulatory measures, FSS frequency coordination and interference mitigation relies today, to a large extent, on voluntary commercially motivated cooperation between FSS operators.

3.5 The results of the conference were:

3.5.1 LOS: While retaining priority to the MLS service in the 5 030 – 5 091 MHz band, this band was also allocated to the AM(R)S, limited to internationally standardized aeronautical systems. Unwanted emissions from the AM(R)S in this band shall be limited to protect RNSS system downlinks in the adjacent 5 010 – 5 030 MHz band (future GNSS service and user downlink band).

3.5.2 BLOS: An existing allocation to the AMS(R)S in the 5 000 – 5 150 MHz band was slightly modified. In the bands 5 000 – 5 030 MHz and 5 091 – 5 150 MHz, the allocation was limited to internationally standardized aeronautical systems. In the band 5 030 – 5 091 MHz, coordination procedures were modified from No. **9.21** to No. **9.11A** which is more appropriate for coordination with terrestrial services, and the allocation was limited to internationally standardized aeronautical systems.

3.5.3 In line with WRC-07, and as reflected further under agenda item 1.4 during this conference; when making allocations to AM(R)S in bands already allocated to ARNS and used by ICAO standardized systems, it was acknowledged that compatibility between ICAO standardized systems would be taken care of within ICAO. Hence these new AM(R)S and AMS(R)S allocations are limited to internationally standardized aeronautical systems.

3.5.4 The conference did not support the allocation or use of FSS spectrum for the provision of BLOS C³, without substantive modifications to such allocations. Such required modifications were not identified at the conference. However, a study item was assigned to the upcoming ITU-R cycle; to identify technical, regulatory and operational recommendations, and an agenda item for WRC-15 was agreed; to consider, based on the result of the ITU-R studies, the possible regulatory actions to support the use of FSS frequency bands for the UAS C³ links, while ensuring the safe operation of UAS C³ links, consistent with the provision of a safety service, making reference to No. **4.10**. ICAO was invited to participate in the ITU-R studies.

3.5.5 As a consequence of the above, Resolution **421** (WRC-07) was suppressed. The above results are fully in line with the ICAO position.

4 Agenda Item 1.4: To consider, based on the results of ITU-R studies, any further regulatory measures to facilitate introduction of new aeronautical mobile (R) service (AM(R)S) systems in the bands 112 - 117.975 MHz, 960 - 1 164 MHz and 5 000 - 5 030 MHz in accordance with Resolutions 413 (Rev. WRC-07), 417 (WRC-07) and 420 (WRC-07).

4.1 Three separate issues were addressed under this item:

4.2 112 – 117.975 MHz

4.2.1 In order to support future requirements for air-ground communications, in particular to extend the current usage of the band 117.975-137 MHz in congested areas (e.g. Europe), WRC-07 made a provisional AM(R)S allocation in the 108 – 117.975 MHz band, pending further studies before WRC-12.

4.2.2 ITU-R, with the assistance of ICAO, has studied any potential compatibility issues between the analogue broadcasting and AM(R) services that may arise from the introduction of AM(R)S systems in the band 112 – 117.975 MHz. The result of these studies confirms that no harmful interference will arise from the introduction of AM(R)S in the band 112 – 117.975 MHz into analogue FM broadcasting receivers below 108 MHz and that both services can operate on a compatible basis. Regarding the compatibility with digital broadcasting service below 108 MHz, it was agreed to pursue this matter under traditional ITU-R activities and outside the WRC process.

4.2.3 Consequentially the allocation was confirmed and Resolution **413** was amended accordingly. It should be noted that this new AM(R)S allocation is shared with the ARNS in a manner that fully protects the ARNS. Furthermore, the allocation is limited to systems which meet ICAO SARPs published in Annex 10 to the ICAO Convention.

4.3 960 – 1 164 MHz

4.3.1 WRC-07 made a provisional AM(R)S allocation in the band 960 – 1 164 MHz to support the introduction of future applications and concepts in air traffic management requiring safety critical aeronautical communication. While recognizing that ICAO will take care of compatibility issues between ICAO standardized ARNS and AM(R)S systems sharing this allocation, ITU-R has conducted studies on operational and technical means to facilitate sharing between non-ICAO ARNS systems and the potential future AM(R)S systems identified to operate in the frequency band 960 – 1 164 MHz.

4.3.2 The results of the ITU-R studies provide separation distances below which site-specific compatibility studies should be performed in order to ensure that in particular the non-ICAO standardized ARNS systems operating in Armenia, Azerbaijan, Belarus, Bulgaria, China, the Russian Federation, Kazakhstan, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan and Ukraine remain protected.

4.3.3 Consequentially the allocation was confirmed and Resolution **417** was amended accordingly. It should be noted that this new AM(R)S allocation is shared with the ARNS in a manner that fully protects the existing and future use of ARNS in this frequency allocation. Furthermore, the allocation is limited to systems which meet ICAO SARPs published in Annex 10 to the ICAO Convention. Coordination procedures to protect the non-ICAO ARNS system identified above, were defined in a manner which ensures that affected countries respond to coordination requests, as a non-reply is considered as acknowledgement of being unaffected.

4.4 5 GHz air/ground aeronautical surface (WiMAX) system

4.4.1 Studies for WRC-07 indicated that 60 – 100 MHz were required for the new air/ground aeronautical surface (sometimes branded as AeroMACS) system planned in the 5 GHz band. WRC-07 allocated 5 091 – 5 150 MHz to the AM(R)S. This 59 MHz wide allocation is shared with the existing ARNS, fixed satellite service (FSS), aeronautical mobile telemetry, and an aeronautical security (AS) application which was pushed by some members of the aeronautical industry during WRC-07.

4.4.2 ITU-R studies in preparation for WRC-12 have focused on two issues; a) whether more spectrum was required for this service; b) compatibility studies to identify whether the this service could share the band 5 000 – 5 030 MHz, or parts of that band, without undue impact to other existing or planned services.

4.4.3 As regards a), the outcome of further studies in ITU-R and ICAO indicated that the 59 MHz shared allocation is not sufficient. ACP WG-F has concluded that about 90 MHz would be required to provide the necessary bandwidth for all the envisaged air/ground applications to be supported by the new service. The basis for these results is a method which satisfies the present sharing conditions with the existing low earth orbit (LEO) FSS, as specified in footnote No. **5.444A**. To satisfy these stringent sharing conditions, the methodology is based on a maximum of 500 airports being visible to the satellite footprint, and only 1 transmitter being active on each frequency, at each airport at any given instant in time. Recently a different methodology was introduced in ITU-R, this methodology proposing a *frequency reuse of one*, in essence multiple transmitters being active simultaneously on the same frequency at each airport. Frequency reuse of one is a new development in the mobile or broadband industry, its standards are still immature, and the technology is unproven as regards achievable quality of service performance. The IEEE 802.16(2009) standard, which the aeronautical SARPs currently under development are based on, is technically capable of using a frequency reuse of one methodology. A recent ITU-R report indicates that such frequency reuse requires 20 to 30 dB higher transmitting power per transmitter for appropriate signal/noise shaping. This method makes no attempt at trying to satisfy existing radio regulatory sharing conditions, to protect the FSS (earth-Space) feederlink present in the band.

4.4.3.1 As regards b), the frequency band 5 000 – 5 010 MHz is used as a global navigation satellite service (GNSS) (earth-Space) feederlink for Galileo (Europe) and QZSS (Japan). 5 010 – 5 030 MHz is planned for GNSS service and user links (space-Earth). During the ITU-R studies which commenced after WRC-07, it was agreed, due to the current immaturity of GNSS user and service link requirements, to concentrate only the band 5 000 – 5 010 MHz as a potential additional frequency allocation to the new aeronautical surface service in the 5 GHz band. The agreed ITU-R studies confirm that sharing in the band 5 000 – 5 010 MHz is feasible, given similar conditions as were used to establish compatibility with the FSS in the band 5 091 – 5 150 MHz.

4.4.4 During the WRC it became apparent that an additional allocation of 10 MHz in the 5 GHz band was only supported by USA and African States, while there was very strong opposition from other Regions. Aviation in general did not appear to have a strong opinion on this issue, while the GNSS community was strongly represented. The allocation WRC-07 made to the AS within the 5 091 – 5 150 MHz band was revoked by this conference. This slightly improves the spectrum access available to the AM(R)S allocation for the air/ground aeronautical surface system in the band 5 091 – 5 150 MHz.

4.5 Overall results

4.5.1 Overall, agenda item 1.4 can be declared a success. The new AM(R)S allocations in the 108 – 117.975 MHz and 960 – 1 164 MHz bands, will be shared with existing ARNS in a manner which does not burden existing and foreseen future implementations of the ARNS. These new allocations pave the way for more efficient and flexible aeronautical use of these frequency bands, and also add a radio regulatory requirement for ICAO standardized systems in these bands. While it was not possible to get a 10 MHz wide additional allocation for the 5 GHz air/ground airport surface system during this conference, indications are that States which require additional bandwidth to support very large airports will have access to additional spectrum through use of Article 4.4 of the Radio Regulations. Also, WRC-15 will re-examine the FSS allocation currently present in the 5 091 – 5 150 MHz band.

5 Agenda Item 1.5: To consider worldwide/regional harmonization of spectrum for electronic news gathering (ENG), taking into account the results of ITU-R studies, in accordance with Resolution 954 (WRC-07).

5.1 This agenda item was to address spectrum needs associated with terrestrial portable radio equipment used by services ancillary to radio and television broadcasting. Despite considerable efforts made by the proponents for electronic news gathering, the conference did not agree to modifications to the Radio Regulations in support of this agenda item. The ICAO Position, to oppose any allocation which would adversely affect the interests of aviation, is fully covered by this outcome.

6 Agenda Item 1.7: To consider the results of ITU-R studies in accordance with Resolution 222 (Rev. WRC-07) in order to ensure long-term spectrum availability and access to spectrum necessary to meet requirements for the aeronautical mobile-satellite (R) service, and to take appropriate action on this subject, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525 - 1 559 MHz and 1 626.5 - 1 660.5 MHz.

6.1 The ICAO position on this agenda item was to support further regulatory provisions to strengthen AMS(R)S access to the bands 1 545 - 1 555 MHz and 1 646.5 -1 656.5 MHz including, if required, changes to No. 5.357A, No. 5.362A and Resolution 222 and taking into account the results of ITU-R studies.

6.2 Before WRC-97 the bands 1 545 - 1 555 MHz and 1 646.5 -1 656.5 MHz were allocated exclusively to the AMS(R)S, and therefore access by AMS(R)S users was intrinsically guaranteed by the Radio Regulations. Following the WRC-97 decision to replace the exclusive AMS(R)S allocation with a “generic” allocation to the mobile-satellite service (MSS), which forced sharing of the bands with maritime and land-mobile users, such guarantee was no longer available. Instead, an alternative footnote No 5.357A was introduced to partially compensate for the loss of the exclusive allocation by giving AMS(R)S users priority of access to the band. The wording of the footnote and of the associated Resolution 222 were subsequently (WRC-2000) strengthened to state explicitly that MSS operators carrying non-safety-related traffic must yield spectrum if necessary to accommodate the spectrum requirements for AMS(R)S communications.

6.3 Since WRC-2000, the effectiveness of those provisions to ensure that AMS(R)S spectrum requirements are consistently met was challenged several times by at least one AMS(R)S operator. WRC-07 therefore agreed that the matter should be on the agenda of WRC-12.

6.4 The studies conducted by the ITU-R in preparation of WRC-12 concentrated on two main issues.

6.4.1 The first was whether the 1 545 - 1 555 MHz and 1 646.5 - 1 656.5 MHz bands (2 x 10 MHz in total) would be sufficient to accommodate the long-term spectrum requirements for the AMS(R)S. The conclusion was that the bands would be sufficient, as long as AMS(R)S users were granted priority access to the bands (if necessary by forcing other users to vacate them).

6.4.2 The second and closely related issue was whether the regulatory provisions of footnote No 5.357A and Resolution 222 were strong enough to ensure that AMS(R)S users were indeed granted priority access to the bands. The issue had arisen because, while those provisions unequivocally supported the priority access principle, there were doubts as to the effectiveness of the procedures for their application. The doubt were mainly related to the facts that such procedures were based on regional Memoranda of Understanding (MoU) governing the assignment of spectrum to MSS operators (including AMS(R)S), and that the content of the MoU was not in the public domain. Furthermore, the assignments agreed under the provisions of the MoU were not in the public domain either. This situation had led to conflicting claims as to whether AMS(R)S requirements were being met or not. Such claims could not be arbitrated by external parties, such as ICAO, due to the intrinsic lack of transparency of the process. On this second issue, the ITU-R studies did not reach a consensual conclusion. This divergence of views was reflected in the proposals submitted to the conference. While some proposals claimed that the issue did not exist and therefore no action was required, others (in line with the ICAO position) disagreed and advocated the introduction of a more transparent process, and in particular the involvement of ICAO.

6.5 The outcome of the conference favoured the ICAO position. Specifically, the conference agreed a substantial modification of Resolution 222, introducing the following changes:

- a) administrations, if they so desire, are invited to have their AMS(R)S traffic requirements submitted to ICAO before the yearly MoU meetings in which spectrum assignments in the band are agreed for the following year;
- b) ICAO is invited to evaluate and, as appropriate, comment on the AMS(R)S traffic requirements received from individual administrations, on the basis of the known global and regional aviation traffic requirements, including the time-scale of regional and global communication requirements;
- c) a new detailed Annex to the Resolution spells out the existing procedures in detail, with substantial modifications intended to ensure the transparency of the process, such as a requirement for administrations to make known the result of the spectrum assignment meetings, and the introduction of a “Reassessment Meeting” to be held if an administration claims that their AMS(R)S spectrum requirements have not been met (with a view assess the validity of the claim and subsequently redress the situation if required).

6.6 Taken together, the changes achieve the purpose of strengthening AMS(R)S access, as required by the ICAO position. The introduction of the detailed Annex effectively addresses the long-standing issue of transparency. The optional involvement of ICAO in the validation of the AMS(R)S traffic requirements provides additional support for AMS(R)S operators’ claims to spectrum and reinforces their position in the MoU meeting

7 Agenda Item 1.9: To revise frequencies and channelling arrangements of Appendix 17 to the Radio Regulations, in accordance with Resolution 351 (Rev. WRC-07), in order to implement new digital technologies for the maritime mobile service.

7.1 This agenda item sought to facilitate the introduction of new digital technologies in the HF frequency bands, as contained within Appendix 17 of the Radio Regulations. The ICAO Position was to ensure that the introduction of new modulation techniques and/or changes to the table contained in Appendix 17, does not cause harmful interference to the AM(R)S operating according to the table contained in Appendix 27, and operating in frequency bands adjacent to those operated by the maritime service.

7.2 Modifications were made to Appendix 17, to accommodate wide band digital transmissions, using multiples of 3 kHz channels, in accordance with Recommendation ITU-R M.1798. Updates were also made to Article 52 *Special rules relating to the use of frequencies*, accordingly. These modifications do not affect AM(R)S spectrum, hence the updates are in line with the ICAO position.

8 Agenda Item 1.12: To protect the primary services in the band 37 - 38 GHz from interference resulting from aeronautical mobile service operations, taking into account the results of ITU-R studies, in accordance with Resolution 754 (WRC-07).

8.1 Prior to WRC-12, the frequency band 37 – 38 GHz contained a generic mobile allocation, shared with the fixed service as well as space research and fixed-satellite services. There has not been any aeronautical use of this band to date, however, prior to WRC-07, some concerns were raised about the potential incompatibility of aeronautical mobile use with other users in this band.

8.2 In 2007 the aerospace industry started developing a new concept, involving very low power point-to-point transmissions onboard aircraft to replace wiring and/or add sensors/transducers in locations on the airframe hitherto difficult to reach. During this early development phase, this frequency band was seen as a potential candidate band to support wireless avionics intra-communications (WAIC) systems. See also discussion on agenda item 8.2

8.3 Later, interest in this band was dropped by the aerospace industry, as preliminary R&D efforts indicated that lower frequency bands would have more favourable characteristics for WAIC use. Furthermore, the outcome of these studies indicated no realistic possibility of aeronautical mobile applications sharing this band with other users. As a result, WRC-12 modified the 37 – 38 GHz mobile allocation to exclude aeronautical mobile. Although the ICAO position was to support the use of technical protection limits to protect other services rather than excluding the band from aeronautical mobile, this outcome is not perceived as a substantive loss of aviation spectrum.

9 Agenda Item 1.14: To consider requirements for new applications in the radiolocation service and review allocations or regulatory provisions for implementation of the radiolocation service in the range 30 - 300 MHz, in accordance with Resolution 611 (WRC-07).

9.1 Under this agenda item, WRC-12 made an additional allocation to the Radiolocation service in the frequency band 154 – 156 MHz, by footnote. This frequency band is used by the fixed and mobile services, except aeronautical mobile. Aviation is not affected by this allocation.

10 Agenda Item 1.15: To consider possible allocations in the range 3 - 50 MHz to the radiolocation service for oceanographic radar applications, taking into account the results of ITU-R studies, in accordance with Resolution 612 (WRC-07).

10.1 WRC-12 allocated certain frequency ranges in the band 3 – 50 MHz for the use of oceanographic radars, on a secondary basis, allowing this technology to be used in a uniform manner, while not interfering with existing fixed and mobile services in those frequency ranges. The frequency ranges allocated are not used by the AM(R)S, hence there is no impact on aviation by these new allocations.

11 Agenda Item 1.19: To consider regulatory measures and their relevance, in order to enable the introduction of software-defined radio and cognitive radio systems, based on the results of ITU-R studies, in accordance with Resolution 956 (WRC-07).

11.1 The ICAO position was one of concern, that the new technologies, software-defined radio (SDR) and cognitive radio systems (CRS) may cause undue interference to other users, if appropriate regulatory measures were not taken. SDR is a radio using software as building blocks rather than hardware, and could potentially be modified with relatively little effort, to work outside its intended operational parameters. CRS operate by automatically adapting their transmission or reception parameters to communicate efficiently, avoiding interference with licensed or unlicensed users. For this technology to work in practice, CRS need to be able to detect all transmitters. Many aeronautical systems however are based on ground based transmitters providing service to airborne receivers. In such a case it is very possible for a cognitive radio to be beyond the line-of-sight of the transmitter, while still being within the line-of-sight of the airborne receiver, resulting in interference to that receiver.

11.2 The conference was of the firm view that SDR is a technology and not a service. Hence the conference did not consider any changes to the Radio Regulations to support the introduction of SDR. It is expected that national type approvals and licensing conditions for transmitters will cover this issue adequately.

11.3 While being of a similar view about CRS, the conference developed a new Recommendation **COM6/1** on the deployment and use of cognitive radio systems. This Recommendation asks administrations to actively participate in ITU-R studies on the implementation of CRS systems, as described in Resolution **ITU-R 58**, developed at the Radiocommunication Assembly, 16-20 January 2012 (RA-12).

11.4 These results satisfactorily cover the concerns addressed in the ICAO position.

12 Agenda Item 1.21: To consider a primary allocation to the radiolocation service in the band 15.4 - 15.7 GHz, taking into account the results of ITU-R studies, in accordance with Resolution 614 (WRC-07).

12.1 The frequency band 15.4 – 15.7 GHz is used by a variety of civil and military radionavigation and radar systems, including weather radars and airport surface detection equipment (ASDE) for operational control of aircraft and ground vehicle movements at airports.

12.2 The results of ITU-R studies in preparation for WRC-12 indicated that the addition of an allocation to the Radiolocation service to this frequency band was feasible, given that existing services were protected with adequate separation distances.

12.3 The conference allocated the frequency band 15.4 – 15.7 GHz to the radiolocation service on a primary basis, shared with the existing allocation to the aeronautical radionavigation, as well as fixed satellite service in portions of the band. This new allocation to the radiolocation service fully protects the aeronautical radionavigation service, as it is not to cause harmful interference to, or claim protection from, stations operating in the aeronautical radionavigation service. This result is fully in line with the ICAO position.

13 Agenda Item 1.22: To examine the effect of emissions from short-range devices on radiocommunication services, in accordance with Resolution 953 (WRC-07).

13.1 Short range devices (SRD) are very low power emitters used for a variety of applications, such as radio frequency identification (RFID) tags. SRDs normally operate on a license exempt basis, and per definition should not interfere with other spectrum users. However, the conclusion of ITU studies is that without constraints, SRDs have the potential to cause harmful interference.

13.2 The view of the conference was that while the decision on frequency bands for use by SRDs is a national matter, there would be significant advantages in international harmonizing of band usage. ITU-R Resolution 54-1, agreed during the RA-12 in the week prior to the WRC-12, assigns further studies on this issue to the ITU-R. No frequency bands were allocated to SRD. This outcome satisfactorily covers the concerns addressed in the ICAO position.

14 Agenda Item 1.23: To consider an allocation of about 15 kHz in parts of the band 415 - 526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services.

14.1 Aeronautical non-directional beacons (NDB) mainly operate in the frequency band up to 435 kHz in ITU Region 1 and 415 kHz in Regions 2 and 3. Above these frequencies and within the frequency band addressed under this agenda item, aeronautical radionavigation has a secondary allocation. Whilst the long-term goal is to remove NDB from use, this is unlikely to be achieved in the near future. However, NDB operations are on a slow demise, no growth in NDB use is foreseen.

14.2 While upgrading the aeronautical radionavigation service to a primary allocation in a number of countries, the amateur service was given a secondary allocation in the frequency band 472 – 479 kHz. The amateur service shall not transmit more than 5W EIRP in this frequency allocation, and not more than 1W EIRP if closer than 800km to the borders of certain concerned countries. Certain concerned countries do not allow the amateur service within their borders.

14.3 This allocation is in line with the ICAO position. The allocation of this new secondary allocation to the amateur service fully protects the current and projected NDB use.

15 Agenda Item 1.25: To consider possible additional allocations to the mobile-satellite service, in accordance with Resolution 231 (WRC-07).

15.1 Under this agenda item, the mobile satellite service scrutinized possible sharing with services in the frequency range 4 – 16 GHz, including a number of aeronautical bands. Despite considerable efforts made by the proponents of this agenda item, in the end the conference did not agree to any modifications to the Radio Regulations. The ICAO Position, to oppose any allocation which would adversely affect the interests of aviation, is fully covered by this outcome.

16 Agenda Item 4: In accordance with Resolution 95 (Rev. WRC-03), to review the resolutions and recommendations of previous conferences with a view of possible revision, replacement or abrogation.

16.1 The following Resolutions were addressed in a manner different from the ICAO Position:

16.1.1 Resolution **18** relates to the procedure for identifying and announcing the position of ships and aircraft of States which are not party to an armed conflict. A minor update was made to this Resolution, not affecting aviation.

16.1.2 Resolution **27** addresses the application of incorporation by reference in the Radio Regulations. Minor updates were made to this Resolution, mainly to clarify its application. This does not affect aviation.

16.1.3 Resolution **63** addresses the protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment. Updates were made to this Resolution to better protect other users of the spectrum against ISM equipment. These updates do not negatively affect aviation.

16.1.4 Resolution **114** addresses the compatibility between the ARNS and the FSS, limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service in the frequency band 5 091 – 5 150 MHz. An editorial update was made to this resolution to reflect a similar editorial update made to footnote No. **5.444**, exchanging the word “precedence” with “priority”.

16.1.5 Resolution **205** addresses the protection of systems operating in the mobile-satellite service in the band 406 – 406.1 MHz, limited to the use of low-power satellite emergency position-indicating radiobeacons (EPIRBs). Modifications to this Resolution address interference concerns from adjacent frequency band users, and are aimed at improving/defending the continued use of EPIRBs in this frequency band.

16.1.6 Resolution **225** addresses the study of additional frequency bands for the satellite component of IMT. Some minor changes were made to this resolution, describing the use of the frequency bands 2 500 – 2 520 and 2 670 – 2 690 MHz as being limited to Region 3. Neither of these bands is used by aviation.

16.1.7 Resolution **418** addresses the use of the band 5 091 – 5 250 MHz by the aeronautical mobile service for telemetry applications. This Resolution was modified to reflect the deletion of Resolution 419. This has no negative effect on aviation.

16.1.8 Resolution **419** addressed the use of the band 5 091 – 5 150 MHz by the aeronautical mobile service for aeronautical security (AS) applications. Consequential to the deletion of the AS from footnote No. **5.444B**, this Resolution has now been deleted. This is in line with the ICAO position as it improves access to the aeronautical air/ground surface AM(R)S in this frequency band, see discussion on agenda item 1.4.

16.1.9 Resolution **644** addresses telecommunication resources for disaster mitigation and relief operations. This Resolution was updated to accurately reflect dated references. Updates are in line with the ICAO Position.

16.1.10 Resolution **748** addresses compatibility between the aeronautical mobile (R) Service and the fixed satellite service (Earth-to-space) in the band 5 091 - 5 150 MHz. This Resolution was modified to reflect the deletion of Resolution **419**. This has no negative effect on aviation.

16.1.11 Resolution **953** addressed protection of radiocommunication services from emissions by short range devices. This Resolution defined the problem statement to be addressed under agenda item 1.22 of WRC-12 and was suppressed in line with the outcome of the conference. RA-12 developed Resolution ITU-R **51-1** to address continuing studies of this subject within the ITU-R. This outcome satisfactorily covers the concerns addressed in the ICAO position.

16.1.12 Resolution **956** addressed regulatory measures and their relevance to enable the introduction of software-defined radio (SDR) and cognitive radio systems (CRS). This Resolution described the problem statement to be addressed under agenda item 1.19 of WRC-12, and was suppressed in line with the outcome of the conference. ITU-R Resolution **58-1** as agreed by RA-12 and ITU Recommendation **Com6/1** describe further studies to be performed on the subject of CRS. This outcome satisfactorily covers the concerns addressed in the ICAO position.

17 Agenda Item 8.2: To recommend to the Council items for inclusion in the agenda for the next WRC and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution 806 (WRC-07).

17.1 Wireless avionics intra-communications (WAIC) systems.

17.1.1 In line with the ICAO position, the WRC approved a new Resolution, to consider regulatory actions, including allocations, to support WAIC, and a new supporting agenda item at WRC-15.

17.1.2 The aerospace industry is developing new commercial aircraft to provide airlines and the flying public with more cost-efficient and environmentally friendly air transportation while maintaining required levels of safety and reliability. One important means of accomplishing these aims is to reduce overall aircraft weight, e.g. by reducing wiring, while providing multiple and redundant methods to transmit safety-related information within and on an aircraft. The utilization of wireless technologies may accomplish these goals while providing environmental benefits such as reduction of carbon footprints as well as cost savings to manufacturers and operators.

17.1.3 WAIC systems are envisaged to consist of point-to-point radio communications between transmitters and receivers installed on a single aircraft, the transmitters and receivers being integrated with the aircraft. In all cases, communication is part of a closed, exclusive network required for aircraft operation. WAIC systems will not provide air-to-ground or air-to-air communications. WAIC systems will be limited to safety and regularity-of-flight related applications.

17.2 Fixed Satellite Service spectrum for Unmanned Aircraft Systems

17.2.1 WRC-12 approved ITU-R studies to identify technical, regulatory and operational recommendations to enable safe use of FSS spectrum by UAS, and an agenda item for WRC-15 was agreed; to consider, based on the result of the ITU-R studies, the possible regulatory actions to support the use of FSS frequency bands for provision of UAS C³ links, while ensuring the safe operation of UAS C³ links, consistent with the provision of a safety service, making reference to No. **4.10**. ICAO was invited to participate in the ITU-R studies. See also discussion on Agenda Item 1.3 in this Appendix.

17.3 VSAT issues

17.3.1 The WRC approved a new Resolution, addressing the support of VSAT communications in the 3.4 – 4.2 GHz band (C-band) in the AFI region. The result originated from a proposal presented by the ATU in response to concerns expressed by African civil aviation entities, and coordinated by the ICAO AFI Regional Offices.

17.3.2 The concerns were related to the increasing demand from mobile system operators and other parties for access to the bands used by civil aviation VSAT communications in the region. Such VSAT communications are typically employed to replace or complement terrestrial communication infrastructure where it is lacking or inadequate. Applications include ground/ground point-to-point connectivity for ATC to ATC center communications as well as for ground/air communications (extended VHF coverage). The C-band is the most appropriate band for this purpose in the tropical regions due to excessive rain attenuation in higher frequency bands. The introduction of new non-aeronautical systems in the bands, such as BWA and IMT systems, could potentially threaten the continued availability of VSAT frequencies for civil aviation use.

17.3.3 The Resolution approved by the WRC is intended to address those concerns. It calls for ITU-R studies on technical and regulatory measures in the region to support the existing and future aeronautical and meteorological use of VSAT in the C-band. While there is no specific agenda item at WRC-15 for this issue, the Resolution calls for a review of the results of the studies and an action by WRC-15 as appropriate. The results of the studies will be reported to the WRC-15 through the report of the Director of the ITU Radiocommunication Bureau.

17.4 The conference agreed to include the following items of interest to aviation on the draft agenda for the WRC-15:

1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **COM6/8 (WRC-12)**;

1.3 to review and revise Resolution **646 (Rev.WRC-12)** for broadband public protection and disaster relief (PPDR), in accordance with Resolution **COM6/11 (WRC-12)**;

1.4 to consider possible new allocation to the amateur service on a secondary basis within the band 5 250-5 450 kHz in accordance with Resolution **COM6/12 (WRC-12)**;

1.5 to consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices **30**, **30A** and **30B** for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution **COM6/13 (WRC-12)**;

1.6 to consider possible additional primary allocations:

1.6.1 to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1;

1.6.2 to the fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz;

and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU-R studies, in accordance with Resolutions **COM6/4 (WRC-12)** and **COM6/5 (WRC-12)**, respectively;

1.7 to review the use of the band 5 091-5 150 MHz by the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in accordance with Resolution **114 (Rev.WRC-12)**;

1.12 to consider an extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9 300-9 900 MHz by up to 600 MHz within the frequency bands 8 700-9 300 MHz and/or 9 900-10 500 MHz, in accordance with Resolution **COM6/18 (WRC-12)**;

1.14 to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of coordinated universal time (UTC) or some other method, and take appropriate action, in accordance with Resolution **COM6/20 (WRC-12)**;

1.16 to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution **COM6/21 (WRC-12)**;

1.17 to consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution **COM6/22 (WRC-12)**;

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-03)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to Resolution **27 (Rev.WRC-12)**;

4 in accordance with Resolution **95 (Rev.WRC-07)**, to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation;

8 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-07)**;

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

9.1 on the activities of the Radiocommunication Sector since WRC-12;

9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and

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APPENDIX

SPECTRUM STRATEGIC OBJECTIVES and SPECTRUM POLICY STATEMENTS

(to be incorporated in the Chapter 7 Volume 1 of ICAO Handbook on radio frequency spectrum
] requirements for civil aviation)

Note: The material in this Appendix is an extract of the modifications to the ICAO Handbook on radio frequency spectrum requirements for civil aviation (Doc. 9718) and includes all new ICAO Spectrum Strategic Objectives and the modified ICAO Policy Statement. IP24 of CNS/MET SG/16 presents the complete Handbook, including all revisions.

Introduction

The safety aspects on the use of radio frequency spectrum by aviation require spectrum to be available on an exclusive basis or, when shared with non-aeronautical radio services, with regulatory and technical conditions that recognize aeronautical safety requirements. The overall ICAO spectrum policy includes the Strategic Objectives and the Policy Statements which provide a measure to implement the spectrum Strategic Objectives and is approved by the ICAO Council.

Implementation of the Strategic Objectives will enable the advancement of technological developments and innovation to enhance safe and efficient global air transport. This is to be achieved through the development of ICAO SARPs as necessary. The radiofrequency spectrum capacity for aviation needs to be sufficient to meet the growing needs for aeronautical communication, navigation and surveillance systems, including any new systems that are being considered in ICAO to meet future CNS/ATM requirements. This is essential to adequately support changing trends air traffic management such as foreseen in the ICAO Global Air Navigation Plan and the ICAO Regional Plans.

Spectrum for aeronautical radio communication and radionavigation (including surveillance) is allocated by the International Telecommunication Union (ITU) with the recognition of the safety aspects identified above. The ICAO spectrum policy aims at continuing this situation, with the intention of securing that aeronautical spectrum capacity requirements are satisfied during the frequency allocation process, taking into consideration the trends in future Air Traffic Management.

Timescale of the Strategic Objectives

The ICAO Strategic Objectives have been developed on the basis of current (Global and Regional) plans for implementing CNS systems, including (ground based and on-board an aircraft) radar systems in the period until about 2035. The Strategic Objectives include a statement of the spectrum necessary for each of the CNS elements and each relevant frequency band. The Strategic Objectives also include spectrum requirements for stand-alone on-board (radar) systems such as airborne radio altimeters, airborne weather radar and airborne ground mapping radar systems.

In many cases, radiocommunication and navigation systems currently in use will continue to operate well beyond 2035, either on a global basis or in certain Regions. The strategic objectives in this Chapter identify requirements for the *medium term as until and beyond 2035*. Spectrum requirements identified for the *long term indicate that such spectrum is expected to continue to be necessary for an undetermined period, extending to well beyond 2035*.

On a regular basis, the Strategic Objectives, including the time scale, are updated taking into consideration developments in the use of current and new CNS systems.

As required, the Strategic Objectives include specific Regional requirements for CNS systems and the associated radio frequency spectrum. These Regional requirements are part of the overall ICAO spectrum strategy.

ICAO Policy Statements

The ICAO Policy Statements provide for specific actions that were identified to assist in meeting the ICAO Strategic Objectives and form the policy of ICAO to implement the Strategic Objectives.

Spectrum allocations for CNS systems

The allocation of spectrum for new services and systems in frequency bands already allocated for aeronautical use needs to take place within the framework set by the relevant ICAO Standards and Recommended Practices (SARPs) for communication, navigation and surveillance systems, as well as other (industry) Standards that apply to current operational systems

Note: Requirements for spectrum for meteorological radar and meteorological satellite systems are addressed by the World Meteorological Organization (WMO). However, specific requirements for airborne weather radar systems are included in the ICAO Spectrum Policy.

ICAO OVERALL STRATEGIC OBJECTIVES:

- To secure the continuing availability of adequate radio frequency spectrum to support the foreseen aeronautical CNS infrastructure (Re. Global Plan)
- To enable the advancement of technological innovation to maintain and enhance the safety of the global air transport system as well as increased efficiency in spectrum utilization

ICAO POLICY:

- Oppose any proposal that places undue or unreasonable constraint on aeronautical systems.
- Insist that any sharing studies carried out for frequency bands used by aviation take full account of the possible impact on the aeronautical safety case and that they encompass the total technical, operational and economic aspects of aeronautical system use.
- Compatibility of ICAO standard systems with existing or planned aeronautical systems operating in accordance with international aeronautical standards will be ensured by ICAO. Compatibility of ICAO standard systems with non-ICAO standard systems will be addressed in ITU, with the assistance of ICAO as required.
- To support efficient use of the frequency bands allocated to relevant aeronautical services, ICAO develops globally harmonized frequency assignment planning criteria and a global frequency assignment plan in support to the ICAO Global Plan.

The above strategic objectives and policy statements are applicable to all frequency bands, and should be regarded as implicit in the policy statements for all bands used by civil aviation.

Band: 90–110 kHz

Service: Radionavigation (LORAN-C)

ACP WG F is considering deletion of the ICAO policy and the related information for the frequency band 90 – 110 kHz for LORAN-C from the Handbook. LORAN-C stations are only sub-regionally or nationally used in some areas.

No ICAO Spectrum Strategic Objective for this band has been developed to date. ICAO Spectrum Strategic Objectives may be required in case LORAN continues to play an important role in international civil aeronautical navigation.

Note: the APAC Region is invited to provide comments on the proposed deletion of material relating to LORAN-C from the Handbook.

Band: 130–535 kHz

Service: Aeronautical radionavigation (NDB/locator)

- **ICAO STRATEGIC OBJECTIVE:** Secure the continuing availability of the frequency band 130 – 535 kHz which is allocated to the aeronautical radionavigation service on a global basis for use by NDB/Locator systems for the medium term and, on a Regional basis, for the long term.

ICAO POLICY:

- No change to 5.70, 5.80 and 5.86.
- In regions where the global navigation satellite system (GNSS) is implemented and non-directional radio beacon (NDB) assignments are withdrawn from international and national usage, aviation requirements for spectrum in these bands may be reduced.
- Until NDBs have been phased out, the current allocations to the aeronautical radionavigation service must be safeguarded.

On a global basis, the use of NDB/Locator beacons is expected to continue in the medium term and for the long term subject to Regional or sub-Regional requirements. The use in general is stabilized and may be reduced over time as a result of on-going GNSS and RNAV implementation. However, the use of NDB and Locator beacons will continue subject to regional requirements (e.g. to provide a backup network to GNSS). No (significant) increase in frequency requirements for NDB and Locator beacons is expected; the aeronautical requirements can be met in the currently available frequency bands. Outer locators which are used in conjunction with the ILS and Marker Beacons are in a number of cases being replaced with DME. Parts of the bands used for NDB/Locator systems are shared with the amateur, broadcasting, maritime radionavigation and the maritime mobile services.

***Note:** The strategic objective foresees that for international civil aviation, NDB systems may be required until the medium term (until and beyond 2035). However, in certain Regions the need for continuing use of NDB on a national (or international) basis may extend to the long term (for an undetermined period after 2035). Regions are invited to state the continuing requirements for NDB, in particular when necessary to support NDB systems on a national basis.*

Band: 2 850–22 000 kHz

Service: AM(R)S (air-ground communications (HF voice and data))

- **ICAO STRATEGIC OBJECTIVE:** Secure the continuing availability of the HF frequency bands 2850 – 22000 kHz which are allocated to aeronautical mobile (R) service for use by air/ground communications on a global basis in the long term.

ICAO POLICY:

- Retain the current allocations in the HF bands to the aeronautical mobile (route) service (AM(R)S) bands and the provisions of Appendix 27 to the Radio Regulations for the foreseeable future for HF voice and data.
- Protect the use of the aeronautical HF bands in accordance with the provisions of Appendix 27.
- No change to Footnotes 5.111 and 5.115.
- Support the measures and participate in the technical studies addressed in Resolution 207 (Rev. WRC-03) concerning the unauthorized use of and interference to frequencies in the bands allocated to the AM(R)S.
- Consider technical solutions which can be implemented efficiently without changes to aircraft equipment or disruption of aeronautical services.

On a global basis, HF communications provide the main means for long distance (beyond the radio horizon) air/ground voice and data communications. Despite the introduction of satellite communication systems (to provide long distance communications as an alternative to the use of HF bands in aviation), HF communications are expected to continue to be required for the long term. The use of these bands for long distance aeronautical voice and data communications is not expected to increase significantly and the future requirements are expected to be met in the currently available frequency bands.

The provisions of Appendix 27 provide for adequate flexibility in the regulatory procedures to implement changes in the use of the HF bands by aviation.

No revision of Appendix 27 is required.

Note: the Strategic Objectives for the aeronautical HF bands foresee the need to retain this band for air/ground voice and data communications for the long term (for an undetermined period after 2035).

Band: 74.8–75.2 MHz

Service: Aeronautical radionavigation (marker beacon)

- **ICAO STRATEGIC OBJECTIVE:** Secure the continuing availability of the frequency band 74.8 – 75.2 MHz which is allocated to the aeronautical radionavigation service for use by Marker Beacons on a global basis for the long term.

ICAO POLICY:

- No change to the current allocations.
- No change to Footnote 5.180.
- Deletion of Footnote 5.181.

Marker Beacons are used, in conjunction with ILS. On a global basis, the frequency band available for Marker Beacons satisfies the aeronautical requirements. In a number of cases, Marker Beacons (and outer Locators) are being replaced with DME. As long as Marker Beacons are in operation, the band 74.8 – 75.2 MHz needs to be available for these systems.

Note: the Strategic Objectives for the frequency band 74.8 – 75.2 MHz foresee the need to retain this band for Marker Beacons for the long term (for an undetermined period after 2035) in support to the continued use of the Instrument Landing System (ILS).

Band: 108–117.975 MHz

Service: Aeronautical radionavigation (VOR/ILS localizer/GBAS/VDL Mode 4)

ICAO STRATEGIC OBJECTIVES:

- Secure the continuing availability of the frequency band 108 – 117.975 MHz which is allocated to the aeronautical radionavigation service for use by ILS-Localizer and VOR on a global basis for the long term.
- Secure the continuing availability of the frequency band 112 – 117.975 MHz (108 – 117.975 for GBAS) which is allocated to the aeronautical mobile (R) service for use by GBAS and VDL Mode 4 on a global basis for the long term.
- Consider, subject to spectrum availability and spectrum requirements, the use of this band to accommodate VHF air/ground communication systems

ICAO POLICY:

- No change to the current allocation to the aeronautical radionavigation service and the aeronautical mobile (route) service (AM(R)S).
- Deletion of Footnote 5.197.
- Ensure conformity with ITU-R Recommendation SM.1009 regarding compatibility with FM broadcast services in the band 87.5–108 MHz and ILS/VOR as well as with ITU-R Recommendation M.1841 for GBAS.

On a global basis the band 108 – 117.975 is used for ILS (Localizer) and VOR. Implementation of GBAS in this band is expected to start around 2015 – 2025 in some areas if GBAS is technically and economically feasible. GBAS may replace in some areas ILS. The spectrum vacated by future ILS decommissioning, if any, will be re-used for GBAS systems. Some residual use of ILS is expected to continue to well beyond 2030.

On a global basis, the future use of VOR systems is expected to decline between 2015 – 2030 due to implementation of GNSS and RNAV. However, a residual number of VOR systems will continue to be in operation to meet specific requirements beyond 2030. The vacated spectrum, if any, will be re-used for GBAS and implementation of VHF air/ground communication systems.

GBAS is expected to be progressively implemented in the period from 2015 – 2030 in the band 108 – 117.975 under the allocation to the aeronautical mobile (R) service, subject to a satisfactory safety case (with special attention to interference into GNSS signals) and being technically and economically feasible.

The frequency band 108 – 117.975 is expected to meet the aeronautical requirements for ILS, VOR and GBAS until 2030 and beyond. Rationalization of GBAS technical characteristics may be necessary, in particular when being implemented in areas where VOR and ILS operations continue.

The frequency band 112 – 117.975 MHz can also be used for VDL Mode 4 under the allocation to the aeronautical mobile (R) service. The spectrum requirements for VDL Mode 4 until 2020 are expected to be minimal (up to a maximum of 2 to 4 channels) and can easily be implemented in most areas. This frequency band is also considered to accommodate VHF air/ground voice and data link systems, subject to spectrum availability.

Note: the Strategic Objectives for the frequency band 108 – 117.975 MHz foresee the need to retain this band for use by the localizer (as an element of the ILS) and for VOR for an undetermined period after 2035. Data link systems like GBAS/VDB and VDL Mode 4 are also foreseen to use this band for an undetermined period after 2035. The strategy includes the option for using this band for air/ground communications in case in the future the available spectrum capacity would permit, in case in some Regions or areas VOR and/or ILS-localizer are being withdrawn.

Band: 117.975–137 MHz

Service: AM(R)S (air-ground and air-air communications (VHF voice and data))

ICAO SPECTRUM STRATEGIC OBJECTIVE:

- Secure the continuing availability of the frequency band 117.975 – 137 MHz, which is allocated to the aeronautical mobile (R) service, for use by VHF air/ground voice and data link on a global basis for the long term.

ICAO POLICY:

- No change to the allocations to the aeronautical mobile (route) service in this band.
- No changes to Footnote 5.200.
- No changes to the provisions relating to the use of the emergency channels 121.5 and 123.1 MHz.
- Promote measures for the deletion of Footnotes 5.201 and 5.202.

The band 117.975 – 137 MHz is extensively used for VHF air/ground voice communications and VHF air/ground and air/air data. On a global basis this band is expected to satisfy the requirements for air / ground aeronautical communication, due to full implementation of 25 kHz and/or 8.33 kHz channel spacing where required. In Europe however, saturation of this band with 8.33 kHz channel spacing being used, is foreseen around 2025.

Note: the Strategic Objective for the frequency band 117.975 – 137 MHz foresees the need to retain this band for air/ground voice and data communications for the long term (for an undetermined period after 2035).

Band: 328.6–335.4 MHz

Service: Aeronautical radionavigation (ILS glide path)

ICAO STRATEGIC OBJECTIVE:

- Secure the continuing availability of the frequency band 328.6 – 335.4 MHz which is allocated to the aeronautical radionavigation service for use by ILS – Glide Path on a global basis for the long term.

ICAO POLICY:

- No change to current allocation to the aeronautical radionavigation service.
- No change to Footnote 5.258.
- Deletion of Footnote 5.259.

On a global basis, the frequency band 332.8 – 335.4 MHz is used for the ILS Glide Path, in conjunction with the ILS Localizer (see 5.2.4). This frequency band is expected to meet the aeronautical requirements for ILS Glide Path for the long term. In areas where GBAS is implemented to replace ILS systems, the use of this band for Glide Path systems may be reduced.

Note: the Strategic Objective for the frequency band 328.6 – 335.4 MHz foresees the need to retain this band for the glide path for the long term (for an undetermined period after 2035) in support to the continued use of the Instrument Landing System (ILS).

Band: 406–406.1 MHz

Service: Mobile-satellite (Earth-to-space) (search and rescue)

ICAO POLICY:

- No change to the allocation to the band 406–406.1 MHz and Footnotes Nos. 5.266 and 5.267.
- Secure protection of emergency locator transmitters (ELTs) which are used in aviation in this frequency band.

Note: No ICAO spectrum Strategic Objectives have been developed for this frequency band. The spectrum requirements for the COSPAS/SARSAT system are expected to satisfy those of international civil aviation

Band: 960–1 215 MHz

Service: Aeronautical radionavigation/radionavigation satellite
(DME/SSR/ACAS/GNSS/1090ES/UAT)

ICAO STRATEGIC OBJECTIVES:

- Secure the continuing availability of the frequency band 960 – 1215 MHz, which is allocated to the aeronautical radionavigation service, for use by UAT, DME and SSR (including ADS-B) on a global basis for the long term
- To support the implementation of new systems in the aeronautical mobile (R) service in the band 960 – 1164 MHz and a potential associated rationalization of the use of the DME band .
- Secure the continuing availability of the frequency band 960 – 1164 MHz which is allocated to the aeronautical mobile (R) service for use by air/ground and air/air data link systems and UAT. Implementation of these data links must take place under the express condition that no interference is caused to the aeronautical radionavigation service (e.g. DME and SSR).
- Secure the continuing availability of the frequency band 1164 – 1215 MHz which is allocated to the radionavigation satellite service for use by GNSS systems on a global basis for the long term, taking into consideration the radio regulatory conditions for using this band

ICAO POLICY:

- No change to the current allocation to the aeronautical radionavigation service or to Footnote 5.328 in the band 960–1 215 MHz.
- No change to Footnote 5.328A.
- No change to the aeronautical mobile (route) service (AM(R)S) allocation or to Footnote 5.327A in the band 960–1 164 MHz with the exception of possible changes to remove the restrictions on the use of the AM(R)S due to non-ICAO standardized systems from ITU-R Resolution 417.

On a global basis, the band 960 – 1215 MHz is used for DME systems; this use is expected increase and to continue to well beyond 2030. In RNAV procedures, DME-DME navigation is planned to be one of the major navigation methods as an element of PBN. The band 960 – 1215 MHz is expected to satisfy on a global basis the future requirements for DME, taking into account the protection given to aeronautical radionavigation (DME) in the ITU Radio Regulations. In some areas, the frequency band is heavily congested with DME assignments. Rationalization in this band of frequency assignments to DME stations, including a review of the technical characteristics of DME may be necessary

Two sub-bands of about +/- 10 MHz around the frequencies 1030 MHz and 1090 MHz are reserved for SSR. SSR provides, in addition to secondary surveillance radar, major functionality for ACAS and ADS-B. SSR is expected to continue to be required for surveillance; the frequency bands used for SSR satisfy on a global basis the aeronautical requirements to well beyond 2030.

The band 1164 – 1215 MHz is also used for GNSS and provides GPS/Galileo/Beidou/Glonass L5 or E5 signals. In accordance with the Radio Regulations, the use of this band by GNSS systems needs to protect DME from interference and accept interference from DME. This frequency band is expected to meet the GNSS requirements on a global basis for L5/E5 signals to well beyond 2030.

The band 960 – 1164 MHz is planned to be used for air/ground (and air/air) data communications (e.g. LDACS). Although achieving compatibility with DME/SSR may be problematic, this band is expected to meet the future data link requirements. Rationalization of DME may assist in providing the necessary spectrum for the data link system.

The frequency 972 MHz is used for the Universal Access Transceiver (UAT), which provides for ADS-B and up-linking of data messages. UAS is not considered for implementation in Europe.

Note: the Strategic Objectives for the frequency band 960 - 1215 MHz foresee the need to retain this band for use by aviation for aeronautical radionavigation and surveillance systems (DME, SSR) as well as for in particular air/ground data link systems (LDACS) for the long term (for an undetermined period after 2035). DME is expected to continue to support both ILS/DME and VOR/DME systems. Also, for the long term, the aeronautical use of GNSS systems in the band 1164 – 1215 MHz is expected.

Band: 1 215–1 400 MHz

Service: Radionavigation/aeronautical radionavigation/radiolocation/radionavigation-satellite (RNSS/primary surveillance radar)

ICAO STRATEGIC OBJECTIVE:

Secure the continuing availability of the frequency band 1215 – 1350 MHz which is allocated to the radionavigation and aeronautical radionavigation service for use by Primary Surveillance Radar on a global basis for the long term

ICAO POLICY:

- No change to the status of the allocation to the radionavigation service in Footnotes 5.331 and 5.334.
- No change to Footnote 5.332.
- No change to the provisions of Footnotes 5.329 and 5.337A regarding the protection of radar stations from the radionavigation-satellite service
- Support further ITU-R studies relating to Resolution **608**.

On a global basis the band 1300 – 1350 MHz (and in many countries also the band 1215 – 1300 MHz) is extensively used for primary surveillance radar, mainly providing long range independent non-cooperative airspace surveillance. This use is expected to continue to be required for the long term.

The use of this band for GNSS signals (GPS L2, GLONASS L2, Galileo E6 and Beidou B6) is not for civil aircraft applications.

A new development in radar technology is the multi static primary surveillance radar (MSPSR). MSPSR may provide more spectrum efficient use of this band and better coverage at lower altitudes. However, the implementation of MSPSR is dependent on the cost and improved spectrum efficiency that can be obtained.

Note: the Strategic Objective for the frequency band 1200 – 1350 MHz foresees the need to retain this band for Primary Surveillance Radar (PSR) for the long term (for an undetermined period after 2035) in support to the continuing requirement for non-cooperative independent surveillance.

Bands: Mobile-satellite bands 1 525–1 559 MHz and 1 626.5–1 660.5 MHz

Service: AMS(R)S (satellite communications)

ICAO STRATEGIC OBJECTIVES:

- Secure sufficient access on a global basis by the aeronautical mobile satellite (R) service in the bands 1545 – 1555 MHz and 1646.5 – 1656.5 MHz for the long term to support the requirements for aeronautical satellite communications.
- Ensure that any new or existing uses of these bands will not cause harmful interference to the use of this band by the aeronautical mobile satellite (R) service.

Note: In the United States the bands 1555 – 1559 MHz and 1656.5 – 1660.5 MHz the aeronautical mobile satellite (R) service has priority and immediate access over other mobile-satellite communications within a network.

ICAO POLICY:

- Support the establishment of adequate technical and regulatory procedures to:
 - a) guarantee access to spectrum in these bands for aeronautical communications as required; and
 - b) ensure that aeronautical communications in categories 1 to 6 of Article 44 are given priority and immediate access at all times.
- If acceptable procedures cannot be established, recover the exclusive allocation of the bands 1 545–1 555 MHz and 1 646.5–1 656.5 MHz to the AMS(R)S.
- If required, modify Footnotes 5.357A and 5.362A to strengthen AMS(R)S access to the bands.
- No change to Footnotes 5.357 and 5.376.
- Support the deletion of Footnotes 5.355 and 5.359.
- Provide support to the procedure to implement Footnote 5.357A and Resolution 222 (Rev. WRC-12)
- Support studies with respect to Resolution COM 4/1 (WRC-12).

In the bands 1545 – 1555 MHz and 1646.5 – 1656.5 MHz, the provisions in ITU Radio Regulations stipulate that priority shall be given during the frequency coordination process to the spectrum requirements for the aeronautical mobile satellite (R) service. Over a long period of time (prior to WRC-12), these provisions did not provide for the required access for aeronautical mobile satellite (R) communications. In order to secure that the aeronautical requirements for in particular long distance communications using satellite technology are met the relevant radio regulatory provisions in Resolution 222 were amended at WRC-12 as an attempt improve and secure in all cases access by aviation to the bands 1545 – 1555 MHz and 1646.5 – 1656.5 MHz.

Note: the Strategic Objectives for the frequency bands 1525 - 1559 MHz and 1626.5 – 1660.5 MHz foresee the need to retain this band to support long distance aeronautical satellite communications (in particular for remote and oceanic areas) for the long term (for an undetermined period after 2035).

Band: 1 559–1 626.5 MHz

Service: Aeronautical radionavigation/Radionavigation satellite/Mobile satellite (GNSS)

ICAO STRATEGIC OBJECTIVES:

- Secure the continuing availability of the frequency band 1559 – 1610 MHz which is allocated to the aeronautical radionavigation and the radionavigation satellite services for use by aeronautical GNSS systems, including augmentation systems, on a global basis for the long term.
- Secure deletion of the fixed service from the band 1559 – 1610 MHz and cessation of operation of any station in the fixed service in this band by 1 January 2015.
- Support the development of regulatory measures to enforce prevention and removal of occurrences of in-band and out-of-band interference
- Support the continuing retention of the allocation to the aeronautical mobile satellite (R) service (E-s, s-E) in the frequency band 1610 – 1626.5 MHz as per 5.367

ICAO POLICY:

- No change to the allocation to the radionavigation-satellite service in the band 1 559–1 610 MHz.
- 1 559–1 610 MHz: No change to the use of this band for future GNSS elements, including GLONASS and GPS which must be protected.
- No new allocations to be made in the band 1 559–1 610 MHz.
- No change to Footnotes 5.364, 5.365, 5.366, 5.367 and 5.368.
- Delete Footnotes 5.362B and 5.362C from these bands on the grounds that the allocation to the fixed service is not compatible with the safe operation of ICAO GNSS services.
- Delete Footnote 5.371.

The band 1559 – 1610 MHz is used by GNSS satellite systems as well as by GNSS satellite augmentation systems and is intensively used for aeronautical radionavigation applications. GNSS already plays a vital role in RNAV operations, ADS-B surveillance and the GLS/GBAS landing system. This band is used by GPS, GLONASS, Beidou and is planned to be used by Galileo.

The band 1559 – 1610 MHz is however subject to intentional interference (GPS jammers) and un-intentional interference (potentially caused by an inadequate regulatory framework to prevent the use of illegal jammers and improper implementation of pseudolites and GNSS repeaters). In addition, the proposed use of terrestrial cellular mobile systems in the (adjacent) band 1545 – 1559 MHz is expected to cause harmful interference to GNSS receivers (see also 5.2.9). Protection of GNSS signals is of paramount importance given the variety of GNSS applications for aeronautical navigation and surveillance. Radio regulatory authorities are responsible for securing the absence of harmful interference to GNSS signals, including when used by aviation.

Although this band is also shared with the fixed service, this use is expected to be terminated by 1 January 2015. Until such time the fixed service already operates as a secondary service (it cannot cause harmful interference to the radionavigation satellite service).

Note: the Strategic Objectives for the frequency band 1559 – 1626.5 MHz foresee the need to retain the band 1559 – 1610 MHz for the use of GNSS systems by aviation for the long term (for an undetermined period after 2035) in support to air navigation. The continued use of the band 1610 – 1626.5 MHz for aeronautical mobile satellite (R) communications for the long term to support satellite systems operating in accordance with ICAO SARPs (e.g. IRIDIUM).

Band: 2 700–3 300 MHz

Service: Aeronautical radionavigation/Radionavigation/Radiolocation (primary surveillance radar)

ICAO STRATEGIC OBJECTIVES:

- Secure the continuing availability of the frequency band 2700 – 2900 MHz which is allocated to the aeronautical radionavigation service for use by primary surveillance radar on a global basis for the long term.
- Where in adjacent frequency bands mobile systems are in use (e.g. WIMAX and LTE), secure protection of radar stations from harmful interference from mobile systems operating in adjacent bands
- Review the measures that were taken to protect primary surveillance radar from interference from cordless mobile cameras.

ICAO POLICY:

- No change to the frequency allocations to the aeronautical radionavigation service in these bands.
- No change to Footnotes 5.423, 5.424A, 5.426 and 5.427.
- Oppose any allocation that would endanger the operation of radar services including those potentially being considered for International Mobile Telecommunications/ mobile broadband under ITU-R Resolution [COM 6/8].
- Given the pressure on the use of this frequency band from non-aeronautical sources and in support of the ICAO Overall Policy Statement:
 - a) insist that any sharing studies carried out encompass the total technical and operational aspects of radar use, including possible impact on the safety case; and
 - b) oppose any proposal that places undue or unreasonable economic penalty on radar systems presently in use.

The band 2700 – 2900 MHz, and to a lesser extent the band 2900 – 3300 MHz, is heavily used for primary surveillance radar for civil aviation which is mainly providing medium range (to about 60 NM) independent non-cooperative surveillance radar. These radars typically provide surveillance in terminal and approach areas around major airports.

The band 2700 – 2900 MHz is also used for meteorological radar. This use is expected, on a global basis, to extend to well beyond 2030.

Radar stations are subject to interference from out-of-band emissions from cellular mobile systems (e.g WIMAX) operating in the adjacent band below 2700 MHz. This interference can be mitigated in principle by improving RF selectivity in the radar stations.

Another area of interference is by the use of the band 2700 – 2900 MHz for digital cordless cameras to support Electronic News Gathering (ENG). In Europe such use is permitted by some Administrations on the basis of CEPT/ECC Recommendation (02)09 and ECC Report 6. Co-frequency use of digital cordless cameras can cause interference to primary surveillance radar up to distances of about 250 NM and in a bandwidth of about +/- 10 MHz from the nominal frequency of the radar station. Such use may become globally harmonized. ECC Report 6 is based on an out-of-date version of ITU-R Recommendation ITU-R M1464 and should be revised to take into account proper protection of radar stations.

The frequency band 2700 – 2900 MHz may also be considered as one of the candidate bands under WRC-15 Agenda Item 1.1. The use of this band by aviation may also become subject to “Spectrum Pricing”.

Note: the Strategic Objectives for the frequency band 2700 – 2900 MHz foresee the need to retain this band for Primary Surveillance Radar (PSR) in particular for terminal areas.

Band: 4 200–4 400 MHz

Service: Aeronautical radionavigation (radio altimeter)

ICAO STRATEGIC OBJECTIVES:

- Secure the continuing availability of the frequency band 4200 – 4400 MHz which is allocated to the aeronautical radionavigation service for use by airborne radio altimeters on a global basis for the long term.

ICAO POLICY:

- No change to the allocation to the radionavigation service in the light of the continuing requirement for radio altimeters to operate in this band and of the results of ITU-R studies indicating that 200 MHz is required to meet the stringent operational requirements for accuracy and integrity for radio altimeters.
- No change to 5.438 which could constrain the operation of radio altimeters.
- Oppose any in-band or near-band allocation that would endanger the operation of the aeronautical radionavigation service including those potentially being considered for International Mobile Telecommunications/mobile broadband under ITU-R Resolution 233.
- Delete 5.439.

The whole of the band 4200 – 4400 MHz is globally used for radio altimeters on board aircraft. Radio altimeters provide an essential safety-of-life function for all phases of flight, including the final stages of landing where the aircraft has to be maneuvered into the flare position or attitude. [Use of this band for radio altimeters is expected to continue.]

The frequency band 4200 – 4400 MHz may also be considered as a potential candidate band for the “Spectrum Release” activities.

Note: the Strategic Objectives for the frequency band 4200 – 4400 MHz foresee the need to retain this band for airborne radio altimeters for the long term (for an undetermined period after 2035).

Band: 5 000–5 250 MHz

Service: Aeronautical radionavigation (MLS); Aeronautical Mobile (R) (surface applications and UAS) and Aeronautical Mobile Satellite (R) (Unmanned Aircraft Systems)

ICAO STRATEGIC OBJECTIVES:

- Secure the continuing availability of the frequency band 5030 – 5091 MHz which is allocated to the aeronautical radionavigation service for use by the Microwave Landing System (MLS) on a global basis for the long term to meet the spectrum requirements for the MLS.
- Assess, on a Regional basis, requirements for the long term implementation of MLS to establish the spectrum requirements for MLS
- Secure the continuing availability of the frequency band 5091 – 5150 MHz which is allocated to the aeronautical mobile (R) service for use by airport communications on a global basis for the long term.
- Secure future implementation of the aeronautical mobile (R) service and the aeronautical mobile satellite (R) service in the band 5030 – 5091 MHz to support air/ground communications for unmanned aircraft systems while satisfying the spectrum requirements for MLS.
- Consider the tuning range for AeroMACS to include the band 5000 – 5150 MHz, to support certain Regional or sub-Regional requirements

ICAO POLICY:

- No change to footnotes 5.444 and 5.444A.
- If necessary, support changes to Footnotes 5.367 and 5.444B in order to facilitate the implementation of aeronautical mobile (route) service (AM(R)S) and aeronautical mobile-satellite (route) service (AMS(R)S) systems.
- Apply the methodology contained in ITU-R Recommendation S.1342 on the coordination of microwave landing system (MLS) with fixed-satellite service (FSS) earth stations in the band 5 091–5 150 MHz.
- Support studies under ITU-R Resolution 114 in order that they can be completed by WRC-15.
- Ensure that in addressing the future use of the frequency band 5 091-5 150 MHz by the FSS current and intended future use by aeronautical systems are not adversely impacted.

Priority is given to the Microwave Landing System in the band 5030 – 5091 MHz.. Other applications for using this band (e.g. in the aeronautical mobile (R) service and aeronautical mobile satellite (R) service to support unmanned aircraft) are emerging.

The band 5091 – 5150 MHz is reserved for airport communication systems in the aeronautical mobile (R) service, which are currently being developed. A tuning range of 5000 – 50150 MHz for AeroMACS is being considered to support either Regional or sub-Regional requirements

The band 5000 – 5030 MHz is also planned for use by the radionavigation satellite service (GNSS) to provide both a feeder link to RNSS satellites as well as a service link, in particular for the Galileo system. However, such use is not expected to be implemented before 2030.

Note: the Strategic Objectives for the frequency band 5000 – 5250 MHz foresee the need to retain the band 5030 – 5091 MHz for the implementation of MLS for the long term (for an undetermined period after 2035). Also, the implementation and use, for the long term, of aeronautical communication systems to support surface communications as well as communications with UAS is expected. Special attention is requested to assess, on a Regional basis, the long term requirements for MLS.

Band: 5 350–5 470 MHz

Service: Aeronautical radionavigation (airborne weather and ground mapping radar)

ICAO STRATEGIC OBJECTIVE:

- Secure the continuing availability of the frequency band 5350 – 5470 MHz which is allocated to the aeronautical radionavigation service for use by airborne weather radar on a global basis for the long term.

ICAO POLICY:

- No change to footnotes 5.448B, 5.448C and 5.448D.
- These bands are used extensively, particularly for airborne weather radar, and are needed for the foreseeable future. No changes should be made which would restrict this aeronautical use.

The band 5350 – 5470 MHz is globally used for airborne weather radar. This use is expected to continue for the long term. The airborne weather radar is a safety critical instrument assisting pilots in deviating from potential hazardous weather conditions and detecting wind shear and microbursts.

Note: the Strategic Objective for the frequency band 5350 – 5470 MHz foresee the need to retain this band for Marker Beacons for the long term (for an undetermined period after 2035) in support to the continued use airborne weather radar systems.

Band: 8 750–8 850 MHz

Service: Aeronautical radionavigation/Radiolocation (airborne Doppler radar)

ICAO STRATEGIC OBJECTIVE:

- Secure the continuing availability of the frequency band 8750 – 8850 MHz which is allocated to the aeronautical radionavigation service for use by airborne Doppler radar and ground mapping radar on a global basis for the long term.

ICAO POLICY:

- No change since the requirement is a continuing one.
- No change to Footnote 5.470.

The band 8750 – 8850 MHz is extensively used for airborne Doppler radar and ground mapping radar. These systems are used to determine ground speed, drift and distance travelled as well as ground mapping. The use of these radar systems is expected to continue for the long term. The band 8750 – 8850 MHz is shared with the radiolocation service and the maritime radionavigation service.

Note: the Strategic Objective for the frequency band 8750 – 8850 MHz foresees the need to retain this band airborne Doppler (and other) radar system for the long term (for an undetermined period after 2035) to support air navigation.

Band: 9 000–9 500 MHz

Service: Aeronautical radionavigation/Radionavigation (precision approach)

radar, airborne weather and ground mapping radar)

ICAO STRATEGIC OBJECTIVES:

- Secure the continuing availability of the frequency band 9000 – 9200 MHz which is allocated to the aeronautical radionavigation service for use by ground based radar systems on a global basis for the long term.
- Secure the continuing availability of the frequency band 9300 – 9500 MHz which is allocated to the aeronautical radionavigation service for use by airborne weather radar and ground based radar on a global basis for the long term.

ICAO POLICY:

- Oppose any changes to the allocations that could adversely affect their use by aviation.
- No change to Footnotes 5.337, 5.427, 5.473A, 5.474, 5.475, 5.475A, 5.475B and 5.476A.
- Support studies under ITU-R Resolution 651 in order that they can be completed by WRC-15
- Ensure that proposals to extend the earth exploration satellite service into the frequency band 9 000-9 200 MHz do not adversely impact the use of the frequency band by airport surface movement radar.

The band 9000 – 9200 MHz is used for ground based primary surveillance radar systems including Precision Approach Radar (PAR) and airport surveillance detection equipment (ASDE). The main purpose of these systems is to provide surveillance to support precision approach to aircraft and to detect traffic at airports. This use is expected to continue to well beyond 2030. The use of the band is shared with the maritime radionavigation service and the radiolocation service.

The band 9300 – 9500 MHz is globally used for airborne weather radar and ground based radar. This use is expected to continue to well beyond 2030. The airborne weather radar is a safety critical instrument assisting pilots in deviating from potential hazardous weather conditions and detecting wind shear and microbursts. The use of this band by the ground based primary surveillance radar is similar to the use of the band 9000 – 9200 MHz. The use of this frequency band is shared with the Earth exploration satellite service and the space research service.

Note: the Strategic Objectives for the frequency band 9000 – 9500 MHz foresee the need to retain this band for ground based Primary Surveillance radar (in particular for airport surveillance applications) as well as for airborne weather radar for the long term (for an undetermined period after 2035).

Band: 13.25–13.4 GHz

Service: Aeronautical radionavigation (airborne Doppler radar)

ICAO STRATEGIC OBJECTIVE:

- Secure the continuing availability of the frequency band 13.25 – 13.4 GHz which is allocated to the aeronautical radionavigation service for use by airborne Doppler radar and ground mapping radar on a global basis for the long term.

ICAO POLICY:

- No change to the allocation as there is a continuing aeronautical requirement for this band.
- No change to 5.497.
- Oppose any changes to the allocations that could adversely affect their use by aviation as a result of studies undertaken in response to ITU Resolutions [COM 6/4] and [COM 6/5]

The band 13.25 – 13.4 GHz is extensively used for airborne Doppler radar and ground mapping radar. These systems are used to determine ground speed, drift and distance travelled as well as ground mapping. The use of these radar systems is expected to continue for the long term. The band is shared with the Earth exploration satellite service and the space research service.

Note: the Strategic Objective for the frequency band 13.25 – 13.4 GHz foresees the need to retain this band for airborne Doppler navigation aids for the long term (for an undetermined period after 2035).

Band: 15.4–15.7 GHz

Service: Aeronautical radionavigation (ASDE/airborne weather radar, other systems)

ICAO STRATEGIC OBJECTIVE:

- Secure the continuing availability of the frequency band 15.4 – 15.7 GHz which is allocated to the aeronautical radionavigation service for use by ground based radar systems on a global basis for the long term.

ICAO POLICY:

- No change to the allocation to the aeronautical radionavigation service.
- No change to Footnotes 5.511A, 5.511C and 5.511D which would introduce further restrictions to aeronautical use of this band.
- Oppose any changes to the allocations that could adversely affect their use by aviation as a result of studies undertaken in response to ITU Resolutions 151 and 152.

The band 15.4 – 15.7 GHz is used for ground based primary surveillance radar systems including Precision Approach Radar (PAR) and airport surveillance detection equipment (ASDE) The main purpose of these systems is to provide surveillance to support precision approach to aircraft and to detect traffic at airports. This use is expected to continue to well beyond 2030. The use of the band is shared with the fixed satellite service (Earth-to-space and space-to-Earth) and the Radio Location Service (RLS. No FSS use has been registered with the ITU within this band.

Note: the Strategic Objective for the frequency band 15.4 – 15.7 GHz foresees the need to retain this band for primary surveillance radar, in particular at airports, for the long term (for an undetermined period after 2035). This frequency band is also used for a variety of airborne weather radar and ground mapping radar systems.

Band: 24.25–24.65 GHz

Service: Radionavigation (ASDE)

ICAO POLICY:

No change to the radionavigation allocations in Region 2 and Region 3.

Note: Due to the non-global nature of the allocation to the Radionavigation Service in this band, no ICAO Spectrum Strategic Objective has been developed

Band: 31.8–33.4 GHz

Service: Radionavigation (ASDE)

Allocation:

ICAO STRATEGIC OBJECTIVE:

- Secure the continuing availability of the frequency band 31.8 – 33.4 GHz which is allocated to the radionavigation service and used by primary surveillance radar to support airport surveillance detection equipment (ASDE radar) on a global basis for the long term.
- Re-assess the need for using this band for ground based airport surface detection equipment (ASDE) radar systems.

ICAO POLICY:

No change to the radionavigation allocations.

The band 31.8 – 33.4 GHz is used by aviation to support ground based airport surface detection equipment (ASDE) radar, mainly to detect traffic at airports. The band is shared with the mobile, the fixed and the space research service.

Note: the Strategic Objective for the frequency band 31.8 – 33.4 GHz foresees the need to retain this band for airport surface surveillance radar systems for the long term (for an undetermined period after 2035). The need for this Strategic Objective needs to be re-confirmed, taking into account Regional requirements. This frequency band is also used for airborne radionavigation systems.

— END —

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**ICAO Handbook on radio frequency spectrum requirements for
Civil Aviation**

Part II
**Frequency assignment planning criteria for aeronautical radio
communication and navigation systems**

Part II of the Handbook is intended to assist States in frequency assignment planning for aeronautical communication and navigation systems. Part II includes frequency assignment planning criteria for VHF air/ground communication systems (voice and data). Chapters addressing VHF/UHF radionavigation systems, non-directional beacons, HF frequencies are in preparation.

The approval of frequency assignment planning criteria rests with the Regional Planning and Implementation Groups (PIRGs) and should be based on the provisions of Annex 10, the material in this Handbook and relevant Regional Air Navigation Agreements.

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Chapter 1. General Methodology for Compatibility Analysis

1.1 Introduction

This chapter describes a general methodology that can be used in the analysis of interference between similar and dissimilar radio systems and provides the procedures for calculating the distance and frequency separation required to prevent harmful interference to systems used by aviation for communication and (radio) navigation purposes.

For a more detailed analysis, taking into account the aeronautical compatibility requirements, the method as described in ITU-R Recommendation SM.337 on “*Frequency and distance separation*” may be used in some cases. Also relevant are the provisions of ITU-R Recommendation SM.1535 on “*The protection of safety services from unwanted emissions*”.

1.2 Compatibility model

1.2.1 Compatibility assessment

The electromagnetic compatibility of radio equipment should be calculated by the following method:

Step 1: determine the desired signal level (and spectral distribution) at the desired (victim) receiver input;

Step 2: determine the undesired (interfering) signal level (and spectral distribution, including noise) at the desired (victim) receiver input, taking into account the total receiving system performance requirements as per Annex 10;

Step 3: determine the interactive effects among the desired and undesired signals for various frequency separations, while meeting the total receiving system performance requirements. These effects can be determined through actual measurements or through analysis.

Step 4: determine from the data obtained in step 3, the degree of frequency and/or distance separation required to provide the required level of service to ensure that any interference received by the victim receiver is not harmful;

Step 4: determine, for establishing frequency/distance separation requirements, the appropriate propagation model.

Note: In all cases, the co-frequency protection requirements have to be assessed, preferably through measurements. The procedures described in Recommendation ITU-R SM.337 would allow, under specific conditions, to develop the frequency/distance separation when the interfering signal is not co-frequency with the desired signal while meeting the system performance requirements.

1.2.2 Protection of the desired signal

1.2.2.1 Protection of the desired signal can be considered along two principles.

1.2.2.1.1 The first principle calculates the actual field strength of both the desired and the undesired signal at the receiver antenna, taking into account the distance to the (desired) transmitter. On the basis of the established D/U ratio, the maximum signal level of the undesired (interfering) signal determines in turn the maximum level of the interfering signal, before the interference becomes harmful as shown in formula (4) in paragraph 1.2.5.. This principle is illustrated in Figure 1-1.

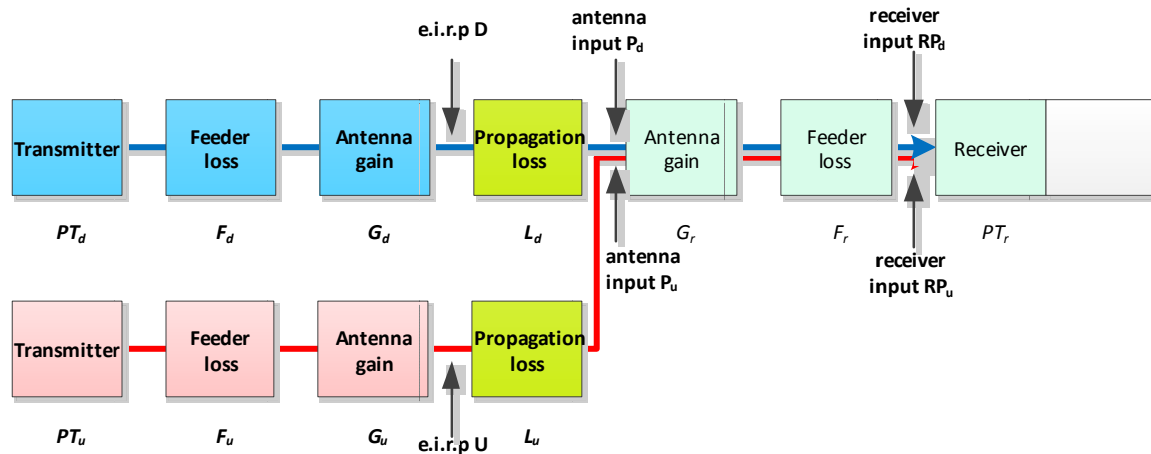


Figure 1-1 Schematic diagram of the complete scenario to be analyzed

where:-

- F_d : feeder loss for the desired transmitter (dB)
- F_r : feeder loss of the receiver (dB)
- F_u : feeder loss for the undesired transmitter (dB)
- G_d : gain of the antenna of the desired transmitting system (dBi)
- G_r : gain of the (desired) receiver antenna (dBi)
- G_u : gain of the antenna of the undesired transmitting system (dBi)
- L_d : propagation loss for the desired signal (dB)
- L_u : propagation loss for the undesired signal (dB)
- PT_d : output power of the desired transmitter (dBm)
- PT_u : output power of the undesired transmitter (dBm)
- P_d : power at the antenna of the desired receiver
- P_u : power at the antenna of the undesired receiver
- RP_d : power at the input of the desired receiver
- RP_u : power at the input of the undesired receiver

1.2.2.1.2 The second principle uses the minimum field strength at the receiver antenna (signal in space) as is specified by ICAO for all communication and navigation systems. This minimum field strength has to be assured throughout the designated operational coverage of the facility. Similar to the first principle described in paragraph 1.2.2.1.1, on the basis of the established D/U ratio, the maximum signal level of the undesired (interfering) signal can be determined, before the interference becomes harmful. This approach is more appropriate to establish protection throughout the designated operational coverage compared to the method in paragraph 1.2.2.1.1. This principle is shown in Figure 1-2.

1.2.2.1.3 In cases where the interactions between the desired and the undesired signal have not been properly established (e.g. through actual measurements) protection of the desired (aeronautical) signal should be based on securing that the undesired signal is well (6 – 10 dB) below the noise floor of the aeronautical receiver.

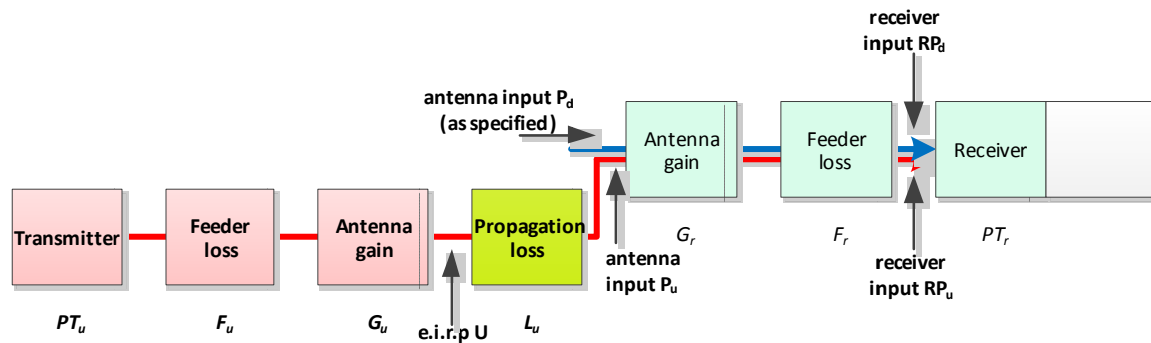


Figure 1-2 Schematic diagram of the minimum signal scenario

1.2.3 Determination of the desired signal at the victim receiver antenna

The following diagram illustrates the scenario to be analyzed.

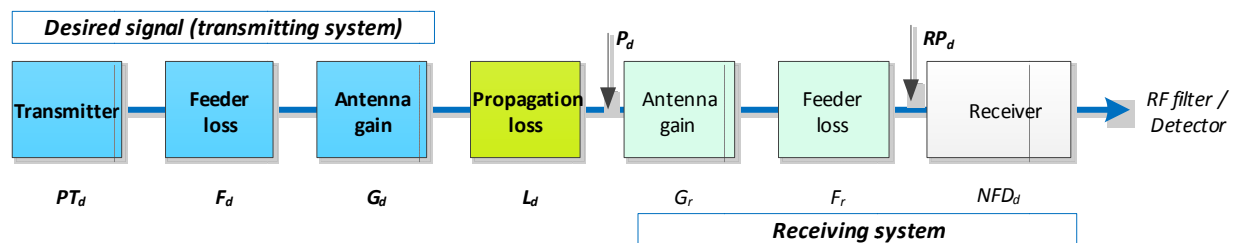


Figure 1-3 Schematic diagram of the desired signal path to the receiving antenna

The received power at the antenna of the receiver can be calculated by summing the transmitter power, antenna gains and feeder losses as shown in formula (1)

$$P_d = PT_d - F_d + G_d - L_d \quad (1)$$

where:

- PT_d** output power of the desired transmitter (dBm)
- F_d** feeder loss for the desired transmitter (dB)
- G_d** gain of the desired transmitter antenna (dBi)
- L_d** propagation loss for the desired signal (dB)
- P_d** power of the desired signal at the antenna of the receiver (dBm)

The propagation loss **L_d** is calculated in accordance with the appropriate propagation model as developed by the ITU. See section 1.3 on propagation modeling and using the propagation the model to calculate the path loss.

When the minimum desired signal level at the receiver antenna is specified and used in compatibility calculations, the scenario as shown in Figure 1-4 applies. In this case, **P_d** at the antenna of the receiver is as is specified in the relevant provisions of Annex 10.

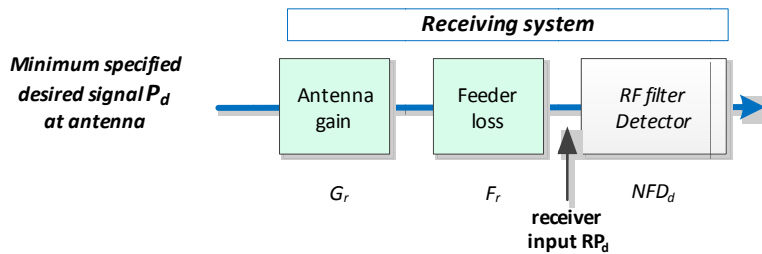


Figure 1-4 Desired signal path when minimum field strength is specified

This modifies formula (1) into formula (2).

$P_d = xx \text{ dBm}$ (2) (xx is as specified by ICAO; for the conversion from $\mu\text{V/m}$ to dBm see paragraph 2.3.2)

1.2.4 Calculation of the undesired signal at the victim receiver antenna

The Figure 1-4 illustrates the undesired signal path to be analyzed.

Note: the need for calculating the signal level of the undesired signal applies to both principles as identified in paragraphs 1.2.2.1.1 and 1.2.2.1.2 and further clarified in paragraphs 1.2.2. and 1.2.3 respectively.

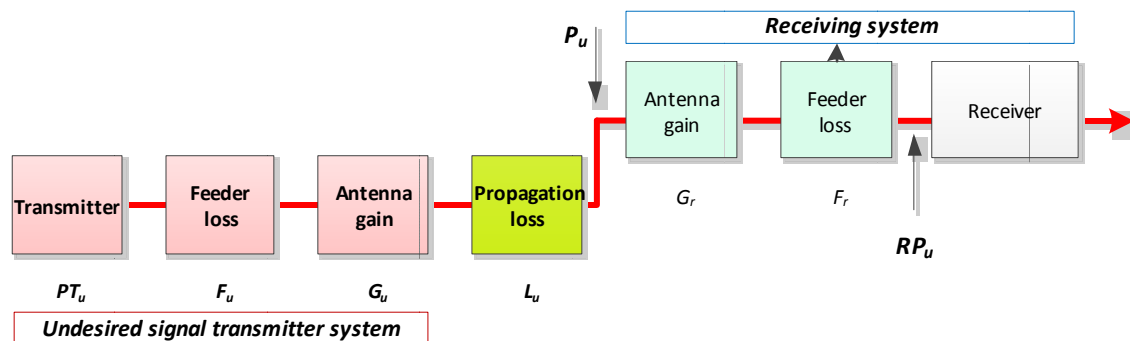


Figure 1-5 Schematic diagram of the undesired signal path

The received power at the input of the receiver antenna can be calculated by summing the various transmitter power, antenna gains and feeder losses as indicated in formula (3).

$$P_u = PT_u - F_u + G_u - L_u \quad (3)$$

where:-

- F_u : feeder loss for the undesired transmitter (dB)
- G_u : gain of the undesired antenna (dBi)
- L_u : propagation loss for the undesired signal (dB)
- PT_u : output power of the undesired transmitter (dBW)
- P_u : power of the undesired signal at the receiver antenna (dBm)

The propagation loss is calculated in accordance with the appropriate propagation model developed by the ITU. See section 1.3 on propagation modeling and using the propagation the model to calculate the path loss.

1.2.5 D/U ratio.

After having calculated (or used the relevant ICAO standard value) the values for the desired signal and the undesired signals at the receiver antenna, these signal levels, in order to protect the desired signal from harmful interference from the undesired signal need to comply with formula (4):

$$P_d - P_u = \frac{D}{U} \quad (4)$$

where:

- P_u**= power of the undesired signal at the receiver [detector] (dBW)
P_d= power of the desired signal at the receiver [detector] (dBW)
D/U: Protection ratio (dB) as required by Annex 10 or established through measurements

Note: if the compatibility analysis is for determining compatibility between an aeronautical system and a non-aeronautical system then a safety margin in the order of 6 – 10 dB should be added to the required D/U ratio.

1.2.6 The effect of the adjacent channel rejection

When the frequencies are offset (i.e. the frequency of the desired signal differs from that of the undesired signal) the adjacent channel characteristics of the desired receiver will attenuate the desired signal before it is being processed in the receiver. The factor with which these signals are attenuated is the Adjacent Channel Rejection (ACR). The ACR is either the ACR as specified by ICAO (typically for intra system compatibility) or the ACR obtained by measurements (typically for inter system compatibility).

The power **P_u** at the antenna, as calculated with formula (3) becomes for adjacent frequencies

$$P_u = P_{T_u} - F_u + G_u - L_u - ACR \quad (5)$$

1.2.7 D/U ratio at the receiver input

For both the desired signal and the undesired signal at the receiver antenna gain **G_r** and receiver feeder losses **F_r** are the same. Therefore the D/U ratio at the receiver antenna is the same as the D/U ratio at the receiver input.

1.3 Propagation modeling

1.3.1 Introduction

The ITU has developed a number of propagation models some of which are applicable to the study of the planning criteria for aeronautical systems and the protection of those systems from interference from other radio systems that are either sharing the frequency band or operating in adjacent frequency band.

The common propagation models used in aeronautical spectrum studies are described in sections 1.3.2-1.3.4 below and their applicability including the advantages and disadvantages are described in section 1.3.5.

1.3.2 Free – Space Propagation Model

The free space propagation model as defined in Recommendation ITU-R P.525 assumes an ideal propagation path where the transmitter and receiver antennas are considered isotropic antennas located in a perfectly

dielectric, homogeneous, isotropic and unlimited environment with no obstructions. The free space attenuation or propagation loss can be calculated with formula (5)

$$L_{bf} = 20 \log \frac{4\pi d}{\lambda} \quad (6)$$

where:

L_{bf} : free-space basic transmission loss (dB)
d : distance
λ : wavelength

Note that d and λ are expressed in the same unit.

The same formula can be re-written using the frequency instead of the wavelength:

$$L_{bf} = 32.4 + 20 \log f + 20 \log d \quad (7)$$

where:

f : frequency (MHz)
d : distance (km).

or

$$L_{bf} = 37.8 + 20 \log f + 20 \log d \quad (8)$$

where:

f : frequency (MHz)
d : distance (NM)

It should be noted that the propagation of radio waves, typical of VHF and UHF frequencies, is subject to a number of additional conditions, compared to the free space propagation. Refraction and ducting as described below as described below can extend the range over which this propagation model is applicable:

Refraction – Gradual changes in the refractive index of the atmosphere causes the bending of radio waves to bend slightly towards the Earth. The effect is that radio waves can propagate beyond the physical horizon to and can be received up to a distance which is commonly referred to as the radio horizon as shown in Figure 1-6. Along this path no other (significant) losses than the free space propagation loss between the transmitter and the receiver has to be considered. Variations in the refractive index of the atmosphere however cause the radio horizon to vary as well. The effect of refraction is corrected in radio propagation by calculation the distance to the radio horizon using a 4/3 Earth radius. The 4/3 Earth radius approximation has been derived based on a standard atmosphere at sea level and is therefore not universally applicable. However, it is very widely used and provides a good approximation to describe the effect of radio path propagation globally.

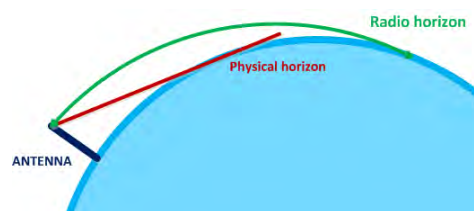


Figure 1-6 Radio Horizon versus physical horizon

Ducting – The change in refractive index is normally linear and gradual, but under certain atmospheric conditions a layer, of warm air may be trapped above cooler air, often over the surface of water. The result is that the refractive index will decrease far more rapidly with height than is usual. The rapid reduction in refractive index (and therefore dielectric constant) may cause complete bending down, as illustrated in the Figure 1-7. The unusual atmospheric condition traps the radio waves in a duct. Extreme bending of the radio waves between the top of the atmospheric duct and reflection of the radio waves from the surface of the Earth may propagate the radio waves over extreme long distances (e.g. more than 500 NM). Other phenomena such as sand storm may also cause ducting of radio waves.

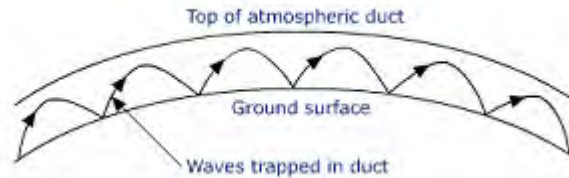


Figure 1-7 Propagation through ducting

Other unusual weather conditions (or other phenomena such as sand storms) can also cause ducting.

In aeronautical frequency assignment planning neither variations in the refractive index of the atmosphere (which causes variations in the distance to the radio horizon and effectively modify the 4/3 factor)) nor the effect of ducting is taken into account. In cases where these phenomena cause serious problems, consideration can be given to accommodate different criteria.

In the aeronautical standard propagation model free space propagation conditions are assumed when the transmitter and the receiver are within the distance to the radio horizon (line of (radio) sight).

The distance to the radio horizon (4/3 Earth radius) can be calculated using equation (9).

$$d_{RH} = 1.23(\sqrt{h_{TX}}) \quad (9)$$

where

d_{RH} : the distance of the station to the radio horizon (NM)
 h_{TX} : the height of the transmitter above the Earth's surface (feet)

Note: The same formula can be used to calculate the radio horizon of the receiver by substituting the height of the transmitter with the height of the receiver.

Applying this formula to both the transmitter and the receiver (e.g. between an airborne transmitter and an airborne receiver) formula (10) can be used for the calculation of the distance to the radio horizon between the transmitter and receiver.

$$d_{RH} = 1.23(\sqrt{h_{TX}} + \sqrt{h_{RX}}) \quad (10)$$

where

d_{RH} : the radio horizon separation distance between the transmitter and receiver (NM)
 h_{TX} : the height of the transmitter above the Earth's surface (feet)

h_{Rx} : the height of the receiver above the Earth's surface (feet)

1.3.3 Aeronautical propagation curves

Recommendation ITU-R P.528 "*Propagation curves for aeronautical mobile and radionavigation services using the VHF, UHF and SHF bands*" contains a method for predicting the transmission loss in the frequency range 125-15 500 MHz for aeronautical and satellite services. The method uses an interpolation method on basic transmission loss data from sets of curves. These sets of curves are valid for ground-air, ground-satellite, air-air, air-satellite, and satellite-satellite links. The only data needed for this method are the distance between antennas, the heights of the antennas above mean sea level, the frequency, and the time percentage. The curves of Recommendation ITU-R P.528 are contained in Appendix A. These curves are also available in a tabular format (spread sheet).

This Recommendation, also, gives the calculations for the expected protection ratio or wanted-to-unwanted signal ratio exceeded at the receiver for at least 95% of the time, R (0.95). This calculation requires the following additional data for both the wanted and unwanted signals: the transmitted power, the gain of transmitting antenna, and the gain of receiving antenna.

These propagation curves are based on empirical data of actual propagation losses for 5%, 50% and 95% time availability. Within the radio horizon these curves are consistent with free-space path loss and allows for an offset to account for the various time availability percentages. These curves were derived from the IF-77 model. The curves are also valid when the propagation path extends beyond the radio horizon and were used to determine the attenuation of radio signals beyond the radio horizon.

Aeronautical frequency assignment planning is based on the curves for 50% of the time. These give a good approximation of the free space propagation (until the radio horizon, beyond which the path losses as in paragraph 1.3.3.1 apply).

1.3.3.1 For propagation over the horizon and based on Recommendation ITU-R P.528 curves for 125 MHz, 1 200 MHz and 5 100MHz the following path losses expressed in dB per nautical mile (**a**) were established:

- in the band 108 – 137 MHz **a** is 0.5 dB/NM
- in the band 960 – 1215 MHz **a** is 1.6 dB/NM
- in the band 5030 – 5091 MHz **a** is 2.7 dB/NM

If the actual distance **d** between the transmitter and the receiver is less than the distance to the radio horizon, the free space transmission loss can be calculated with formula (**8**).

If the actual distance **d** between the transmitter and the receiver is greater than the distance to the radio horizon, (i.e. the receiver is **beyond** direct radio line of sight of the transmitter), the total transmission loss is the sum of the free space transmission loss for the distance to the radio horizon and the transmission loss for propagation beyond the radio horizon (e.g. 0.5 dB/NM for VHF frequencies as shown above. The total transmission loss can be calculated with formula (**11**).

$$L_{bf} = 37.8 + 20 \log(d) + 20 \log(f) + a \cdot (d - d_{RH}) \quad (11)$$

A Windows version of the IF 77 model is contained in the ICAO frequency assignment planning program FREQUENCY FINDER 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 loss. For the path beyond the radio horizon, as in formula (**11**) the transmission loss is calculated, depending

on the frequency range, as shown above in paragraph 1.3.3.1. Applying the IF-77 model may result in a more accurate prediction of the actual radio wave propagation characteristics.

1.3.4 Calculation of basic transmission loss when both the undesired transmitter and desired receiver are on the ground

1.3.4.1 In certain situations, both the undesired transmitter and the desired (victim) receiver can be located on the ground (e.g. the aircraft is on the surface of the airport and may interfere with a ground receiver station or a ground transmitter may interfere with an aircraft receiver). Applying in this case free space propagation loss will result in unrealistic low transmission losses when free space propagation is applied. More realistic models that should be applied in these cases is either the two-ray (or flat Earth model) or the Egli model.

1.3.4.2 Two ray or flat Earth model

To calculate the received power taking into account the effect of the ground, the two ray ground reflection model or flat Earth model can be applied and gives a more accurate prediction of the received power compared to the free space model with formula (12)

$$P_u = eirp_U + G_R - L_R - L_{pol} - 40 \log d + 20 \log H_T + 20 \log H_R \quad (12)$$

In this formula is:

- P_u = Received power (dBm) at the receiver input
- $eirp_U$ = e.i.r.p. of the undesired (interfering) transmitter, including antenna gain and cable losses
- d = distance (m) between (undesired) antenna and (desired) receiver
- H_T = transmitter antenna height (m)
- H_R = receiver antenna height (m)
- G_R = receiver antenna gain (dB)
- L_R = receiver cable losses (dB)
- L_{pol} = polarization discrimination (dB) (assumed to be 10 dB if direction of polarization differs 90°)

1.3.4.3 Egli model

The Egli model can be used to predict propagation losses taking into account the effect of the terrain, when both the transmitting and the receiving antenna are located relatively close to the ground. The Egli model offers a more accurate prediction of path loss compared to the free space model. The Egli model is based on measured path losses and converted into the following mathematical model and provides an alternative generic method to predict propagation losses when the antennas are close to the ground and includes an empirical frequency dependent correction for frequencies greater than 30 MHz:

The received power from an undesired (interfering) transmitter can be calculated with the formula (13):

$$P_u = eirp_U + G_R - L_R - L_{pol} - 40 \log d + 20 \log H_T + 20 \log H_R + 20 \log 40 - 20 \log f \quad (13)$$

In this formula is:

- P_u = Received power (dBm) at the receiver input
- $eirp_U$ = e.i.r.p. of the undesired (interfering) transmitter, including antenna gain and cable losses
- d = distance (m) between (undesired) antenna and (desired) receiver
- H_T = transmitter antenna height (m)
- H_R = receiver antenna height (m)
- G_R = receiver antenna gain (dB)
- L_R = receiver cable losses (dB)
- L_{pol} = polarization discrimination (dB) (assumed to be 10 dB if direction of polarization differs 90°)
- f = frequency (MHz)

1.4 Net filter discrimination (placeholder)

(to be added)

Chapter 2. Aeronautical VHF air-ground radio communication systems operating in the band 117.975 – 137 MHz

2.1 Introduction

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 and for air-ground and air-air data link communications. The use of this band is regulated by the ITU through the ITU Radio Regulations and relevant ITU-R Recommendations and Reports. Details on these Regulations can be found in Volume I of this Handbook. Specific provisions pertaining to the aeronautical use of this band is in the relevant ICAO SARPs in Annex 10, Volumes III and V. This chapter contains technical and operational material on the assignment and use of frequencies in the band 117.975 – 137 MHz. Material on the use of the band 108 – 117.975 MHz by the aeronautical mobile (R) service (GBAS/VDB and VDL Mode 4) is in Chapter 3 of this Handbook on VHF/UHF navigation systems (ILS, VOR, GBAS/VDB, VDL Mode 4, DME; *in preparation*).

Note: The use of the allocation to the aeronautical mobile (R) service in the band 108 – 117.975 by aviation is subject to the conditions as contained in ITU Resolution 413 (WRC-12).

2.1.1 ICAO documents relevant to frequency assignment planning in the band 117.975-137 MHz

- a. Annex 10 Volume III (*Communication systems*),
 - i. Part I (Digital data communication systems) – Chapter 6 – *VHF air-ground digital link*
 - ii. Part II (Voice communication systems) – Chapter 2 – *Aeronautical Mobile Service*
- b. Annex 10 Volume V, Chapter 4 – *Utilization of frequencies above 30 MHz* and Attachment A - *Considerations affecting the deployment of VHF communication frequencies*
- c. 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 interfering transmissions can be generated on the desired (operational) frequency (co-frequency interference) or on frequencies adjacent to the desired frequency (adjacent frequency interference). The general model (as described in Chapter 1) which is used to establish separation distances between co-frequency and adjacent frequency assignments is illustrated in Figures 2-1 and 2-2.

2.2.1.2 The protection of communications from harmful interference requires that, in general, a signal from a desired RF source that is received will not receive simultaneously a signal from another (undesired) RF source that can cause harmful interference to the proper reception and processing of the desired signal. This is achieved by securing that in the frequency assignment planning process the undesired RF source is separated in distance (in case both sources operate on the same frequency) from the (desired) receiver or, when operating on adjacent frequencies, is sufficiently separated in frequency and distance. The distance separation (or the frequency/distance separation) needs to be sufficient to bring the undesired signal level at the desired receiver to a value below which the interference, if any, is no longer harmful and the receiving system performance requirements are met..

2.2.2 Interference model for aeronautical frequency assignment planning

2.2.2.1 The model used for establishing (co-frequency) separation distances in aeronautical frequency assignment planning for systems used in the band 117.975 – 137 MHz for VHF air-ground communications, based on the general method in Chapter 1 and is illustrated in Figures 2-1 and 2-2. This model assesses interference at the antenna input (signals in space). Specifications for aeronautical systems as established by ICAO also refer to signals in space.

2.2.2.2 RF emissions that are co-frequency (or adjacent frequency) to the actual operating frequency of facility **A** in Figure 2-1 (e.g. emissions from aircraft “**b**” in Figure 1-2) may interfere with communications within the designated operational coverage of the desired station/service (area **A** in Figure 2-1). Frequency assignment planning for both the facilities **A** and **B** in Figure 2-1 needs to secure that no harmful interference is caused between the station operating within the designated operational coverage of facility **A** and of facility **B**. This is achieved by securing sufficient geographical separation between the facilities.

Note: Within the designated operational coverage of a single frequency, all aircraft (and the ground station) operate as a “party line” where multiple users are using the same frequency.

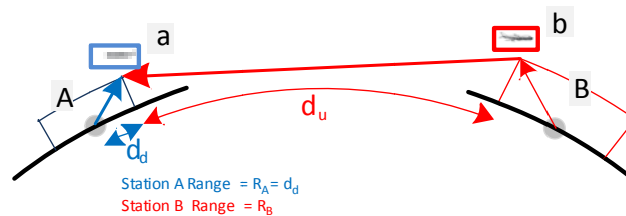


Figure 2-1 Model for establishing separation distances

2.2.2.3 For air/ground communications, the protection of the desired aircraft receiver (which is communicating with a ground station) from harmful interference caused by transmissions on another aircraft (operating on the same or an adjacent frequency) is normally the most constraining factor in securing the use of these frequencies free from harmful interference. This model is illustrated in Figure 2-1; the schematic diagram of this model is in Figure 2-2.

2.2.2.4 In Figure 2-1, aircraft station “**a**” that is receiving signals from the (desired) ground station “**A**” can be interfered by transmissions from aircraft station “**b**” (or any other undesired RF source). The separation distance between aircraft station “**a**” and aircraft station “**b**” needs to secure that the level of the (undesired) signals received by aircraft “**a**” from aircraft “**b**” are sufficiently below the level of the signals received from ground station “**A**” to prevent harmful interference. The signal ratio necessary to protect the desired signal from harmful interference from the undesired signal is the protection ratio (D/U).

*Note: in case ground station “**B**” (or both ground stations “**A**” and “**B**”) is an aeronautical broadcast station (e.g. VOLMET) a different geometry as shown in Figure 2-1 applies. This is further described in paragraphs 2.7.2.2 and 2.7.2.3.*

2.2.2.5 The signal level of the desired and the undesired signal at the aircraft antenna can be calculated with the method as illustrated in Figure 2-2.

The level of the desired and of the undesired signal at the (desired) antenna input can be calculated with formulas (14) and (15) as shown in Chapter 1, paragraphs 1.2.3 and 1.2.4.

The level of the desired signal at the antenna is:

$$P_d = PT_d - F_d + G_d - L_d \quad (14)$$

The level of the undesired signal at the antenna input is:

$$P_u = PT_u - F_u + G_u - L_u \quad (15)$$

Formula (4) in Chapter 1, paragraph 1.2.5 shows that $P_d - P_u = \frac{D}{U}$

Note: for both the desired signal and the undesired signal, the antenna gain and the feeder losses of the receiving station are the same when the frequency of both signals is the same (co-frequency) or when both transmitters operate on the (first) adjacent frequency (25 kHz). The ratio of the desired to the undesired signal at the antenna is therefore the same as at the receiver input.

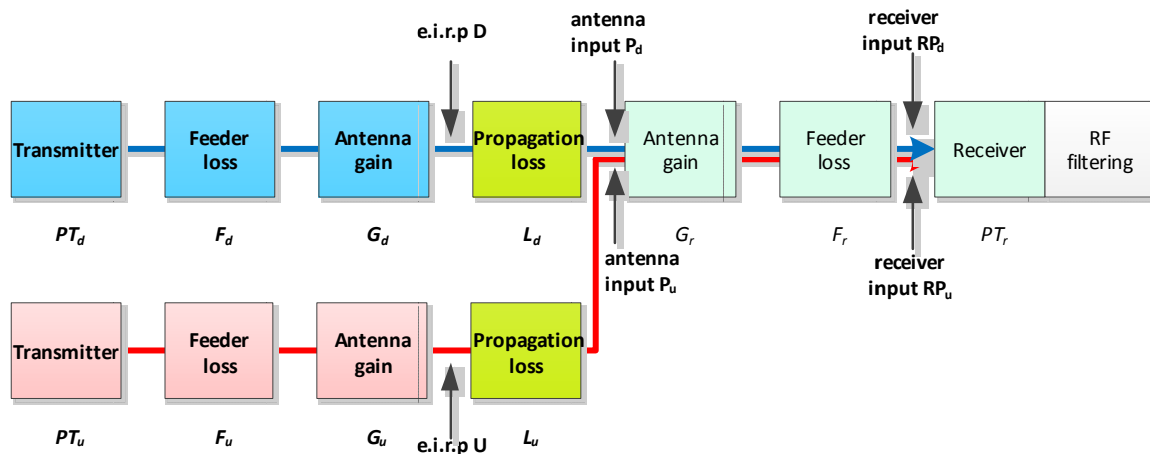


Figure 2-2 Desired signal and undesired signal path to desired (victim) receiver

In formula (14) L_d is the free space propagation loss for the designated operational range (DOR) of the desired facility (A in Figure 2-1) and can be calculated with formula (8) in Chapter 1, paragraph 1.3.2:

$$L_d = 37.8 + 20 \log f + 20 \log d_{DOR}$$

In formula (15) L_u is the separation distance between the undesired RF source (aircraft “b” in Figure 2-1 and the desired receiver (aircraft “a” in Figure 2-1) and can be calculated as follows:

$$L_u = 37.8 + 20 \log f + 20 \log d_{SEPDIST}$$

$$\frac{D}{U} = P_d - P_u = e.i.r.p D - L_d - (e.i.r.p U - L_u) = e.i.r.p D - e.i.r.p U - 20 \log d_{DOR} + 20 \log d_{SEPDIST} .$$

From this formula, the free space separation distance between the desired receiver and the undesired transmitter can be calculated. This separation distance presents the minimum free space separation between the desired receiver and the undesired transmitter.

2.2.3 Separation-distance ratio method

In case the e.i.r.p of both the desired transmitter (A in Figure 2-1) and the undesired RF source (“b” in Figure 2-1) are the same, the (required) D/U can be expressed as the ratio between $d_{SEPDIST}$ and d_{DOR} in the formula above

For the desired signal at the receiver antenna: $P_d = e.i.r.p - L_d$

For the undesired signal at the receiver antenna: $P_u = e.i.r.p - L_u$

Note: equal e.i.r.p. for ground and aircraft transmitter is normally assumed in frequency assignment planning for aeronautical air/ground communication systems. The e.i.r.p includes the transmitter output power and the effect of cable losses and antenna gain. Tables 2-1 and 2-2 in paragraph 2.3.2 provide typical values normally used in compatibility analyses)

The desired to undesired signal ratio (D/U) equals $P_d - P_u$ (formula (4) in Chapter 1); P_d and P_u are expressed in dBm).

$$\frac{D}{U} = e.i.r.p - L_d + G_r - F_r - (e.i.r.p - L_u + G_r - F_r) = L_u - L_d$$

L_d and L_u are respectively the propagation losses along the radio path from the desired transmitter and from the undesired transmitter to the receiver and is based on free space propagation conditions. L_d is the designated operational range of the desired facility. The free space propagation model is documented in paragraph 1.3.2 in Chapter 1. In case the separation between the desired receiver and the undesired transmitter is larger than the radio horizon of each station, the effect of the propagation beyond the radio horizon needs to be considered. The effect of beyond-the-radio horizon propagation is described in paragraph 1.3.3 in Chapter 1 and paragraph 2.2.5 in this Chapter. The free space propagation loss is calculated using formula (8) in Chapter 1, paragraph 1.3.2 as follows:

$$L_d = 37.8 + 20 \log f + 20 \log d_d$$

and

$$L_u = 37.8 + 20 \log f + 20 \log d_u$$

which brings

$$\frac{D}{U} = L_u - L_d = 37.8 + 20 \log f + 20 \log d_u - (37.8 + 20 \log f + 20 \log d_d) = 20 \log d_u - 20 \log d_d = 20 \log \frac{d_u}{d_d} \quad (16)$$

Formula (16) demonstrates that the desired to undesired (D/U) signal ratio can be expressed as the ratio between the distance from the receiver to the undesired transmitter and the distance to the desired transmitter under free space propagation conditions.

2.2.3.1 For aeronautical VHF air/ground voice communication systems, ICAO SARPs specify that the D/U protection ratio for air/ground voice communication systems is 20 dB (signals in space). In areas with frequency congestion, a D/U protection ratio of 14 dB may be used.

Substituting in formula (16) $D/U = 20$ gives a separation distance ratio (d_u/d_d) of 10. In case (in free space) the distance from the receiver to the undesired transmitter is **10 times** larger than the distance to the desired transmitter (when both the desired and the undesired transmitter radiate with the same e.i.r.p.), the signal ratio of the desired signal to the undesired signal is 20 dB.

Substituting in formula (16) $D/U = 14$, gives a separation distance ratio (d_u/d_d) of 5. In case (in free space) the distance from the receiver to the undesired transmitter is **5 times** larger than the distance to the desired transmitter (when both the desired and the undesired transmitter radiate with the same e.i.r.p.), the signal ratio of the desired signal to the undesired signal is 14 dB.

Note: free space propagation conditions only apply when the transmitter and the receiver are within radio line-of-sight of each other (within the radio horizon). The separation distance ratio (d_u/d_d) assumes equal e.i.r.p. of both the desired and the undesired transmitter station. See section 2.3.1 for the application of the D/U ratio of 20 dB or of 14 dB.

2.2.3.2 The interference model described paragraph 2.2.2 and the distance ratio method in paragraph 2.2.3 calculate (directly or indirectly) the desired signal level at the receiver antenna (or the receiver input). This

model takes into account that when the distance between the desired transmitter and receiver is decreased, the actual signal strength at the receiver increases and, while meeting the required D/U criteria, the distance from the undesired (interfering) transmitter to the receiver may be decreased.

Note: The minimum signal level method, described in paragraph 2.2.4, is based on the protection of the minimum field strength throughout the designated operational coverage of the desired service. The frequency assignment planning constraints in this case are more restrictive.

2.2.3.3 Adjacent channel separation distance ratios can also be calculated using this method. When calculation the adjacent channel separation, formula 21 calculates:

$$\frac{D}{U} = L_u - L_d$$

For adjacent channel calculations, taking into account the adjacent channel rejection ACR, this formula can be re-written into

$$\begin{aligned}\frac{D}{U} &= (L'_u + ACR) - L_d \\ \frac{D}{U} = L_u - L_d &= (L'_u + ACR) - L_d = (20 \log d'_u + ACR) - 20 \log d_d \\ \frac{D}{U} - ACR &= 20 \log d'_u - 20 \log d_d = 20 \log \frac{d'_u}{d_d}; \\ \frac{d'_u}{d_d} &= 10^{(D/U - ACR)/20}\end{aligned}$$

Note: d'_u is the distance from the undesired transmitter to the receiver.

The D/U ratio to be used in (normally 20 dB) depends on the regionally agreed frequency assignment planning criteria.

The minimum geographical separation distance between facilities operating on the first adjacent channel (either 25 kHz or 8.33 kHz) is normally 10 NM. This implies that designated operational coverage areas where adjacent channels are in use need to be separated by at least 10 NM.

For a mixed environment where both 8.33 kHz and 25 kHz channels are being used, different adjacent channel criteria apply (see paragraph 2.7.4). The method in paragraph 2.2.3 below is recommended for determining adjacent channel separation.

The distance-ratio method cannot be used for determining geographical separation distances for area services (e.g. ACC, FIR) or for cases where the transmitter is located well outside the center of (or even outside) a circular service area.

2.2.4 Minimum signal level method

2.2.4.1 Annex 10 (Volume III) has established minimum field strength levels (signal in space) for the air/ground communication systems that can operate in the frequency band 112 – 137 MHz. Protection of aeronautical VHF air/ground communication systems is typically based on the principle that the minimum desired signal is not subject to harmful interference when the interfering (undesired) signal is 20 dB or more (or 14 dB, as required) below the specified minimum field strength (of the desired signal), in accordance with the provisions in Annex 10. ICAO has specified in Annex 10 (Volume II) that the minimum field strength for VHF COM air/ground voice communication systems should be 75 µV/m throughout the designated operational coverage. (Re. Annex 10, Volume III, Part II, paragraph 2.2.1.2); the desired to undesired (D/U) ratio is either 20 dB or, where applicable, 14 dB

Note: These field strength levels, together with other relevant data such as typical values for ground and airborne transmitter power, are reproduced in Tables 2 – 1 and 2 – 2 (see paragraph 2.3.2 below).

When protecting only the minimum specified field strength level (which, from the frequency assignment protection point of view is the safest method), the method used for establishing co-frequency separation distances does not take into account the radiated energy of the desired transmitter but requires that the minimum specified RF signal throughout the designated operational coverage area is protected. Generally, this method provides for better protection compared to the distance-ratio method described in paragraph 2.2.2 since it takes into account that the VHF COM antenna does not radiate in all directions the same energy (the VHF COM antenna is not an isotropic radiator). See also paragraph 2.2.4.3 below.

2.2.4.2 The minimum signal level method is described in paragraph 1.2.2.1.2 in Chapter 1, Figure 1-2. This method is illustrated in Figures 2-3 and 2-5. In this method, protection of the desired signal from harmful interference requires that a signal from an undesired source (e.g. aircraft “b” in Figure 2-3) at the desired receiver is sufficiently below the minimum signal level (75 $\mu\text{V/m}$) of the desired signal (and NOT the actual signal level as calculated in paragraph 2.2.2 and 2.2.3).

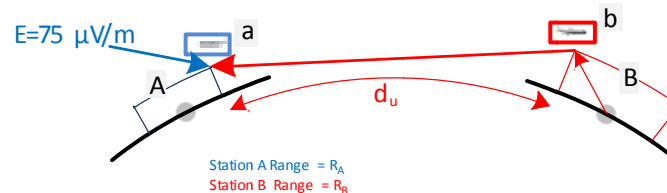


Figure 2-3 Model for establishing separation distances when minimum field strength is specified

This model also applies to calculating separation distances when the desired receiver and the undesired transmitter are operating on adjacent frequencies. Due to the effect of RF selectivity of the desired receiver, the minimum separation distance in this case is smaller than when they are operating on the same frequency. The undesired (interfering) station can be an aircraft station or a ground station.

2.2.4.3 Effect of the vertical polar diagram of VHF COM antennas

2.2.4.3.1 The minimum signal level method takes into account the structure of the vertical polar antenna diagram for the VHF COM antenna which is not radiating in all directions with the same energy, as is shown in Figure 2-4 and in areas between the lobes, radiates less energy.

It the system design for VHF COM systems should secure that for the ground station the conditions of Annex 10 (which specify the minimum field strength) are met. Since the alternative (or simplified) model does not take into account the actual e.i.r.p. of the desired ground station (transmitter), no separation distance ratio criterion as described in paragraph 2.2.2.4 can be developed.

2.2.4.3.2 The minimum signal level method is recommended for use in particular when compatibility with dissimilar systems (e.g. VHF COM voice and VDL) has to be established.

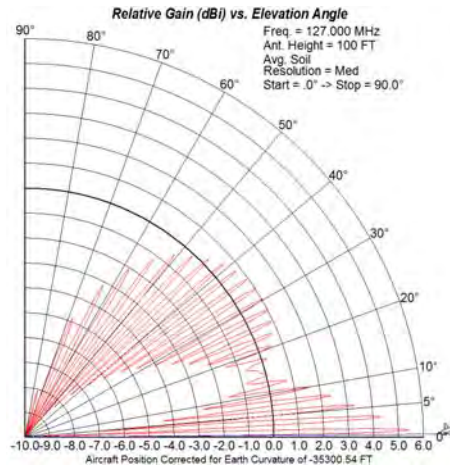


Figure 2-4 Vertical polar diagram of antenna 30 m above ground level

2.2.4.4 The minimum signal level method requires that the signal level of the undesired (interfering) signal be calculated at the antenna of the receiver. The desired signal level is 75 $\mu\text{V/m}$. The D/U ratio($P_d - P_u$ (dBm)) is 20 (14) dB. The analysis below describes this method which is illustrated in the schematic diagram in Figure 2-5.

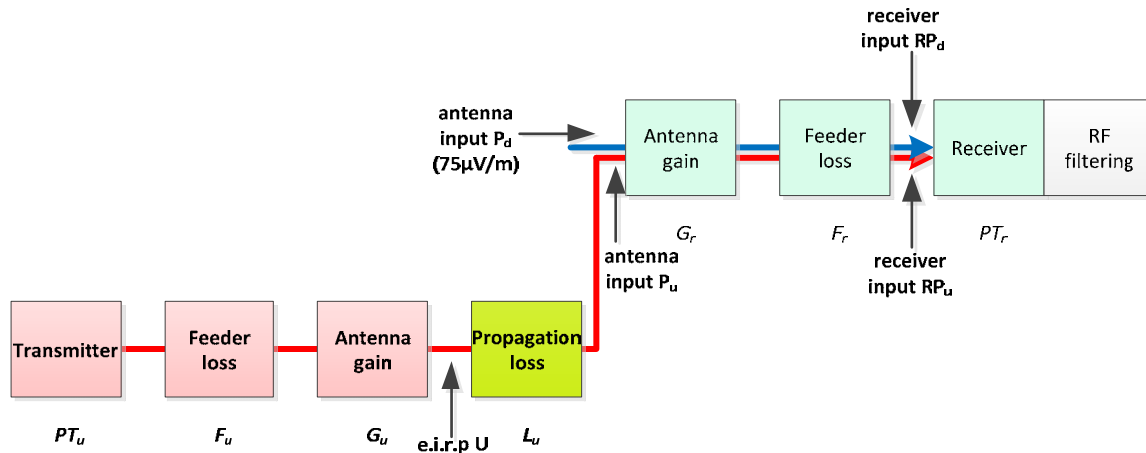


Figure 2-5 Minimum desired signal at antenna and undesired signal path to desired (victim) receiver antenna

2.2.4.5 The (desired) signal level (P_d) at the antenna is 75 $\mu\text{V/m}$ (-82 dBm). The level of the undesired signal (P_u) (from aircraft "b" in Figure 2-3) is calculated formula 21 in paragraph 2.2.2.3.

$$P_d = 75 \mu\text{V/m} = -82 \text{ dBm} \text{ (at the receiver antenna)}$$

$$P_u = P_{T_u} - F_u + G_u - L_u \text{ (at the receiver antenna; } P_u \text{ is for most transmitters typical 25 W)}$$

For $P_u = 25 \text{ W}$ (44 dBm), $F_u = 3\text{ dB}$ and $G_r = 0 \text{ dB}$,

$$P_u = 44 - 3 + 0 - L_u = (41 - L_u) \text{ dBm}$$

$$\frac{D}{U} = 20 \text{ dB} = P_d - P_u = -82 \text{ dBm} - 41 \text{ dBm} + L_u = -123 \text{ dBm} + L_u$$

$$L_u = 143 \text{ dB}$$

2.2.4.6 In this scenario ($D/U = 20$ dB), and assuming a typical transmitter power for the undesired aircraft transmitter of 25 W, the minimum separation distance between the desired receiver and the undesired (aircraft) transmitter needs to secure that the transmission losses over the radio path are 143 dB.

Formula (8) in Chapter 1, paragraph 1.3.2 calculates that for a free space transmission loss of 143 dB ($f = 127$ MHz) a (free space) distance of 1428 NM is required. This distance is greater than the distance to the radio horizon for aircraft at an altitude of 45000 ft. The effect of the radio horizon is described in paragraph 2.2.5. Calculations for establishing the minimum separation distance between facilities are in section 2.7.

2.2.4.7 In case the protection ration is 14 dB (see Section 2.3.1), the required free space transmission loss is calculated as follows:

$$\frac{D}{U} = 14 \text{ dB} = P_d - P_u = -82 \text{ dBm} - 41 \text{ dBm} + L_u = -123 \text{ dBm} + L_u$$

$$L_u = 137 \text{ dB}$$

Formula (8) in Chapter 1, paragraph 1.3.2 calculates that for a free space transmission loss ($f = 127$ MHz) a (free space) separation distance of 718 NM is required. This distance is greater than the distance to the radio horizon for aircraft at a maximum altitude of 45000 ft. The effect of the radio horizon is described in paragraph 2.2.5. Calculations for establishing the minimum separation distance between facilities are in section 2.7.

Note: When applying the minimum signal level method as described in this section, the application of a D/U of 14 dB or 20 dB has no (or a limited) effect on the minimum separation distance with a co-frequency interfering station since in both cases the free space separation distance that is required to secure protection of the desired signal from harmful interference is more than the sum of the distances to the radio horizon of the respective facilities.

2.2.4.8 The minimum signal level method as described in paragraph 2.2.4.5 can also be used to calculate the adjacent channel separation distance as follows:

$$P_d = 75 \mu\text{V/m} = -82 \text{ dBm} \text{ (at the receiver antenna)}$$

$$P_u = PT_u - F_u + G_u - (L'_u + ACR) \text{ (at the receiver antenna)}$$

Where the total transmission loss for the undesired signal $L_u = L'_u + ACR$

(ACR is +60 dB for the first adjacent channel)

For $P_u = 25$ W (44 dBm), $F_u = 3$ dB and $G_r = 0$ dB,

$$P_u = 44 - 3 + 0 - L'_u - ACR = 41 - L'_u - ACR \text{ (dBm)}$$

$$\frac{D}{U} = 20 \text{ dB} = P_d - P_u = -82 \text{ dBm} - 41 \text{ dBm} + L'_u + ACR = -123 + L'_u + ACR \text{ (dB)}$$

$$L'_u = 123 + \frac{D}{U} - ACR \text{ (for the values of } P_d \text{ and } P_u \text{ above)}$$

If ACR =60 dB (first adjacent channel rejection), $L_u = 63 + \frac{D}{U}$

$$L'_u = 37.8 + 20 \log f + 20 \log d_u = 83 \text{ (dB)}$$

For $f=127$ MHz and $D/U=20$ DB $L'_u = 1.4$ NM

Note: To protect the receiver to the muting threshold ($5 \mu\text{V/m}$ or $P_d = -105.6$ dBm) a minimum separation distance of 21 NM would be required.

The minimum geographical separation distance between facilities operating on the first adjacent channel (either 25 kHz or 8.33 kHz) is normally 10 NM. This implies that designated operational coverage areas where adjacent channels are in use need to be separated by at least 10 NM.

For a mixed environment where both 8.33 kHz and 25 kHz channels are being used, different adjacent channel criteria apply (see paragraph 2.7.4).

Editorial note: The EUR FMG has developed provisions for the calculation of adjacent channel geographical separation for 8.33 kHz and 25 kHz facilities operating in a mixed environment. Additional material will be inserted in this paragraph clarifying these provisions. Temporary, the adjacent channel criteria developed by the EUR FMG have been inserted in paragraph 2.8

2.2.5 The effect of the radio horizon

2.2.5.1 The effect of the radio horizon on the (radio) path loss is shown in Figure 2-6

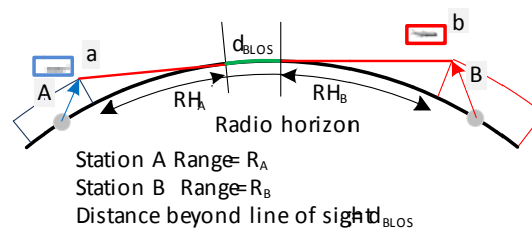


Figure 2-6 Propagation path greater than radio line of sight

In cases where minimum required *free space* separation distance between the receiver and the undesired (interfering) transmitter, as calculated with the methods in paragraph 2.2.3 or 2.2.4, is greater than the sum of the distance to the radio horizon, the calculation of the total separation distance needs to include the conditions applicable to the “over the horizon” propagation. The radio signals over the horizon are attenuated at a much faster rate per nautical mile compared to free space propagation. This is shown in the ITU propagation curves in Appendix A. For VHF frequencies, the attenuation beyond the radio horizon is 0.5 dB/NM. (See Chapter 1, paragraph 1.3.3.1).

In the example given in Figure 2-6, the total free space loss (propagation loss) between aircraft stations “a” and “b” is equal to sum of the free space attenuation of the path ($RH_A + RH_B$) to which the attenuation d_{BLOS} needs to be added.

With formula 11 in Chapter 1, the total path loss between aircraft stations “a” and “b” as shown in Figure 2-3 can be calculated as follows:

$$L_{bf} = 37.8 + 20 \log(RH_A + RH_B) + 20 \log(f) + 0.5(d_{BLOS})$$

In this formula RH_A , RH_B and d_{BLOS} are expressed in NM; f is expressed in MHz. RH_A and RH_B can be calculated with formula (9) in Chapter 1.

2.2.6 Protection based on line-of sight separation

2.2.6.1 When the minimum required separation between the designated operational coverage of facilities operating on the same frequency is larger than the sum of the distance to the radio horizon of each facility (to obtain the required D/U ratio (20 dB or 14 dB)) at the edge of coverage (maximum range and maximum height), the frequency assignment planning criteria for co-frequency assignment planning as contained in Annex 10 Volume V requires that the designated operational coverage areas for each facility are separated by no more than the sum of the distances to the radio horizon (see paragraph 2.3.1.2 and Appendix E)

This implies that when the separation distance is indeed determined by the sum of the distance to the radio horizon of the respective facilities, the required D/U protection ratio is not met in a small area at the closest points between the two designated operational coverage areas. It is however recognized that it is highly unlikely that two aircraft will be at the closest point at edge of each designated operational coverage area at the same time. The size of the small area depends on the dimensions of the designated operational coverage of the two facilities.

2.2.6.2 In some specific cases however, as described in paragraph 2.7, the effect of propagation beyond the radio horizon has to be considered when establishing geographical separation distances.

Note: The calculation of minimum separation distances for various air/ground communication services is described in paragraphs 2.7 and 2.8.

2.3 Frequency assignment planning criteria

Note: This section describes the frequency assignment planning criteria for VHF air/ground voice communication systems. Frequency assignment planning criteria for the VHF air/ground data link (VDL Mode 2 and VDL Mode 4) are in section 2.9

2.3.1 General planning criteria

2.3.1.1 Provisions concerning the deployment of VHF frequencies and the avoidance of harmful interference are contained in Annex 10, Volume V, Chapter 4, section 4.1.5. (Amendment 86) For the ease of reference, these provisions are reproduced in Appendix E. The latest amendments to Annex 10 should be consulted in case additional amendments were introduced.

2.3.1.2 For co-frequency assignments the minimum geographical separation between facilities shall be such that the designated operational coverage of each facility is separated by a distance not less than:

- i. required to provide a D/U ratio of 20 dB;**
or
- ii. the sum of the distance to the radio horizon of the designated operational coverage area of each facility.**

Alternatively, in areas where the frequency congestion is severe, a protection ratio of 14 dB can be used on the basis of a Regional air navigation agreement

Notes:

- i. facilities using a common frequency do not require frequency protection between each other (e.g. Extended Range facilities)*
- ii. the distance to the radio horizon is calculated as shown in Chapter 1, paragraph 1.3.2 with the formula*

$$d_{RH} = 1.23(\sqrt{h})$$

where

d_{RH} = the distance of the station to the radio horizon (NM)

h = the height of the transmitter or receiver above the Earth's surface (feet)

- iii. the application of the minimum separation distance based on the sum of the radio horizon distance of each facility assumes that it is highly unlikely that two aircraft will be at the closest points between and at the maximum altitude of the frequency protected service volume of each facility*

- iv. details on the calculation of separation distances are in paragraph 2.7. Paragraph 2.8 contains separation distances for the uniform designated operational coverage for aeronautical services as identified in paragraph 2.6.
- v. the separation distance shall be calculated for aircraft operating at the maximum range and maximum height of the designated operational coverage.
- vi. in cases where broadcast services (VOMET) are involved, the minimum geographical separation distance required to obtain a protection ratio D/U of 20 dB is established relative to the ground broadcast transmitter.

2.3.1.3 For adjacent frequency assignments, the minimum geographical separation between facilities shall be such that points at the edge of the designated operational coverage of each facility are separated by a distance sufficient to ensure operations free from harmful interference.

Notes:

- i. the edge of the designated operational coverage is at the maximum range and maximum height.
- ii. for facilities operating with 25 kHz or 8.33 kHz channel spacing, the adjacent channel separation of 10 NM has been established.
- iii. protection is based on an Adjacent Channel Rejection (ACR) of 60 dB with the first assignable 25 kHz or 8.33 kHz channel.
- iv. In a mixed environment, where both 25 kHz and 8.33 kHz channel spacing is deployed, the adjacent channel separation as shown in Table 2-6 is to be applied when making frequency assignments

2.3.2 Typical signal parameters

2.3.2.1 Table 2 – 1 contains typical values for ground and airborne transmitter power that can be used in a detailed compatibility 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 2-1 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	Airborne	Ground	Airborne	Ground	Airborne	Ground	Airborne	Ground
Min signal at receiver antenna Annex 10, Vol. III	75 µV/m (-82 dBm)	20 µV/m (-93 dBm)	75 µV/m (-82 dBm)	20 µV/m (-93 dBm)	75 µV/m (-82 dBm)	20 µV/m (-93 dBm)	75 µV/m (-82 dBm)	35 µV/m (-88 dBm)
	part II	part II	part I	part I	part I	part I	part I	part I
	2.2.1.2	2.3.1.2	6.2.2.	6.3.2	6.2.2.	6.3.2	6.9.5.1.1.2	6.9.5.1.1.1

Parameter	DSB-AM	DSB-AM	VDL-M2	VDL-M2	VDL-M3	VDL-M3	VDL-M4	VDL-M4
RECEIVER	Airborne	Ground	Airborne	Ground	Airborne	Ground	Airborne	Ground
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	-85 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 2-2 Typical values for various parameters for VHF communication systems (receiver)

Conversion from input power (dBm) to field strength (μV/m and v.v.) was with the following formula:

$$P_r = E - 20 \log f - 167.2 \quad (17)$$

where:

P_r is isotropically received power (dB(W))

E is the electric field strength (dB(μV/m) and

f is the frequency (GHz) (ITU-R Recommendation P.525-2 refers).

This formula can be re-written into:

$$10 \log P_r = 20 \log E - 20 \log f - 77.2 \quad (18)$$

where:

P_r is the signal at receiver antenna (in space) in mW,

E is the field strength at the antenna in μV/m

F is the frequency f in MHz.

[dB(μV/m) = 20log(μV/m)]

10 log P_r is expressed in dBm (power relative to 1 milliwatt)

2.4 Allotment of the frequency band 117.975 – 137 MHz

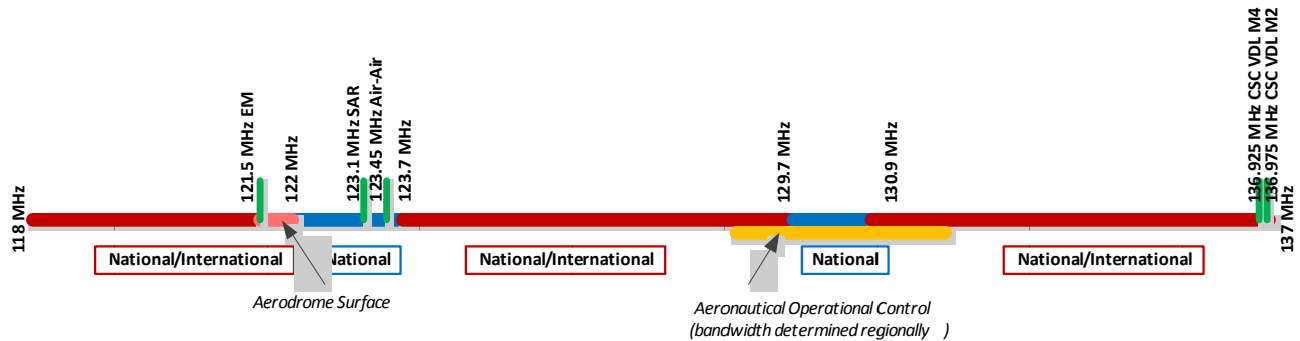
2.4.1 Special frequencies

2.4.1.1 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. Specific allotments to services are to be determined regionally. Appendices C and D contain these regionally agreed allotment plans. In practice, not much consideration is given to the allotments for national / international use.

Note:

Frequency assignments for international use are those that are required as per regional Air Navigation Plan. These frequencies are identified with "ICAO" in the frequency assignment plan. Other frequencies are for national use and are identified as "NAT" in the frequency assignment plan.

Annex 10, Volume V includes provisions for the use of specific frequencies as follows:



Frequency (MHz)	Usage	Comments	Annex 10, Volume V
121.500	Aeronautical emergency frequency	Guard band* 121.450 – 121.550 MHz	4.1.3.1
121.550 – 122.917	Aerodrome surface communications		-
123.100	Auxiliary frequency (SAR)	Guard band* 123.050 – 123.150 MHz	4.1.4.3
123.450	Air-to-air communications	Outside range of VHF stations	4.1.4.2
128.825 – 132.025	Aeronautical Operational Control	Range to be determined Regionally**	(Rec.) 4.1.8.1.3
136.925	Common signaling channel	Reserved for VDL Mode 4	4.1.3.3.2
136.975	Common signaling channel	Reserved for VDL Mode 2	4.1.3.3.1
136.500 – 136.975	Only for frequency assignments with 25 kHz channel spacing		4.1.8.8.1, Note 1
* the frequencies 121.450 MHz, 121.550 MHz, 123.050 MHz and 123.150 MHz are assignable frequencies			
** regional allotment plans have determined the actual band for aeronautical operational control communications			

Table 2-3 Frequency allotment and special frequencies

2.4.1.2 Regional allotment plans provide for the use of the frequency band 136 – 137 MHz by VDL (VDL Mode 2 and VDL Mode 4). In Europe the frequency band 136.700 – 137.000 MHz is reserved for VDL.

2.4.2 Regional allotment plans

2.4.2.1 In addition to the general allotment plan in Annex 10, 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. Appendices C and D contain a detailed overview of these allotment plans.

2.4.2.2 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 the relevant 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.

2.4.2.3 Regional allotment plans provide for the use of the frequency band 136 – 137 MHz by VDL (VDL Mode 2 and VDL Mode 4). In Europe the frequency band 136.700 – 137.000 MHz is reserved for VDL.

2.5 Frequency separation and channeling

2.5.1 Frequency separation between VHF COM channels

2.5.1.1 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 4.1.2.2.) This provision recognizes that in Regions or areas where 25 KHz channel spacing provides for an adequate number of frequency assignments to meet national and international requirements equipment designed for 25 kHz channel spacing will continue to be used and continue to be protected. The introduction of 8.33 kHz channel spacing in Regions or areas requires a Regional air navigation agreement for the mandatory carriage of equipment designed for 8.33 kHz channel spacing.

2.5.1.2 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 that may be still in operational use is not always be protected from harmful interference that can be caused by stations operating on adjacent 25 kHz or 8.33 kHz frequencies.

2.5.2 Protection of 25 kHz frequency assignments from 8.33 kHz assignments

2.5.2.1 In Regions that continue operation of communication equipment designed for 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, both within the same Region as well as in adjacent Regions (see Annex 10, Volume V, paragraph 4.1.2.3, note and 4.1.8.1, note 2).

2.5.3 Channeling

2.5.3.1 Normally, in aviation (e.g. in radio telephony) the frequency in use is identified by the actual frequency. For the use of 8.33 kHz frequencies, the frequency identification for 8.33 kHz frequencies is replaced with a channel identification that is using a number (similar to the identification of a frequency) which is mapped to the actual frequency in use. The channel/frequency identification to be used for identifying frequencies with a channel spacing of 8.33 kHz is as shown in Table 2 – 4.

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 2-4 Channeling / frequency pairing for frequencies with 25 kHz and 8.33 kHz separation

2.6 Services and designated operational coverage

2.6.1 Services

2.6.1.1 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
EM Emergency
SAR Search and rescue

2.6.2 Coordination of special frequencies

2.6.2.1 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. The provisions in Annex 10 include a guard band for these frequencies to prevent adjacent channel interference. 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 out of the coverage of VHF ground stations.

2.6.3 Table of uniform values for designated operational coverage (DOC)

2.6.3.1 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 – 4.

Service	Designated Operational Coverage (DOC)		Comments	Mode
	Range (NM)	Height (ft)		
Aerodrome				
TWR	25	4000	Height above ground	A/G
TWR/L	16	3000	Height above ground; only in EUR	
PAR	25	4000	Height above ground	A/G
AFIS	25 EUR: 15	4000 EUR: 3000	Height above ground	A/G
AS	Limits of aerodrome	Surface		A/G
Approach				
APP-L	50 EUR: 25	12000 10000		A/G
APP-I	75 EUR: 40	25000 EUR: 15000		A/G

Service	Designated Operational Coverage (DOC)		Comments	Mode
	Range (NM)	Height (ft)		
APP-U	150 EUR: 50	45000 EUR: 25000		A/G
En-Route				
ACC-L	Area	25000	Within specified area; max range 155 NM**	A/G
ACC-LL	EUR: Area	15000	Within specified area; max range 120 NM**	
ACC-I	Area	25000 EUR: 35000	Within specified area; max range 130 NM** Within specified area; max range 185 NM**	A/G
ACC-U	Area	45000	Within specified area; max range 200 NM**	A/G
FIS-L	Area	25000	Within specified area; max range 155 NM**	A/G
FIS or FIS-U	Area	45000 EUR: 23000	Within specified area; max range 200 NM** Within specified area; max range 120 NM**	A/G
VOLMET	200	45000	Maximum range 200 NM*	BC
Other functions				
ATIS	200 EUR: 60	45000 EUR: 20000		BC
A-A	200	45000	Maximum range 200 NM**	A/G
A-G	200	45000	Maximum range 200 NM**	A/G
AOC	100	250	Not protected; max. range 100 NM	A/G
EM	N/A	N/A	No frequency coordination required	A/G
SAR	N/A	N/A	No frequency coordination required	A/G
GPS	200	45000	Maximum range 200 NM**	A/G

Table 2-5 Table of uniform designated operational coverage

Notes:

- For designated operational coverage marked with **, see paragraph 2.6.4
- Different DOC areas may be specified by States
- DOC for AOC only provided to enable compatibility assessment when frequencies for AOC are shared with ATC services; different DOC may be specified.
- For area services, no frequency protection is provided outside the specified area.
- Unless specified by States, the DOC for A-A and A-G is assumed at 45000 ft. / 200 NM
- Mode: A/G: air/ground communications; BC: (ground) broadcast communications

2.6.3.2 Additional functionality concerning the use of these services in the column “comments” may be added to the services as follows:

CD	Clearance delivery
CTA	Control area
DF	Direction finding
ER	Extended range
PAR	Precision Approach Radar
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.

Certain services may not require protection because they are not in operation to provide safety-of-life service (e.g. for Gliders, Balloons). However, when these services are shared with ATC services, a compatibility analysis is required (see also paragraph 2.7.2.5.3).

2.6.3.3 Non-standard DOC (Range and Height) may be implemented as and when required. Reduced DOC, where operationally acceptable, may alleviate frequency congestion.

2.6.3.4 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.

2.6.3.5 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).

2.6.4 Coverage at very low angles from ground transmitter

2.6.4.1 Due to the vertical polar diagram of the antenna of the ground station, at very low angles the radiation of the transmitted energy is too low to provide coverage over a large area. Also, the distance to the aircraft decreases if the angle of the radio path with the horizontal plane through the ground antenna increases. As an example, for an aircraft operating at 45000 ft., the distance to the ground transmitter decreases as shown in Table 2-6.(4/3 Earth radius).

Angle (degree)	Distance (NM) Height: 45000 ft	Distance (NM) 25000 ft
0 (radio horizon)	261	261
.1	252	186
.2	245	178
.3	237	171
.4	230	164
.5	223	158
.6	217	152
.7	210	146
.8	204	140
.9	198	135
1	192	130

Table 2-6 Distance as function of angle above horizon

The geometry used in these calculations is shown in Figure 2-7

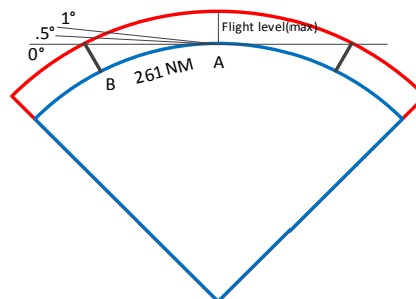


Figure 2-7 Reduction in distance to the transmitter when receiving above the horizontal plane through the ground antenna

On the basis of the principles in 2.6.4.1, in case for certain services no actual maximum Designated Operational Range has been specified, the maximum operational range within which frequency protection is provided can be about 80% of the distance to the radio horizon. For certain of these services, a maximum operational range has been incorporated in table 2-4.

It is recognized that States may require different values for the designated operational coverage from the uniform values in Table 2-5 for certain services.

2.6.5 Interference from FM broadcasting stations

2.6.5.1 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.

2.6.6 Co-location of facilities

2.6.6.1 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).

2.6.7 Coordination of frequency assignments

2.6.7.1 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 (methodology)

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 2.7.4 contains material to be considered when establishing separation distances in a mixed 25 kHz and 8.33 kHz environment.

2.7.1 Frequency and/or distance separation

2.7.1.1 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.

2.7.1.2 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 and provisions in paragraphs 2.2 and 2.3 and comply with the frequency assignment planning criteria as specified in Annex 10, Volume V. Practical values for the separation of co-frequency facilities are in section 2.8.

2.7.2 Co-frequency separation distances

2.7.2.1 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 (see paragraph 2.3).

2.7.2.1.1 Circular service areas

(i) Separation distance is based on D/U = 20 dB or radio line-of-sight distance

As described in paragraph 2.3 and as per the requirements of Annex 10 the minimum **required** 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 not greater than the sum of the distance to the radio horizon from each aircraft station.

As shown in Figure 2-8, the minimum distance between the *DOC* of the service areas is equal to

$$RH_A + RH_B$$

The distance to the radio horizon can be calculated with formulas (8) or (9) in Chapter 1, paragraph 1.3.2. In these formula, the factor h_{TX} and or h_{RX} is the designated operational height of the respective DOC areas.

As shown in Figure 2 – 8, when the ground stations (with circular coverage and the ground stations are located approximately at the center of this coverage area) have a designated operational range of R_A and R_B respectively and RH_A and RH_B is the distance from the respective aircraft to the radio horizon, the minimum separation distance between the *ground stations* is:

$$R_A + RH_A + RH_B + R_B.$$

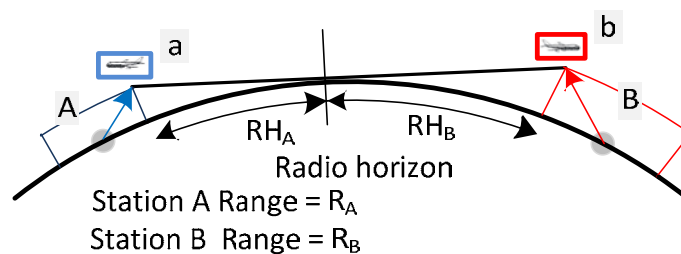


Figure 2-8 Separation based on radio line-of-sight

Separation distance is based on D/U = 14 dB (1 : 5 separation distance ratio) or radio line-of-sight.

As described in paragraph 2.2.2 and as per the requirements of Annex 10 the minimum **required** geographical separation distance between the edges of the designated operational coverage areas can be calculated with the separation distance ratio method as follows. This method has been implemented in Europe [and North America].

To meet the 14 dB protection requirement, the distance between the (desired) aircraft receiver and the (interfering) aircraft transmitter needs to be at least 5 times the distance between the (desired) aircraft receiver and the desired ground station.

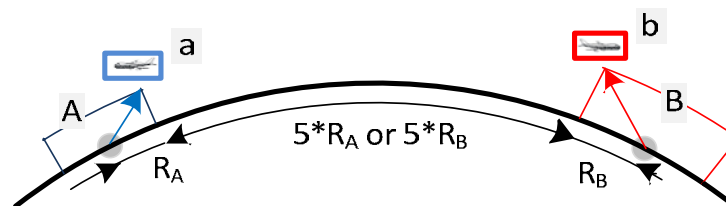


Figure 2-9 Separation distance based on the 5 to 1 distance ratio

In Figure 2 – 9 the designated operational range for ground station **A** is R_A and for ground station **B** is R_B . Aircraft stations **a** and **b** operate at the closest point and at the edge of the respective DOC areas. 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** ($5 \cdot R_A$) aircraft station **a** is protected (14 dB) 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** ($5 \cdot R_B$) aircraft station **b** is protected from interference from aircraft station **a**. The minimum required separation distance between the two DOC areas **A** and **B** is the largest of

$$(\text{Max}) [5 \cdot R_A \text{ or } 5 \cdot R_B]$$

The minimum separation between the ground stations (circular coverage for **A** and **B** and the ground stations are located in the approximate center of the DOC) is the larger value of

$$(\text{Max}) [(R_A + 5R_A + R_B) \text{ or } (R_A + 5R_B + R_B)]$$

In cases where the value $(\text{Max}) [5 \cdot R_A \text{ or } 5 \cdot R_B]$ is larger than the sum of the distances to the radio horizon of each facility ($RH_A + RH_B$) as described in 2.2.5 and 2.3.3.1 above, the radio line-of-sight criterion should be used. The minimum total **required** separation distance between closest points at the edges of the respective coverage areas is therefore:

$$(\text{Min}) \{ [RH_A + RH_B] \text{ or } (\text{Max}) [5R_A \text{ or } 5R_B] \}$$

Note 1: In both cases above, the edge of the DOC area is the point where the aircraft can operate at maximum designated operational range and height. Application of the 5 to 1 distance ratio assumes that the e.i.r.p of both the [desired] station and the [undesired; interfering] station are the same. Where the e.i.r.p of the transmitters is different, adjustments to the 5 to 1 distance ratio are necessary (see paragraph 1.3.4).

Note 2: The application of the 5:1 distance ratio in frequency assignment planning is not recommended for area services or for services with circular DOC when the ground station is located well outside the center of the circular service since in these cases the worst case where the 5:1 distance ratio needs to be met is not always the closest point between the DOC areas considered. In addition, it should be recognized that the benefits for efficient frequency assignment planning using the 5:1 distance ratio are marginal. Only in areas where frequency congestion is becoming desperate, the use of the 5:1 distance ratio for frequency assignment planning should be considered.

Note 3: in both cases above, once protection of the aircraft receiver “a” is secured, also the ground station is protected from harmful interference (from aircraft station “b” since the ground station is well beyond the radio horizon of aircraft station “b”).

2.7.2.1.2 Area services

2.7.2.1.2.1 For area services (such as ACC or FIS; see Table 2-5) the minimum separation distance between the DOC of the area service (ACC, FIS) and the DOC of other service areas (which can either be an area service or a circular service) is the distance between the closest points at the edge of the area service and of the DOC area of the other service. This scenario is illustrated in Figure 2-15 and described in paragraph 2.7.5

2.7.2.1.2.2 To secure protection of both services from harmful interference using radio line of sight criterion the distance between these (closest) points shall be at least the sum of the radio horizon of each aircraft at maximum Designated Operational Height. The distance to the radio horizon between these points can be calculated for each point with the formulas (9) and (10) in Chapter 1, paragraph 1.3.2.

As pointed out in Note 2 to paragraph 2.7.2.1.1, the use of the 5:1 distance ratio for co-frequency assignment planning for area services is not recommended.

2.7.2.2 Broadcast services (ATIS and VOLMET)

2.7.2.2.1 Broadcast services such as ATIS and VOLMET are characterized by ground-to-air transmissions only and do not involve airborne transmissions. As a consequence, only interference from the (undesired) ground broadcast station needs to be considered. Because of the continuing nature of the broadcast transmissions, protection of the (desired) signal down to the muting level of the receiver is necessary.

A VOLMET (ATIS) broadcast station normally has a maximum designated operational range is 200 NM and a maximum designated operational height of 45000 ft. see paragraph 2.6.4 and Table 2-4). For an (undesired) VOLMET transmitter with an e.i.r.p. of 100 W, the field strength at the (desired) aircraft, when the VOLMET station is 15 NM beyond the radio horizon of the (desired) aircraft) will be approximately at the receiver muting level of 5 $\mu\text{V/m}$ (-105.6 dBm).

The designated operational coverage for these broadcast stations is normally the maximum that can be achieved (200 NM at flight level 450). The interference mechanism is shown in Figure 2 – 10.

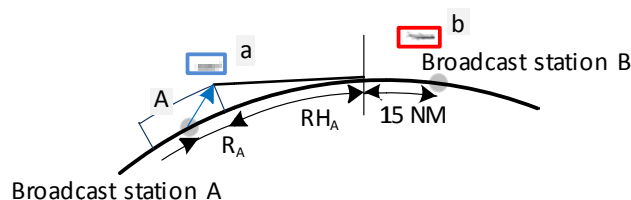


Figure 2-10 Interference mechanism between broadcast services

The minimum separation distance between two (ground) broadcast stations is

$$R_A + RH_A + 15 \text{ (NM)}$$

To secure compatibility when station B is the wanted broadcast station and aircraft B is the desired receiving aircraft station, the minimum separation distance between the (ground) broadcast stations A and B is

$$R_B + RH_B + 15 \text{ (NM)}$$

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:

$$\text{(Max) } RH_A + R_A + 15 \text{ or } RH_B + R_B + 15$$

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)

The minimum separation distances between the edge of the designated operational coverage of each facility is **15 NM**.

2.7.2.3 Broadcast and air-ground services

2.7.2.3.1 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 - 11 applies

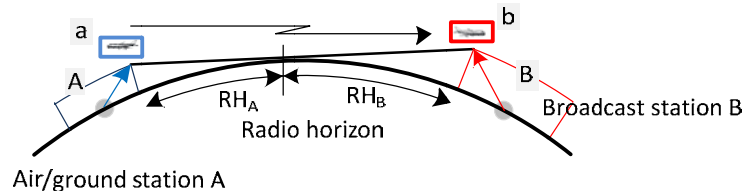


Figure 2-11 Interference mechanism between broadcast services and air/ground services

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 **A**, the same methodology as described in paragraph 2.7.2.1.1 applies (separation distances in case both the undesired and the desired station provide air/ground communication services).

To protect aircraft station **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 2.7.2.2):

$$R_A + RH_A + 15 \text{ NM}$$

However, the distance to protect aircraft station **B** from interference from transmissions from aircraft station **A** is always greater than the distance to protect aircraft station **A** from interference that can be caused by broadcasting station **B**. Geographical separation between the facilities should be based on the method as described in paragraph 2.7.2.1.

2.7.2.4 Aerodrome surface communications (AS)

Aerodrome Surface communications provide an essential safety service. In case the separation distance is not sufficient, clearances or other instructions that are intended to be used solely on a nearby ("undesired") aerodrome can be understood as a valid instruction on the desired aerodrome. For AS communications, the actual difference in height (above MSL) with a nearby airport or the effect of anomalous propagation may need to be considered. A height difference of 100 m with the nearby aerodrome would result in the radio horizon (of the nearby aerodrome) being increased to about 25 NM. The resulting (D/U) would be 15.5 dB. (See the Appendix to this paper)

Along the same principles as for aircraft in flight, as described in paragraph 2.7.2.1.1, the minimum separation distance can be calculated with the formula $RH_A + RH_B$ as illustrated in Figure 2-12.

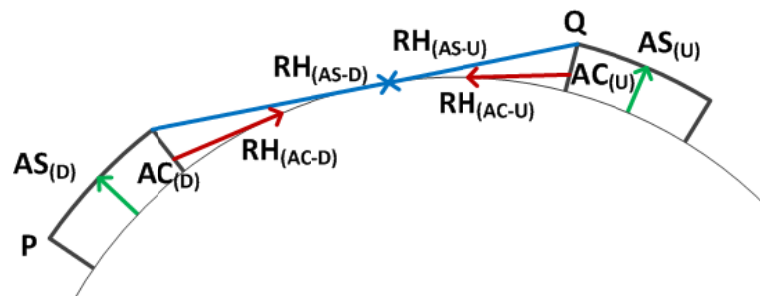


Figure 2-12 Geometry for calculating separation distances for AS communication services

In Figure 2-12, the parameters are:

AS_(D) and AS_(U): Designated operational coverage for aerodrome surface communications (5 NM/100 ft.)

AC_(D): Desired aircraft (antenna height 30 ft.)

AC_(U): Undesired aircraft (antenna height 30 ft.)

AS_(D): Desired AS ground [base] station (antenna height 100 ft.)

AS_(U): Undesired AS ground [base] station (antenna height 100 ft.)

RH_(AS-D) and RH_(AS-U): Distance to the radio horizon from the edge of coverage (12.3 NM)

RH_(AC-D) and RH_(AC-U): Distance to the radio horizon from the aircraft at maximum range (6.7 NM for 30 ft.)

Using formulas (1) and (3) in Chapter 1 the required transmission loss can be calculated as

$$\frac{D}{U} = L_u - L_d$$

In this formula $L_d = 37.8 + 20 \log d_d = 13.9 \text{ dB}$ ($d_d=5 \text{ NM}$)

and $L_u = 37.8 + 20 \log d_u + A = 13.9 \text{ dB}$ (d_u is the distance to the radio horizon between the two ground stations which is for stations at a height of 100 ft. (30 m) above the terrain $2 \times 12.3 \text{ NM}$. A is the required transmission loss beyond the radio horizon)

$$\frac{D}{U} = L_u - L_d = 20 \log(RH_{(AS-d)} + RH_{AS-u}) + A - 13.9 = 20$$

For $RH_{(AS-d)} + RH_{AS-u}=24.6$, the factor A (transmission loss beyond the radio horizon) equals 6dB. This corresponds to a distance of 12 NM. As a result, the total minimum separation between the two ground stations should be 36.3 NM (37 NM). Since the antenna height above the terrain of the ground station (30) is higher than that of the aircraft station, this separation distance will protect the communications with an aircraft (on the surface of an airport) as well as vehicles using AS frequencies.

Note: when using the two-ray propagation model (see Chapter 1, paragraph 1.3.4), the minimum separation distance between the two ground stations would be slightly more than 25 NM.

In frequency assignment planning, the DOC for AS services is circular with a designated operational coverage of 5 NM / 100 ft. The minimum separation distance between the DOC of two (co-frequency) AS services is equal to the sum of the distance to the radio horizon of each station. This would provide for a co-frequency separation distance between the ground stations of 35 NM.

If so desired, on the basis of regional agreements, the separation distances to be applied can be amended. In addition, consideration could be given to increase the minimum separation distance to a value that would reduce the undesired signal to below a squelch level of 5 $\mu\text{V/m}$ at the [airborne and ground] receiver antenna. However, when considering that more realistic propagation models for ground-ground propagation as in Chapter 1, paragraph 1.3.2 will result in better protection, the separation distance of 35 NM between AS ground stations may provide sufficient protection.

Adjacent channel protection for AS services needs to be provided by securing that the DOC of the undesired (interfering) station is separated by at least 10 NM from the DOC of the desired station.

Editorial note: if so desired, this paragraph can be simplified. Note that in the case of AS services, protection is offered to the ground station as the antenna height of the ground station is greater than that of the aircraft station on the surface of the airport.

2.7.2.5 Unprotected services

2.7.2.5.1 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.

2.7.2.5.2 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 should not be subject to interference calculations.

2.7.2.5.3 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. In these cases, establishing a DOC for the un-protected service is necessary.

2.7.2.5.4 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 Adjacent frequency separation distances

2.7.3.1 Air/ground communication services (25 kHz or 8.33 kHz frequency separation).

The minimum separation between aircraft operating on the first adjacent (25 kHz or 8.33 kHz) frequency used in frequency assignment planning is 10 NM as illustrated in Figure 2-13. In paragraph 2.2.2.6 and 2.2.3.8 calculations for adjacent channel separation are provided. This separation distance applies to frequency assignment for use by equipment designed for 25 kHz frequencies (channels) or for 8.33 kHz frequencies (channels). The separation distance in cases where equipment designed for 8.33 kHz bandwidth is used in the same area where equipment designed for 25 kHz bandwidth channels is used is described in paragraph 2.7.4.

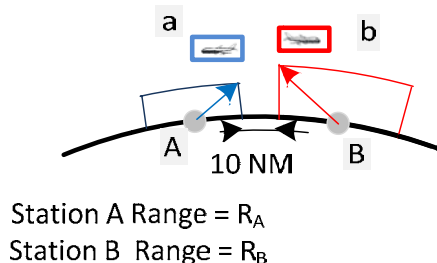


Figure 2-13 Adjacent frequency separation for air-ground services

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.

2.7.3.2 Adjacent frequency separation distances between broadcast services (ATIS, VOLMET).

2.7.3.2.1 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 – 11.

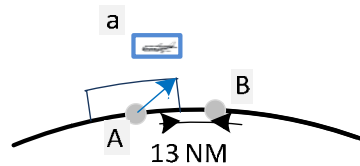


Figure 2-14 Adjacent frequency separation between broadcast services

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 $R_B + 13 \text{ NM}$

where:

R_B is the designated operational range for ground broadcast station **B** (not shown in Figure 2 – 14)

The minimum separation distance that needs to be secured between the broadcast stations **A** and **B** is the larger value of:

$$(\text{Max}) R_A + 13 \text{ NM or } R_B + 13 \text{ NM}$$

In this case, the DOC for adjacent channels may overlap with each other.

2.7.3.3 Adjacent frequency separation distances – broadcast and air-ground services

2.7.3.3.1 In this case, two different interference mechanisms need to be analyzed as illustrated in Figures 2-13 and 2-14. 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 - the 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

$$R_A + 13 \text{ NM}$$

where

R_A is the designated operational range of the station providing air/ground communications.

A – the 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

$$R_A + 10 + R_B$$

where:

R_A is the designated operational range of the air-ground communication service and

R_B 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:

$$(\text{Max})R_A + 13 \text{ NM or } R_A + 10 + R_B$$

2.7.4 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 have been developed by the EUR Frequency Management Group and may require further consideration, in particular with regard to the protection of frequencies using off-set carrier (CLIMAX) systems.

2.7.4.1 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))

2.7.4.2 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).

2.7.4.3 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 respectively).

2.7.4.4 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).

2.7.4.5 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)

2.7.4.6 Table 2 – 7 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 to 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 2-7 Adjacent frequency separation distances for a mixed 25 kHz/8.33 kHz environ

2.7.5 Frequency planning criteria for area services

2.7.5.1 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.

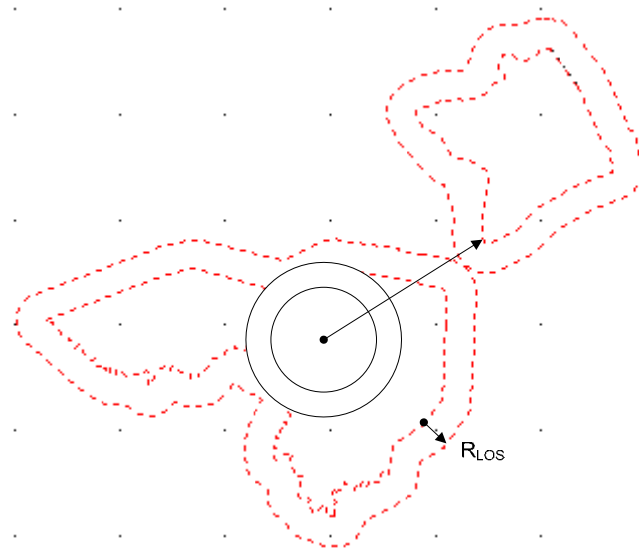


Figure 2-15 Minimum separation of area services

Note: R_{LOS} is radio line-of-sight

2.7.5.2 Co-frequency geographical separation for area services

2.7.5.2.1 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 – 15 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.

2.7.5.2.1.1 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.

2.7.5.2.2 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:

- 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
- 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.

2.7.5.2.2.1 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.

2.7.5.3 Adjacent frequency geographical separation for area services

2.7.5.3.1 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 – 15 the buffer zone around the area service is 10 NM)

2.7.5.3.2 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

2.7.5.3.3 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:

- 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.
- 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 (air ground communication services and ground based broadcasting services)

2.8.1 Calculation of distances to the radio horizon

Applying the methodology as described in paragraph 2.7.2, separation distances between the edges of the designated operational coverage areas 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 2-8 Distance to radio horizon with aircraft at maximum altitude

The minimum separation distance between the closest point of the designated operational coverage area of each service are summarized in Table 2 – 9 and are in accordance with the methods described in paragraph 2.7.2. Separation distances involving air/ground communication services have been calculated as shown in paragraph 2.7.2.1.1 and are limited to the sum of the radio horizon of each facility. When using non-uniform values for the designated operational coverage of the services in Table 2-5, the minimum geographical separation between the can be calculated as shown in paragraph 2.7.2.1.1 (separation distance based on radio line-of-sight distance).

2.8.1.1 The minimum separation distance between broadcast services (VOLMET, ATIS) assumes a designated operational coverage for these services of 260 NM / 45000 ft. See also paragraph 2.7.2.2.

2.8.2 Table of separation distances

2.8.2.1 Separation distances between the edge of the designated coverage areas

		VICTIM											
	Service	TWR 25/4000	AFIS 25/4000	AS Surface	APP-U 150/450	APP-I 75/250	APP-L 50/120	ACC-U Area/450	ACC-L Area/250	FIS-U Area/450	FIS-L Area/250	VOLMET 260/450	ATIS 200/450
INTERFER	TWR	156	156		338	273	212	338	273	338	273	338	338
	AFIS	156	156		338	273	212	338	273	338	273	338	338
	AS (Note 2)			25									
	APP-U	338	338		520	455	394	520	455	520	455	520	520
	APP-I	273	273		455	390	329	325	390	455	390	455	455
	APP-L	212	212		394	329	268	394	329	394	329	394	394
	ACC-U (Note 1)	338	338		520	455	394	520	455	520	455	520	520
	ACC-L (Note 1)	273	273		455	390	329	455	390	455	390	455	455
	FIS-U (Note 1)	338	338		520	455	394	520	455	520	455	520	520
	FIS-L (Note 1)	273	273		455	390	329	455	390	455	390	455	455
	VOLMET	338	338		520	455	394	520	455	520	455	15	15
	ATIS	338	338		520	455	394	520	455	520	455	15	15

Table 2-9 Minimum geographical co-frequency separation distances between stations

Note 1: All distances are in NM.

Note 2: 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. No separation

distances with other services are provided. Should it be necessary to share frequencies for AS with air/ground communication services, the minimum geographical separation distance can be calculated as shown in paragraph 2.7.2.1.1 and assuming a designated operational coverage for aerodrome surface communications of 5 NM/100 ft.

2.8.2.2 In the EUR Region, the table of separation distances has been developed, taking into account

- i. Different values for the uniform designated operational coverage (see paragraph 2.8.3.1 and Table 2-5.
- ii. Application of the separation-distance ratio method (5:1) using the D/U protection ratio of 14 dB.

For information purposes, this table is reproduced below.

EUR Table of separation distances

Service	AFIS/TWR 16/3000	TWR 25/4000	APP-U 50/250	APP- I 40/150	APP-L 25/100	ACC-U Area/450	ACC-I Area/350	ACC-L Area/250	ACC/LL Area/150	VOLMET 271/450	ATIS 60/02050
AFIS/TWR	80	125	250	200	125	328	297	261	218	328	241
TWR	125	125	250	200	125	339	308	272	229	339	252
APP-U	250	250	250	250	250	455	424	388	345	455	300
APP-I	200	200	250	200	200	412	381	345	302	412	300
APP-L	125	125	250	200	125	384	353	317	274	384	297
ACC-U (Note 1)	328	339	455	412	384	522	491	455	412	522	300
ACC-I (Note 1)	297	308	424	381	353	491	460	424	381	491	300
ACC-L (Note 1)	261	272	388	345	317	455	424	388	345	455	300
ACC-LL	218	229	345	302	274	412	381	345	302	412	300
VOLMET	328	339	455	412	384	522	491	455	412	10	211
ATIS	241	252	300	300	297	300	300	300	300	211	124

Notes:

- i. Separation distances in NM.
- ii. All distances in red/italics have been calculated using the 5:1 distance ratio. Other separation distances are limited to the radio horizon.
- iii. Separation distances between VOLMET and ATIS were calculated assuming an antenna height of the VOLMET/ATIS transmitter of 65 ft. (20m)

2.9 Separation distances for VDL (VDL Mode 2 and VDL Mode 4)

2.9.1 VDL operating co-frequency with other VDL or VHF COM voice systems

2.9.1.1 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 2.7.2. The designated operational coverage for VDL Mode 2 and VDL Mode 4 facilities need to be separated from the designated operational coverage of a co-frequency VHF-COM voice (DSB-AM) system with at least the distance to the radio horizon of each service. .

Note: This applies also to frequency assignments between VDL facilities.

2.9.2 VDL operating on adjacent frequencies with other VDL or VHF COM voice systems

The 1st frequency, adjacent (25 kHz) to either a DSB-AM frequency or a VDL frequency should not be used in the same airspace.

The 2nd frequency, adjacent (25 kHz) to a DSB-AM frequency should not be used in the same airspace for VDL Mode 4.

		Interference source		
		DSB-AM	VDL 2	VDL 4
Victim	DSB-AM		1	2
	VDL 2	1	1	1
	VDL 4	2	1	1

Table 2-10 25 kHz guard band (channels) between DSB-AM, VDL mode 2 and VDL mode 4 (air-air)

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.

2.9.3 Operation of VDL on the surface of an airport

2.9.3.1 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. The following adjacent channel constraints have been developed under the assumption that the minimum separation between an aircraft on the surface of an airport and the ground station (transmitter/receiver) is at least 210 m. This is considered a realistic scenario at most airports. However, aircraft at the surface of an airport can be separated at closer ranges. Protection has been considered at the minimum required field strength and calculations have been made assuming free space propagation conditions. Measurements at a number of representative airports showed that in many cases the minimum fields strength is about 10 – 12 dB higher than the minimum required.

2.9.3.2 On the basis of an analysis performed by the Aeronautical Communications Panel, the following frequency assignment planning constraints have been developed for VDL Mode 2 and VDL Mode 4, when operating with aircraft on the surface of an airport.

		Interference source		
		DSB-AM	VDL 2	VDL 4
Victim	DSB-AM	-	4	4
	VDL 2	4	1	1
	VDL 4	4	1	1

Table 2-11 25 kHz guard band (channels) between DSB-AM and VDL (modes 2 and 4) on the surface of an airport

2.9.3.3 Interference can occur if the frequency separation between a VDL frequency assignment (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 at least 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.

Appendices

Appendix A Aeronautical propagation curves for 125 MHz, 300 MHz, 1200 MHz and 5100 MHz
(Source: Recommendation ITU-R P.528)

Appendix B Terms and definitions

Appendix C Regional frequency allotment plans

Appendix D Regional frequency utilization table

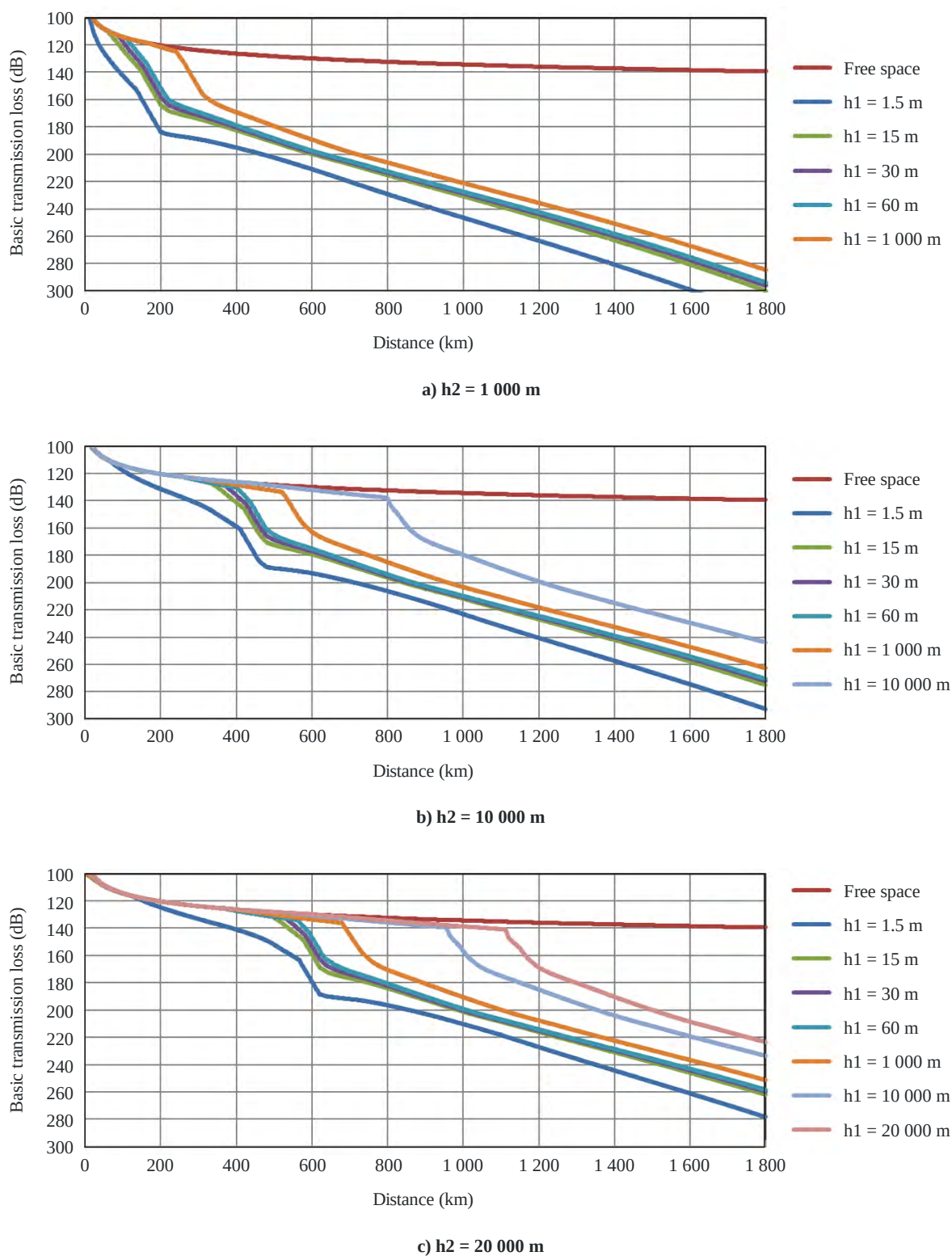
Appendix A

Appendix A contains the propagation curves as per ITU-R Recommendation P.528-3

The following points are to be noted:

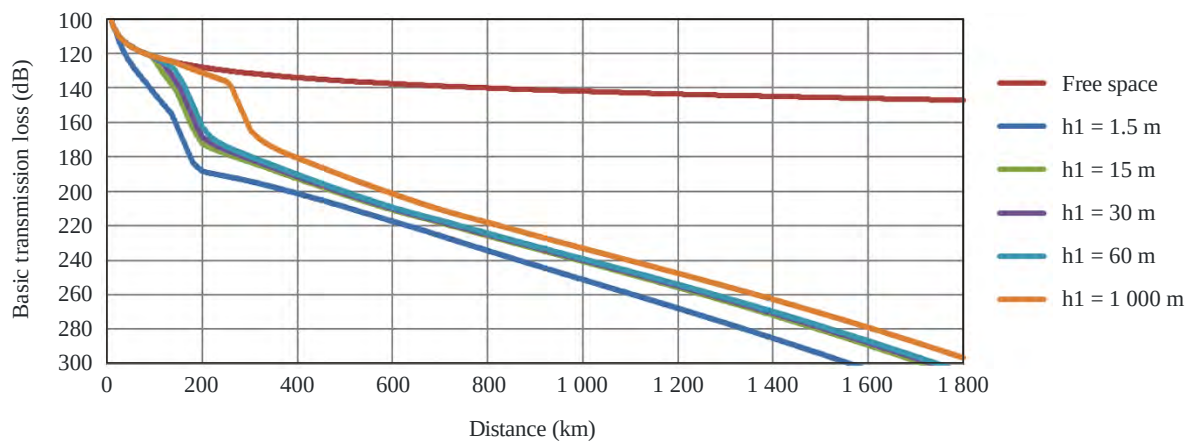
- 1** Figures A-1 to A-4 show median values of the basic transmission loss at the frequencies 125, 300, 1 200 and 5 100 MHz for the time availability of 50%.
- 2** Each figure consists of three curve sets where the upper, middle and lower sets provide h_2 values of 1000, 10 000, and 20 000 m, respectively.
- 3** Additional curves and further details on their application are contained in ITU-R Recommendation P.528-3. This Recommendation also includes the curves in a tabular format (spreadsheet).

Figure A - 1 Curve sets for basic transmission loss at 125 MHz for 50% of the time for values of h_1

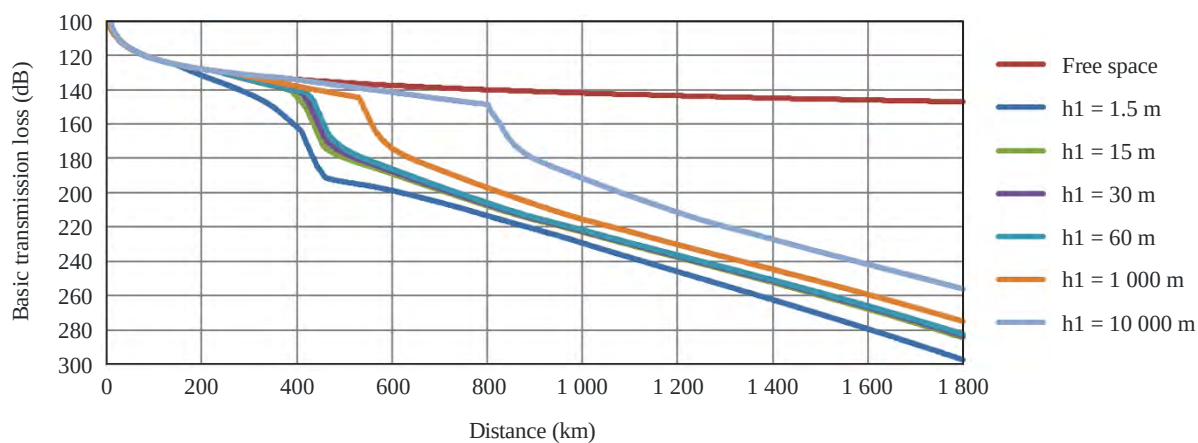


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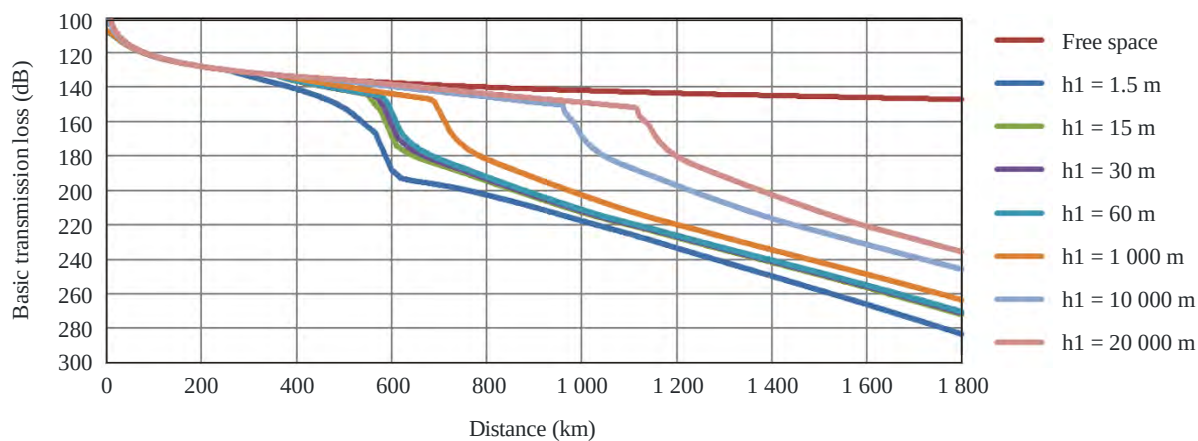
Figure A - 2 Curve sets for basic transmission loss at 300 MHz for 50% of the time for values of h_1



a) $h_2 = 1\,000\text{ m}$



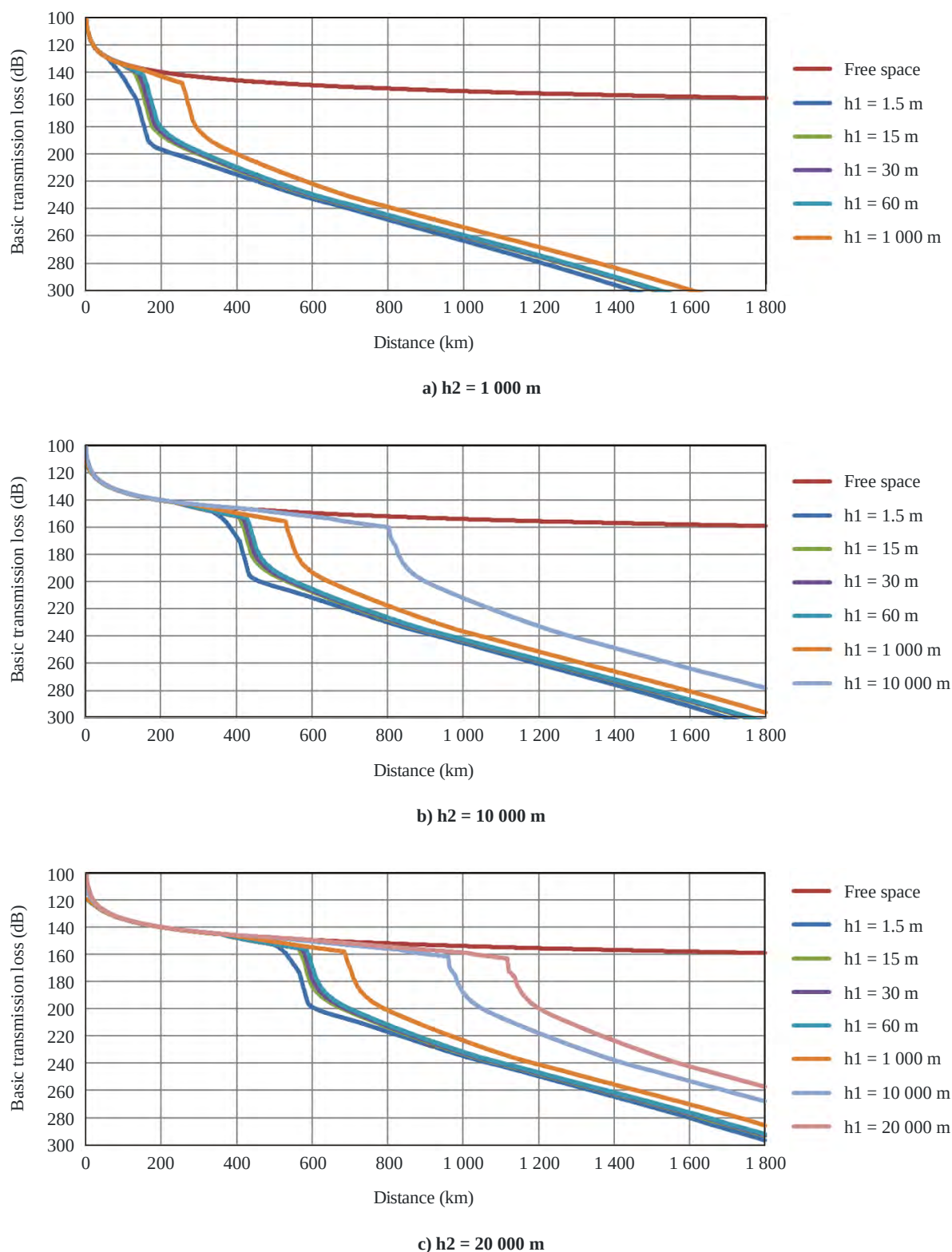
b) $h_2 = 10\,000\text{ m}$



c) $h_2 = 20\,000\text{ m}$

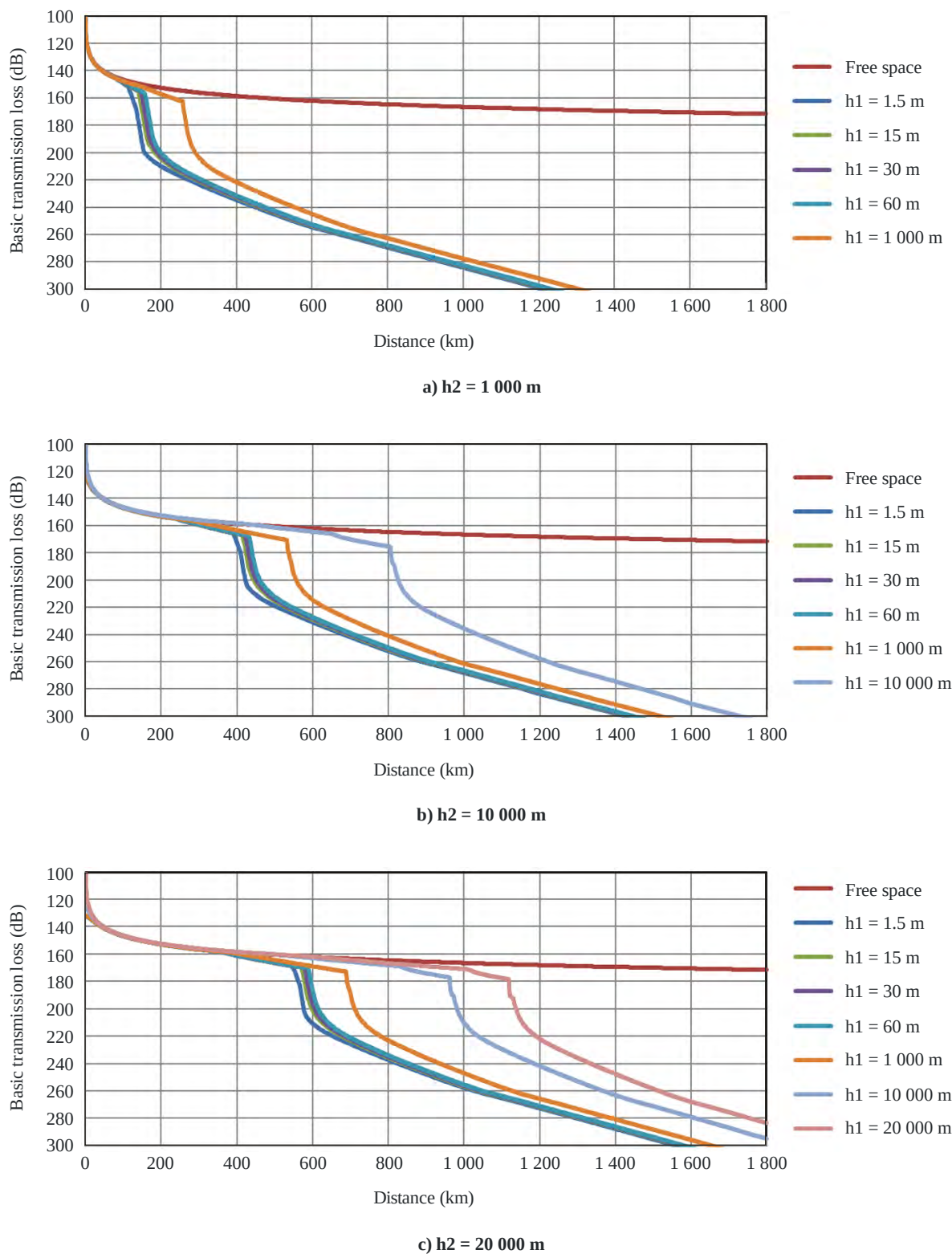
P0528-02-04

Figure A - 3 Curve sets for basic transmission loss at 1 200 MHz for 50% of the time for values of h_1



P.0528-04-04

Figure A - 4 Curve sets for basic transmission loss at 5 100 MHz for 50% of the time for values of h_1



P.0528-06-04

Appendix B

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)).

Appendix C

VHF COM Frequency Allotment Plan for AFI (Re. AFI ANP)

National Aeronautical Mobile Services		International and National Aeronautical Mobile Services	
NOT ALLOTTED	122.900 +3.0/2.5	AS	121.500
	122.800 +3.0/2.5		121.600 +3.0/2.5
	122.700 +3.0/2.5		121.700 +3.0/2.5
	122.600 +3.0/2.5		121.800 +3.0/2.5
	122.500 +3.0/2.5		121.900 +3.0/2.5
	122.400 +3.0/2.5		122.000
	122.300 +3.0/2.5		122.100
	122.200 +3.0/2.5		122.200
	122.100 +3.0/2.5		122.300
	122.000		122.400
EMERGENCY	121.400	APPI	121.400
	121.425		121.450
	121.450		121.475
	121.475		121.500
	121.500		121.525
	121.525		121.550
	121.550		121.575
	121.575		121.600
	121.600		121.625
	121.625		121.650
NOT ALLOTTED	121.100	APPI	120.475
	121.125		120.500
	121.150		120.525
	121.175		120.550
	121.200		120.575
	121.225		120.600
	121.250		120.625
	121.275		120.650
	121.300		120.675
	121.325		120.700
ACC-U	120.875	APPI	120.875
	120.900		120.900
	120.925		120.925
	120.950		120.950
	120.975		120.975
	121.000		121.000
	121.025		121.025
	121.050		121.050
	121.075		121.075
	121.100		121.100
ACC-U	120.500	APPI	120.500
	120.525		120.525
	120.550		120.550
	120.575		120.575
	120.600		120.600
	120.625		120.625
	120.650		120.650
	120.675		120.675
	120.700		120.700
	120.725		120.725
ACC-U	120.300	APPI	120.300
	120.325		120.325
	120.350		120.350
	120.375		120.375
	120.400		120.400
	120.425		120.425
	120.450		120.450
	120.475		120.475
	120.500		120.500
	120.525		120.525
APPI	119.875	APPI	119.875
	119.900		119.900
	119.925		119.925
	119.950		119.950
	119.975		119.975
	120.000		120.000
	120.025		120.025
	120.050		120.050
	120.075		120.075
	120.100		120.100
APPI	119.600	APPI	119.600
	119.625		119.625
	119.650		119.650
	119.675		119.675
	119.700		119.700
	119.725		119.725
	119.750		119.750
	119.775		119.775
	119.800		119.800
	119.825		119.825
ACC-U	119.300	APPI	119.300
	119.325		119.325
	119.350		119.350
	119.375		119.375
	119.400		119.400
	119.425		119.425
	119.450		119.450
	119.475		119.475
	119.500		119.500
	119.525		119.525
APPI	118.875	APPI	118.875
	118.900		118.900
	118.925		118.925
	118.950		118.950
	118.975		118.975
	119.000		119.000
	119.025		119.025
	119.050		119.050
	119.075		119.075
	119.100		119.100
TWR	118.000	TWR	118.000
	118.025		118.025
	118.050		118.050
	118.075		118.075
	118.100		118.100
	118.125		118.125
	118.150		118.150
	118.175		118.175
	118.200		118.200
	118.225		118.225
TWR	118.000	TWR	118.000
	118.025		118.025
	118.050		118.050
	118.075		118.075
	118.100		118.100
	118.125		118.125
	118.150		118.150
	118.175		118.175
	118.200		118.200
	118.225		118.225

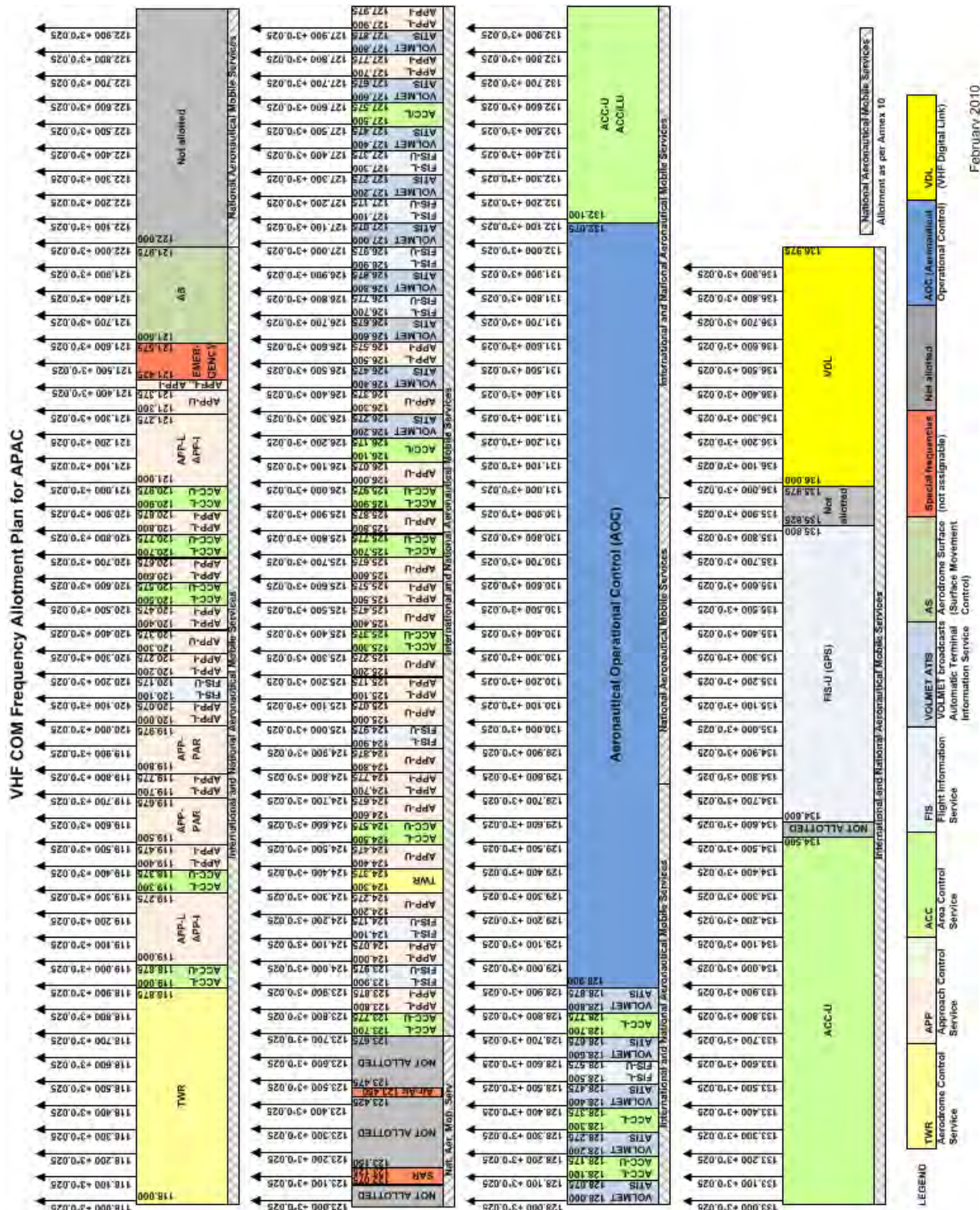
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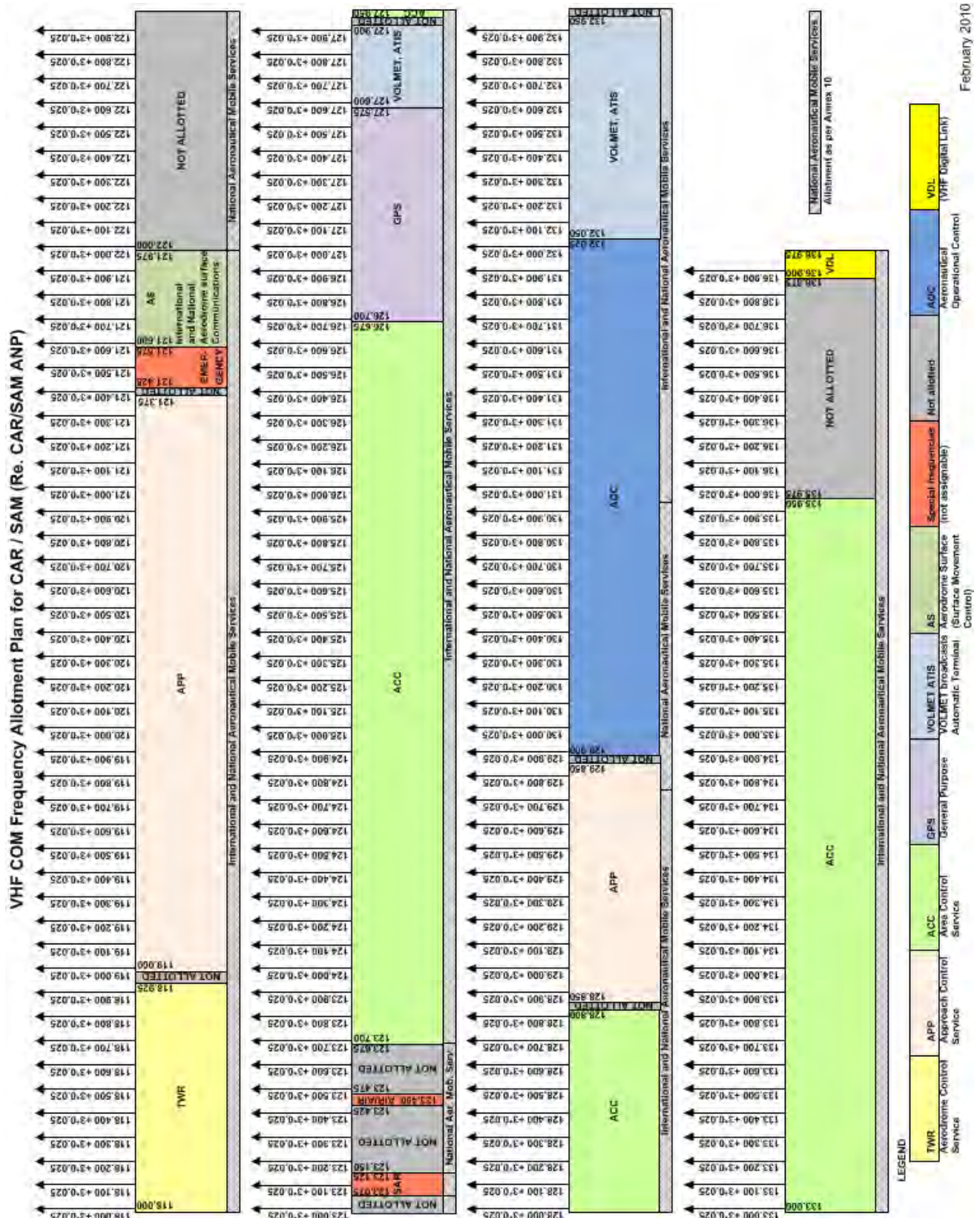
National Aeronautical Mobile Services
Allotment as per Annex 10

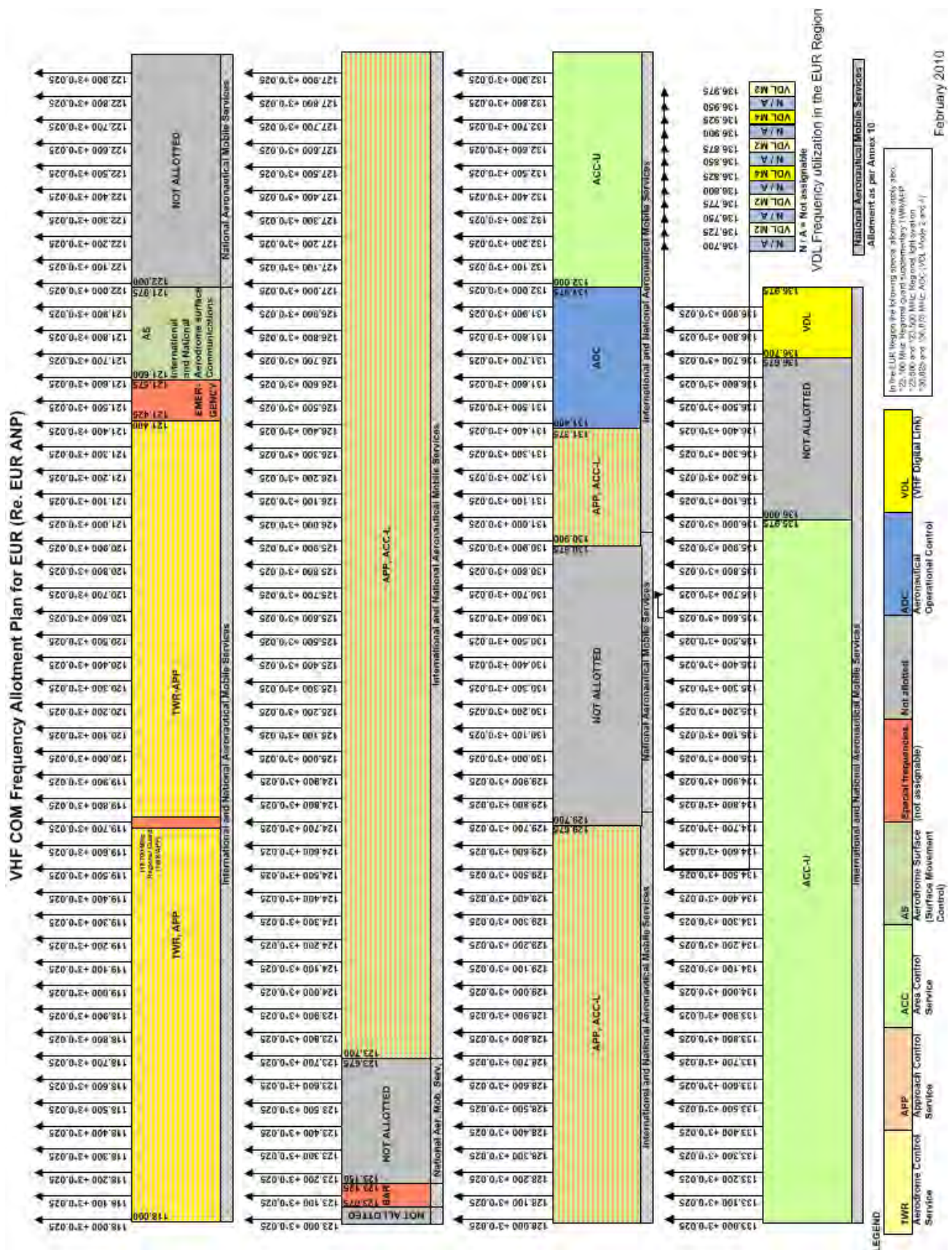
International and National Aeronautical Mobile Services

LEGEND									
TWR	APP	ACC	FIS	VOLMET ATIS	AS	Special frequencies	Not allocated	ADC (Aeronautical Operational Control)	VDL
Aerodrome Control Service	Approach Control Service	Area Control Service	Flight Information Service	VOLMET broadcasts Automatic Terminal Information Service	Aerodrome Surface (Surface Movement Control)				

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Appendix D

Regional frequency utilization table

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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
121.3500	121.355	Not used	Not used	Not used	TWR, APP	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
121.6500	121.655	Not used	Not used	Not used	AS	Not used	Not used
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC U	CAR	EUR	MID U	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
127.7750	127.780	Not used	Not used	Not used	APP, ACC-L	Not used	Not used
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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,	ACC	APP, ACC-L	VOLMET,	ACC

Frequency	Channel	AFI	APAC ATIS	CAR	EUR	MID ATIS	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
130.5417	130.540	Not used	Not used	Not used	Not allotted	Not used	Not used

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
130.8417	130.840	Not used	Not used	Not used	Not allotted	Not used	Not used
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC U	CAR ATIS	EUR	MID U	SAM 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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC U	CAR	EUR	MID U	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

Frequency	Channel	AFI	APAC	CAR	EUR	MID	SAM
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
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

APPENDIX E ANNEX 10 VOL V

- END -

**Results of Survey of Operational Use of Services and Products from Service Providers of
WAFS in Asia/Pacific Regions and WAFS Training Needs of Asia/Pacific States
(December 2011 – January 2012)**

Access to WAFS services

1. *Does your State/Territory currently have access to WAFS products?*

All States/Territories (18; 100%) said that they have access to WAFS products.

2. *Which sets of WAFS products does your State/Territory have access to?*

5 States/Territories (28%) said that they have access to UK WAFS products, 7 (39%) US WAFS products and 6 (33%) both (Figure 1).

3. *Which sets of WAFS products does your State/Territory use as the primary source for producing flight documentation?*

17 States/Territories responded to this question. 8 States/Territories (47%) said they use UK WAFS as primary source and 9 States/Territories (53%) said they use US WAFS as primary source (Figure 2).

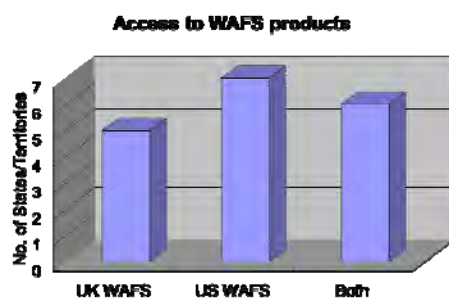


Figure 1

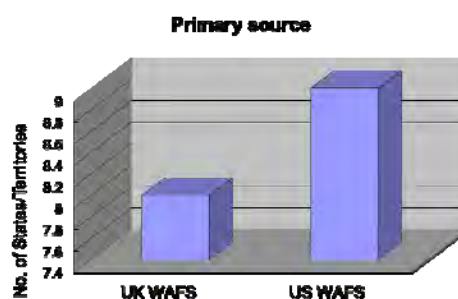


Figure 2

4. *What is/are the channels through which your State/Territory gains access to UK WAFS products?*

There are 11 States/Territories responding to this question. 8 States/Territories (73%) said that the channel they use is SADIS 2G, 10 States/Territories (91%) via SADIS FTP Service / Secure FTP Service, and 2 State/Territory (18%) via other channel (the Global Telecommunications System (GTS)) (Figure 3).

5. *What is/are the channels through which your State/Territory gains access to US WAFS products?*

There are 13 States/Territories responding to this question. 11 States/Territories said that the channel they use is ISCS-G2 (85%), 7 States/Territories (54%) via WAFS Internet File Service (WIFS), and 3 States/Territories (23%) via other channel (GTS) (Figure 4).

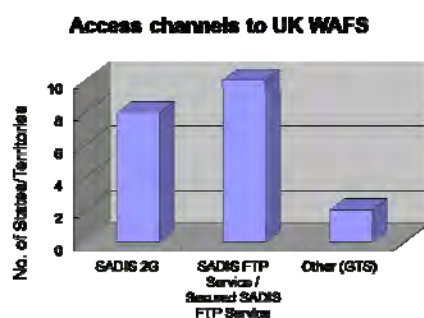


Figure 3

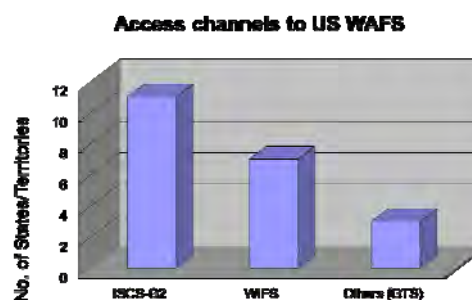


Figure 4

6. *If your State/Territory is under the footprint of SADIS 2G satellite and your State/Territory has not yet access to UK WAFS products via SADIS 2G satellite, does your State/Territory have any plan to receive UK WAFS products via SADIS 2G satellite?*

7 States/Territories responded to this question and said that they have no plan to use SADIS 2G for the following reasons:

- (a) already receiving US WAFS products (7; 100%);
- (b) already receiving UK WAFS products via SADIS FTP Service / Secure SADIS FTP Service (1; 14%);
- (c) already receiving UK WAFS products via other channels (GTS) (1; 14%);
- (d) have no technical expertise in implementation (1; 14%);
- (e) high operating cost (2; 28%).

7. *If your State/Territory has not yet gained access to UK WAFS products via SADIS FTP Service / Secure SADIS FTP Service, does your State/Territory have any plan to do so?*

7 States/Territories responded to this question. 2 State/Territory said that they planned to gain access to UK WAFS products via SADIS FTP Service / Secure SADIS FTP Service in 2012 and 2013 respectively. 5 States/Territories said that they have no plan to do so for the following reasons:

- (a) already receiving US WAFS products (5; 100%)
- (b) have no technical expertise to gain access to the service (1; 20%).

8. *If your State/Territory is using the SADIS FTP Service, does your State/Territory have any plan to switch to use Secure SADIS FTP Service by 30 November 2012?*

Of the 14 States/Territories responding to this question, 10 of them (71%) said that they planned to migrate to Secure SADIS FTP Service by 30 November 2012. 4 States/Territories (29%) have no plan to do so for the following reasons:

- (a) Already receiving UK WAFS products via SADIS 2G satellite (4; 100%)
- (b) Not enough time to prepare for switching (1; 25%)
- (c) have no technical expertise in switching (2; 50%).

9. *WAFC Washington will terminate the ISCS satellite broadcast on 30 June 2012. The WAFS data and products currently provided by ISCS satellite service are currently available via WIFS. The US has requested ISCS users to transition to WIFS no later than 1 March 2012. If your State/Territory has not yet gained access to US WAFS products via WIFS, does your State/Territory has any plan to do so?*

10 States/Territories responded to this question. 6 States/Territories (60%) said 'yes' and 4 State/Territory (40%) said 'no'. All those 6 States/Territories planned to gain access to WIFS in 2012. The 4 States/Territories have no plan to gain access to WIFS for the following reason:

- (a) already receiving UK WAFS products (3; 75%)
- (b) have no technical expertise in switching (1; 25%).

Transition from GRIB1 to GRIB2 WAFS data

10. *Both WAFC London and WAFC Washington commenced the provision of WAFS Aviation GRIB2 data via their respective server based systems (SADIS FTP for WAFC London; WIFS for WAFC Washington) on 2 March 2010. WAFS Aviation GRIB2 data are also made operationally available via SADIS and ISCS on 18 November 2010. Re-prioritization of GRIB2 data over GRIB1 data will be made on 5 July 2012. Is your State/Territory currently receiving/retrieving WAFS Aviation GRIB2 data?*

11 States/Territories (61%) said that they are receiving WAFS Aviation GRIB2 data and 7 States/Territories (39%) said no (Figure 5).

11. *If your State/Territory is currently receiving/retrieving WAFS Aviation GRIB2 data, is your State/Territory utilizing them operationally for preparing flight documentation?*

11 States/Territories responded to this question. 4 of them (36%) are using GRIB2 data operationally for preparing flight documentation and 7 of them (64%) are not (Figure 6).

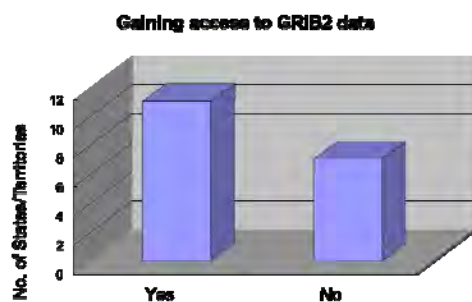


Figure 5

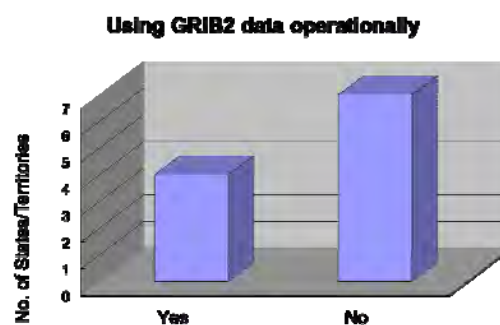


Figure 6

12. *If your State/Territory is not currently receiving/retrieving WAFS Aviation GRIB2 data and/or is not yet utilizing GRIB2 data operation, does your State/Territory have any plan to utilize GRIB2 data operationally for preparing flight documentation?*

10 States/Territories responded to this question. 8 of them (80%) said that they planned to use GRIB2 data operationally and 2 State/Territory (20%) said that they have no plan (Figure 7).

8 States/Territories indicated their plan to use GRIB2 data operationally: 5 (62.5%) in 2012 and 3 (37.5%) in 2013. The two States/Territories have no plan to use GRIB2 operationally because:

- (a) not able to decode WAFS Aviation GRIB2 data (1; 50%)
- (b) limited computing facilities and processing software to process WAFS Aviation GRIB2 data to generate products for flight documentation (2; 100%).

13. *It is planned that broadcast of WAFS forecasts in GRIB1 would cease in November 2013. Does your State/Territory envisage any difficulty in preparing for the migration from GRIB1 to GRIB2 WAFS data?*

15 States/Territories responded to this question. 6 (40%) States/Territories said that they have difficulty in migrating from GRIB1 to GRIB2 data and 9 States/Territories (60%) said no (Figure 8). The areas of difficulty are:

- (a) not yet receiving WAFS Aviation GRIB2 data (3 quotes)
- (b) no technical expertise in processing WAFS Aviation GRIB2 data (3 quotes)
- (c) no access to finances to procure the necessary GRIB2 visualization software (3 quotes).



Figure 7

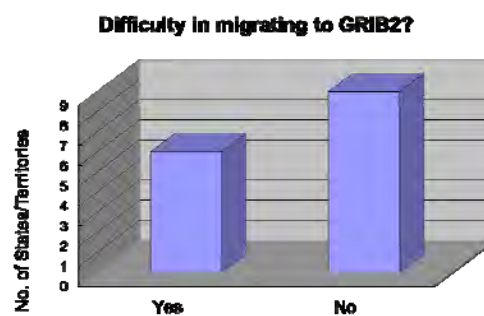


Figure 8

Utilization of trial gridded forecasts of icing, turbulence and CB

14. *WAFS London and WAFS Washington are currently providing gridded forecasts of icing, turbulence and CB in GRIB2 format via their respective server based systems (SADIS FTP for WAFS London; WIFS for WAFS Washington) for trial and evaluation only. Have your State/Territory evaluated the performance of the trial gridded forecasts of icing, turbulence and CB?*

2 States/Territories (11%) said that they have evaluated trial gridded forecasts of icing, turbulence and CB, and 16 States/Territories (89%) said that they have not done so. Of the above 2 States/Territories, both of them evaluated those of both US and UK WAFS. Comments provided by the States/Territories are as follows:

- (a) Limited analysis has been performed on data. The greatest problem has been developing a product from the data that can be used by operators. Operators are used to receiving severity and they now receive a potential field. i.e. translating potential fields into severity as required by operators. Users have indicated that high probability of low severity is not of much interest, moderate probability of high severity is of interest and high probability of high severity is of great interest, but how do we obtain severity?

The consistency between the two WAFCs of gridded icing, turbulence and CB fields has historically been relative poor. However the previous ability to compare the fields from the two WAFCs was very useful to obtain confidence in the likelihood of the event occurring, however since the two WAFCs datasets have been blended/harmonized, it is now difficult to obtain a confidence that that a scenario will eventuate. This independence is a detriment to the WAFS.

- (b) Our earlier observations on difference between gridded forecasts of icing from WAF London and WAF Washington presented in Section 4, WP/42 (Revised) of CNS/MET SG/15 of APANPIRG held in Bangkok, Thailand, 25-29 July 2011 (http://www.bangkok.icao.int/cns/meeting.do?method=download&year_id=13&meeting_id=78&doc_id=956) seemed to be addressed after the harmonization on 29 Nov 2011. However, longer term comparison should be conducted by the WAFCs to ascertain this.

As harmonization might impact on the performance of the product, it is not clear whether the focused study, as contained in the "Guidance on the Harmonized WAFS Forecasts for CB clouds, Icing and Turbulence forecasts", is still valid. Further evaluation on the harmonized product by the WAFCs should be conducted.

So far only one study on icing has been made available. Before the new gridded forecast are to be used operationally, evaluation of the performance should be conducted by the WAFCs in accordance with Conclusion 6/15 of WAFSOPSG/6.

Secure SADIS FTP download speed

15. *A regional survey on Secure SADIS FTP download speed in mid-2011 revealed that the Secure SADIS FTP download rate was significantly lower than that of WIFS, yet modestly higher than SADIS FTP, and reflected the low number of Secure SADIS FTP users. The bandwidth may have to increase in light of the fact that more users are expected to transition from SADIS FTP to Secure SADIS FTP due to 1) the transition of service is obligatory by November 2012 for SADIS FTP users, 2) a likely increase in Internet users versus satellite retrieval, 3) States selecting passive mode versus active mode for security reasons, and 4) the need for assuring Secure SADIS FTP can manage a large volume of users in the rare event WIFS service were to fail. In addition, an increase in bandwidth will provide a quicker return to service following any planned or unplanned outage. It is noted that an increase in the bandwidth of Secure SADIS FTP would entail an increase in the charge for gaining access to Secure SADIS FTP service. Given the above, does your State/Territory consider whether an upgrade to Secure SADIS FTP download speed is considered beneficial??*

Recall in para. 4 above, 10 States/Territories are getting access to SADIS FTP / Secure SADIS FTP services. Among them, 8 responded to this question. 6 of them (75%) considered an upgrade to Secure SADIS FTP download speed beneficial, while 2 of them (25%) considered otherwise. In other words, a majority of States/Territories considered an upgrade to Secure SADIS FTP download speed beneficial.

Training needs

16. *Have your State/Territory gained access to training via the following resources?*

15 States/Territories responded to this question and indicated that they have gained access to training in WAFS via the following sources:

- (a) seminar(s)/Workshop(s) organized by ICAO (8 responses)
- (b) seminar(s)/Workshop(s) organized by other organization(s) (4 responses : 2 by WMO; 1 by MeteoFrance; and 1 by IBL Software Engineering)
- (c) on-line training (1 response : by ENM MeteoFrance)
- (d) self-study of training materials on Internet (7 responses)
- (e) Others: (3 responses : documentation or training by vendors)

17. What is/are the area(s) of training on WAFS that your State/Territory consider most needed?

The table below summarizes the priority of areas of training on WAFS as indicated by the States/Territories:

Areas	No. of States/ Territories quoting this area as priority ‘1’	No. of States/ Territories quoting this area as priority ‘2’	No. of States/ Territories quoting this area as priority ‘3’	No. of States/ Territories quoting this area as priority ‘4’	No. of States/ Territories quoting this area as priority ‘5’ or lower
Interpretation of WAFS products (see Note (1))	9	1	4	2	0
Generation of products for flight documentation (see Note (2))	5	5	4	0	0
WAFS processing software (see Note (3))	2	4	3	4	1
Channels for reception of WAFS products (see Note (4))	2	1	4	2	3
Decoding of WAFS data (see Note (5))	0	5	6	1	4
Other (see Note (6))	3	0	0	0	1

Note :

(1) States/Territories remarked that the topic on ‘Interpretation of WAFS products’ should:

- cover how to interpret/use gridded experimental fields
- cover potential vs severity - how should potential be applied
- cover use of max vs mean datasets - when to use each
- be relevant to southern hemisphere

- cover practical examples on the application of gridded forecast of CB cloud, icing and turbulence;
 - cover how to establish the threshold for specific application given the performance of these gridded products; and
 - cover how to use the gridded forecast (which are probabilistic in nature) together with the SIGWX charts (which are deterministic in nature)
 - cover verification of CB Forecast, gridded icing product
 - cover gridded forecasts of icing, turbulence and CB
- (2) States/Territories remarked that the topic on ‘Generation of products for flight documentation’ should:
- be relevant to southern hemisphere
- (3) States/Territories remarked that the topic on ‘WAFS processing software’ should:
- be relevant to southern hemisphere
 - cover software training to improve product
 - cover automatic plotting of synoptic data in any given time
- (4) States/Territories remarked that the topic on ‘Channel for reception of WAFS products’ should:
- be relevant to southern hemisphere
 - cover FTP automation.
- (5) States/Territories remarked that the topic on ‘Decoding of WAFS data’ should:
- be relevant to southern hemisphere
 - cover decoding data and their use.
- (6) Other topics include:
- What is the intended usage of the max vs mean datasets? - when to use each.
 - What potential values should be used for icing, turbulence and CB products
 - technical aspects of transmission and reception
 - Overlaying of different products, e.g., satellite imageries and radar imageries

FASID TABLE MET 6

PRIMARY INTERNET-BASED SERVICE IN THE ASIA/PAC REGION FOR **OPMET DATA (including WAFS FORECASTS)**

EXPLANATION OF THE TABLE

Column

- 1 States for which ~~WAFS forecasts~~ **OPMET data** are made available by WAFC London and WAFC Washington
- 2 Primary Internet-based service for ~~WAFS~~ **OPMET data** dissemination

State	Primary Internet-based service for WAFS dissemination
1	2
Afghanistan	SADIS FTP
Australia	Either
Bangladesh	SADIS FTP
Bhutan	SADIS FTP
Brunei Darussalam	Either
Cambodia	Either
China	Either
Hong Kong, China	Either
Macao, China	Either
Cook Islands	WIFS
Democratic People's Republic of Korea	Either
Fiji	WIFS
France: French Polynesia, New Caledonia, Wallis and Futuna Islands	WIFS
India	SADIS FTP
Indonesia	Either
Japan	~~Either~~ SADIS FTP
Kiribati	WIFS
Lao People's Democratic Republic	Either

State	Primary Internet-based service for WAFS dissemination
Macao, China	Either
Malaysia	Either
Maldives	SADIS FTP
Marshall Islands	WIFS
Micronesia (Federated States of)	WIFS
Mongolia	Either
Myanmar	Either
Nauru	WIFS
Nepal	SADIS FTP
New Zealand	WIFS
Pakistan	SADIS FTP
Palau	Either
Papua New Guinea	WIFS
Philippines	Either
Republic of Korea	Either
Samoa	WIFS
Singapore	Either
Solomon Islands	WIFS
Sri Lanka	SADIS FTP
Thailand	Either
Timor-Leste	Either
Tonga	WIFS
Tuvalu	WIFS
Vanuatu	WIFS
Viet Nam	~~Either~~ SADIS FTP

Note.— The determination of the primary Internet-based services (SADIS FTP and/or WIFS) from which States/users should obtain WAFS forecasts is based on the geographic areas of coverage of the SADIS and ISCS2 satellite footprints.

DRAFT OF TOKYO – DARWIN VAAC BACKUP TEST PROCEDURES

1. Introduction

- 1.1 The International Airways Volcano Watch Operations Group (IAVWOPSG) recognised the need for the regular testing of VAAC backup procedures that would ensure the continuing availability of Volcanic Ash Advises and identify deficiencies in the dissemination procedures of backup products. Therefore, the second meeting of IAVWOPSG held in Bangkok, 15 to 19 March 2004, adopted Conclusion 2/19, as follows:

Conclusion 2/19 – Inclusion of VAAC back-up procedures in Doc 9766

That the Secretariat include in Doc 9766, Handbook on the International Airways Volcano Watch (IAVW) – Operational Procedures and Contact List, the VAAC back-up procedures agreed by the group.

- 1.2 Appendix D, paragraph f) of ICAO Doc.9766 - Handbook on International Airways Volcano Watch (IAVW) states that:

The back-up arrangements should be tested at least annually

- 1.3 The Tokyo and Darwin VAACs have developed a mutual back-up arrangement that includes procedures for undertaking a back-up test as described in this document.

2. Purpose and Scope of VAAC Back-up tests

- 2.1 The purpose of the VAAC back-up test is to ensure that internal procedures for the handover of responsibility and the issue of products for the other VAAC's area of responsibility are robust and functional.
- 2.2 The scope of the test also includes checking the dissemination pathways of the Volcanic Ash Advisory (VAA) messages.
- 2.3 The test is not designed to check the issuance of Volcanic Ash SIGMET and so there is **no requirement** to issue test SIGMETs.

3. Back-up test procedures

- 3.1 **Procedures for Tokyo – Darwin VAAC Back-up tests**
Internal procedures related to handover of responsibility and issuance of VAAs for the other VAAC's area of responsibility will be tested and the results included in a final report.
- 3.2 **Procedures for testing the dissemination of back-up VAAs**
On the specified date at **0100 UTC** the Tokyo VAAC will issue a test Volcanic Ash Advisory (VAA) for the Darwin VAAC. The message will indicate that it is a TEST and will follow the format given in Section 4 of these procedures.

Recipients of the message **should send a confirmation email** to the address given in the message, including the message text and the time received.

MWOs should NOT issue a test SIGMET.

At **0200 UTC** the Darwin VAAC will issue test VAA for the Tokyo VAAC area of responsibility. The message will indicate that it is a TEST and will follow the format given in Section 4 of these procedures.

Recipients of the message **should send a confirmation email** to the address given in the message, including the message text and the time received.

MWOs should NOT issue a test SIGMET.

In the event of a major eruption in either area the test may be cancelled.

3.3 **Processing of the test results**

The Tokyo and Darwin VAACs, in conjunction with the Asia/Pacific Regional OPMET Databanks (RODBs), will analyse the received responses to the test messages and present the results to IAVWOPSG/7 in March 2013.

4. **Format of test VAA for the external test**

(from VAAC Tokyo to VAAC Darwin)

FVAU01 ADRM DDHHMM
VA ADVISORY
DTG: YYYYMMDD/HHMMZ
VAAC: DARWIN
VOLCANO: TEST 9999-999
PSN: N1000 E10000
AREA: UNKNOWN
SUMMIT ELEV: 9999M
ADVISORY NR: YYYY/N
INFO SOURCE: TEST TEST TEST
AVIATION COLOUR CODE: NIL
ERUPTION DETAILS: TEST TEST TEST
OBS VA DTG: 99/9999Z
OBS VA CLD: WIND SFC/FL999 999/99KT
FCST VA CLD +6 HR: NO VA EXP
FCST VA CLD +12 HR: NO VA EXP
FCST VA CLD +18 HR: NO VA EXP
RMK: THIS IS A TEST ADVISORY ISSUED BY TOKYO
VAAC FOR THE DARWIN VAAC AREA OF RESPONSIBILITY. PLEASE
ACKNOWLEDGE RECEIPT OF THIS ADVISORY BY SENDING AN EMAIL TO
DARWIN.VAAC AT BOM.GOV.AU
DARWIN VAAC.
NXT ADVISORY: NO FURTHER ADVISORIES=

(from VAAC Darwin to VAAC Tokyo)

FVFE01 RJTD DDHHMM
VA ADVISORY
DTG: YYYYMMDD/HHMMZ
VAAC: TOKYO
VOLCANO: TEST 9999-999
PSN: N1000 E10000
AREA: UNKNOWN

SUMMIT ELEV: 9999M
ADVISORY NR: **YYYY/N**
INFO SOURCE: TEST TEST TEST
AVIATION COLOUR CODE: NIL
ERUPTION DETAILS: TEST TEST TEST
OBS VA DTG: 99/9999Z
OBS VA CLD: WIND SFC/FL999 999/99KT
FCST VA CLD +6 HR: NO VA EXP
FCST VA CLD +12 HR: NO VA EXP
FCST VA CLD +18 HR: NO VA EXP
RMK: THIS IS A TEST ADVISORY ISSUED BY DARWIN
VAAC FOR THE TOKYO VAAC AREA OF RESPONSIBILITY. PLEASE
ACKNOWLEDGE RECEIPT OF THIS ADVISORY BY SENDING AN EMAIL TO
VAAC AT EQVOL2.KISHOU.GO.JP
TOKYO VAAC.
NXT ADVISORY: NO FURTHER ADVISORIES=

APANPIRG/23
Appendix R to the Report on Agenda Item 3.4

CNS/ATM Implementation Planning Matrix

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
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.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
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.			

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
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 circuit with ROK put into operational use in June 2011. ATN/AMHS tests with India are on-going. Plan for ATN/AMHS implementation with Hong Kong, China (2012). Plan for ATN/AMHS implementation with Macau, China (2012). ATN and AMHS technical trial with Mongolia is TBD.	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. Total distance of air route with PBN is around 10.4 thousand km. which is approximately 7% of national route distance in China. 4RNP10 routes have been implemented in Sanya FIR. RNP4 has been implemented in Lhasa to Ali, Xining to Yushu and Europe-Asia route.	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.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
	Plan for test with Russian Federation (2012) Connection tests with Thailand is TBD.								
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 July 2009. 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 Taipei (2009), Beijing (2010), Thailand (2012), Japan (TBD), Philippines	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 Taipei conducted in 2010 and 2012	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 RNP4 Enroute (>FL290 in 2014)	Implemented in certain airspace Basic RNP-1 for SIDs and STARs in 2013.	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	FANS 1A trials for ADS-C completed in 2002.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
	(2014) and Viet Nam (2013) Plan for ATN/AMHS implementation with China (2012) and Taipei (2013).						FL 290 in December 2014 ADS-B trial using ADS-B signal provided 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. Mode SMSSR coverage available 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.		

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
FIJI	ATN BIS Router and AMHS implemented	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. Situations awareness service will be provided in 2013.	FANS 1/A ADS-C implemented.	
FRANCE <i>(French Polynesia Tahiti)</i>		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	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.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
	MUMBAI – THAILAND – BBIS -Awaiting readiness from Thailand MUMBAI AMHS – Commissioned in APRIL 2011								
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.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
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 Taipei 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 Taipei 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. Multilateration Systems have been implemented at five airports and are being implemented at three airports. PRM (WAM) is planned to be implemented at Narita Airport. (Operation will start in 2014).	FANS 1/A. ADS-C implemented in Fukuoka FIR.	
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.					

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
MALAYSIA	ATN BIS Router completed 2007. AMHS planned in 2012.	AFTN AIDC planned with Bangkok ACC – TBD. AIDC between Kuching and KK FIR already implemented. For Kuala Lumpur FIR, will be implemented by end of 2013.	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 in 2011.	Implemented for Oceanic Routes. RNAV-5 domestic Routes implementation in progress and partially implemented.	Basic RNAV implemented	RNP AR APCH for WMKP and WBGG in progress, will be implemented by middle 2013. Other airports next.	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 2013	ATM system software already upgraded to support AIDC. Trials with neighbouring ACC's planned in Sept. 2012.	New software upgrade in progress. Trials to be started in Aug. 2012.	Planned for completion in 2012	PBN based SIDS and STARS implemented.	RNP approach implemented at Ibrahim Nasir Int'l Airport	Implementation in progress. System to be commissioned in 2012.	Implemented since 2008. New software upgrade in progress and planned for completion in Aug. 2012	
MARSHALL ISLANDS						NPA implemented at Majuro Atoll.			
MICRONESIA (FEDERATED STATES OF)									
Chuuk				Implemented					
Kosrae				Implemented					
Pohnpei				Implemented					
Yap				Implemented					

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
MONGOLIA	AMHS/AFTN gateway is implemented in first quarter of 2012. ATNBIS router will be implemented in 2013. Coordinating with China on ATN/AMHS connection technical trial target date TBD.	ATM automation system supports AIDS and OLDI. Coordinating with Russia on OLDI connection in target date TBD. Coordinating with China on AIDC connection technical trial target date TBD.	Function available. Regular trials are conducted.		GPS procedures are being developed and implemented at 10 airports.		Five ADS-B ground station for combination with SSR will be implemented first quarter of 2013. Full coverage for surveillance gaps will be implemented by 2015-2016.	FANS 1/A ADS-C implemented since August 1998.	
MYANMAR	AMHS implemented Nov. 2011	Plan to support AIDC to the ATM automation system at 2013	Implemented since August 1998. Software upgrading and integration to ATC automation will be completed in 2012.	Three new DVOR installation have been completed by 2012 and plan to operate in 2013.	New ILS system at YGN Int'l AP finished installation by 2012 and plan to operate in 2013.		Plan to implement two ADS-B ground stations at the end of 2012.	Implemented since August 1998. Software upgrading and integration to ATC automation will be complete in 2012.	
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.		

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
NEW CALEDONIA	New router and AMHS planned at the end of 2013 with Nadi				Arrival GNSS based RNAV procedures have been developed by for La Tontouta Airport		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 area (WAM) and Auckland (airport surface movements). ADS-B data available from all MLAT & SSR sites.	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	Implementatio n 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.

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
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.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
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 March 2011. Completed ATN/AMHS trial using VPN over internet with Bahrain in 2011. On-going ATN/AMHS trial with Thailand and planned to complete by 2012.	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.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
	ATN/AMHS circuit with UK put into operational use in March 2012.								
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 Suvarnabhumi 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. The provider is linked to the New Zealand AFTN				RNAV procedures planned for 2013-2014	NPA planned for 2007. RNP AR APCH planned for 2013-2017	Trial planned for 2017		CPDLC and ADS-C is not considered for lower airspace

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
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 (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	Implemented	
VANUATU									

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
VIET NAM	BIS Routers planned for 2009. ATN/AMHS trial in 2010 and operation in 2012. ATN BIS Router AMHS in 2013	AFTN based AIDC implemented in 2009. Trial for ATN based AIDC planned in 2010. Trial for AIDC in 2012. Plan to implement in 2013	CPDLC operational trial conducted in early 2007. Implemented in 2007	For en-route TBD.	RNAV	GBAS 2015	2013	FANS 1/A ADS-C operational trial conducted for oceanic area of Ho Chi Minh FIR since March 2002. FAN 1/A implemented in 2007	

* Navigation – Navigation including Performance Based Navigation (PBN), APV and precision approach

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SUBJECT/TASKS LIST IN THE CNS FIELDS

The priorities assigned in the list have the following connotation:

A = Tasks of a high priority on which work should be expedited;

B = Tasks of medium priority on which work should be under taken as soon as possible but not to the detriment of Priority "A" tasks; and

C = Tasks of medium priority on which work should be undertaken as time and resources permit but not to the detriment of priority "A" and "B" tasks.

TOR = Terms of Reference of the Sub-Group

TASKS NO. 1 TO 34 HAVE BEEN COMPLETED AND REMOVED FROM THE LIST

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
1 (58)	(TOR 4)	A – Safety C-Sustainability All GPIs	Subject: To transit to PFF into ANRF	A	Develop ANRF relevant to CNS for regional monitoring	CNS SG	2013-2014
2 (35)	(TOR 3)	C-Sustainability All GPIs	Subject: To facilitate regional implementation of CNS/ATM Tasks: a) coordinate training/workshops to allow States to develop and implement new CNS/ATM procedures; b) encourage States to participate in the evaluation and training of new CNS/ATM systems; c) progress the adoption of WGS-84 co-ordinate system and introduction of high integrity systems for the management of the co-ordinate data.	A	1) Identify topics for training, develop syllabi and plan training programme; 2) Encourage States in the evaluation and training of new CNS/ATM systems; 3) Co-ordinate with States and monitor progress; 4) Collect information and suggest methods of resolving problems commonly faced by the States.	CNS SG ATM SG CNS SG	On going On-going On-going On-going

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
3 (36)	APANPIRG D. 4/46 RAN/3 C.12/3 APANPIRG 5/3 (TOR 3)	C-Sustainability All GPIs	Subject: Provision of adequate CNS services Task: Monitor CNS/ATM systems research and development, trials and demonstrations in the fields of CNS and facilitate the transfer of this information and expertise between States.	A	1) Encourage States to conduct R&D, trials & demonstrations of new CNS services; 2) Monitor global developments that may have beneficial consequences on regional planning activities; 3) Consolidate information on new capabilities in the CNS/ATM system, for the Sub-Groups review and action; 4) Serve as a focal point for review of ongoing work of Regional formal and informal working groups that is relevant to CNS; 5) Provide for coordinated training/seminars to keep all States informed on developments of trials and demonstrations.	CNS	On-going
4 (43)		C-Sustainability GPI17,18,19,22	Subject: Implementation of data link Task: Encourage implementation	A	Encourage States to implement CPDLC, D-ATIS, D-VOLMET and DCL	CNS SG	1st SOCM meeting held in 2009 and 2nd SOCM meeting held in 2012

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
5 (46)	APANPIRG/17 C 17/23	C-Sustainability GPI-5 GPI-11	Subject: To implement Performance Based Navigation Concept in Asia/Pacific Region Task: Implement Performance Based Navigation in the Region.	A	1) To conduct Workshops/Seminars in the Region to familiarize the States about PBN Concept 2) To develop roadmap for implementation of RNP and RNAV procedures	CNS SG ATM SG CNS SG	Seminar and Workshop on PBN were Conducted in 07/08, 03/2009, 05/2011 and one to be in December 2012 in December Regional PBN plan Ver. 3 was adopted in 2011.
6 (49)		A-Safety C-Sustainability E-Continuity GPI23	Subject: WRC-2015 ~~14~~ (2012) Task: Supporting ICAO position for ITU WRC-2015 on agenda items related to civil aviation	A	Seek States to support ICAO position at regional telecommunity – APT APG and at WRC.	CNS SG	On-going till 2015
7 (50)	CNS/MET SG/13 Decision 13/7 ToR (5)	C-Sustainability E-Continuity GPI21 GPI11	Subject: SBAS capability study Task: conduct study on the need for and feasibility of establishing a regional SBAS capability	B	To conduct study by members of the CNS/MET Sub-group	CNS SG PBNTF	2013
8 (51)	TBD by APANPIRG/20	A-Safety C-Sustainability GPI9	Subject: Study of using SSR Mode S SI code Task: Study on the need for introduction of SSR Mode S SI code for future use in the Asia and Pacific region	B	To conduct study by members by the CNS/MET Sub-group	CNS SG ADS-B SITF	2015
9 (52)	ToR of CNS/MET SG (4)	C-Sustainability GPI 22	Subject: HF Radio Communication Guidance material Task: Develop HF radio communication GM for North Pacific, BoB and Indian ocean area.	B	To develop the Guidance Material by members of the CNS Sub-group.	CNS SG Need volunteer to take the task For BOB and North Pacific area	2013

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
10 (53)	ToR of CNS/MET SG (5) and APANPIRG Conclusion 20/72	A-Safety C-Sustainability GPI-5, 9 GPI-11	Subject: Develop a standard ionospheric model to facilitate implementation of GNSS; Task: Estalbish Task Force for collection and exchange of ionospheric data with objective of establishing a standard ionospheric model	A	To collect data and and analysis the data towards development of required ionospheric model	CNS SG ISTF	2014
11 (54)	APANPIRG Conclusion 19/24 and Conclusion 20/32	A-Safety C-Sustainability GPI-5 and GPI22	Subject: Improve AMS(R) S communication in the remote and oceanic areal; Task: Promote development of performance and provision of satellite data link communication and develop solution for the challenges	A	Conduct satellite data-link operational continuity meetings. Mobilize stakeholders of AMS(R)S to improve the performance of the Satellite communication service. SOCM/1was held in Aug.09. SOCM/2 was held in Feb. 2012	CNS SG	2013
12 (55)	APANPIRG/13 C 13/19	C-Sustainability GPI-5 GPI-9	Subject: To improve situational awareness and enhance surveillance service Task: Implement ADS-B based surveillance service .	A	1) To conduct Workshops/Seminars in the Region to familiarize the States about ADS-B; 2) To develop sub-regional implementation plan for implementation of ADS-B; 3) Promote ADS-B data sharing	CNS SG	Seminar and Workshop on ADS-B were Conducted in 2004/05/06/07/08/09/10/11/12 South China Sea and Bay of Bengal Sub-Regional project Progressed. States started data sharing from 2011

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
13 (56)	APANPIRG/16 C 16/31	C-Sustainability GPI-22	Subject: To improve AFS in the Region Task: Implement ATN/AMHS to enhance ground to ground communication service in the Region.	A	1) To conduct Workshops/Seminars in the Region to familiarize the States about ATN/AMHS Concept 2) To develop implementation plan and coordinate trials and routing.	CNS SG	Seminar and Workshop every two years since 2005. Related FASID tables timely updated in 2012.
14 (57)	TOR	C-Sustainability GPI23	Subject: Aeronautical spectrum management Task: Review new criteria for VHF frequency allocation planning	A	To review new materials being developed by ACP to be included in Radio Handbook Volume I – Spectrum Strategy Objectives in Vol.1 and separation criteria for coordination in Vol. II	CNS SG	2013
15 (59)	TOR	C-Sustainability GPI 23	Subject: Regional common ground based communication infrastructure	A	To study regional common communication service provider for AFS between States in the APAC region	ATNICG CNS SG	2014
16 (60)	TOR APANPIRG\23 C23\	C-Sustainability	Subject: Introduction of Required COM Performance and Required SUR Performance	A	To conduct RCP & RSP workshop; To collect and provide required data	CNS SG	2014

* Number in bracket indicates sequential number since establishment of the Sub-group.

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SUBJECT/TASKS LIST IN THE MET FIELD

The priorities assigned in the list have the following connotation:

A = Tasks of a high priority on which work should be expedited;

B = Tasks of medium priority on which work should be under taken as soon as possible but not to the detriment of Priority "A" tasks; and

C = Tasks of medium priority on which work should be undertaken as time and resources permit but not to the detriment of priority "A" and "B" tasks.

TOR = Terms of Reference of the Sub-Group

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
1 (32)	RAN/3 C.8/14 APANPIRG/14 (TOR 3)	A-Safety Sustainability GPI-19	Subject: Inadequate implementation of procedures for advising aircraft on volcanic ash (VA) and tropical cyclones (TC) and other hazardous weather Task: Monitoring of the implementation of meteorological advisories and warnings which includes VA and TC	A	Monitor and provide assistance in the implementation of meteorological advisories and warnings procedures to ensure provision of timely information on weather hazardous to aircraft. Monitor outcomes of ICAO global groups and WMO for developing framework of contingency plan for specific phenomenon including VA, TC, radioactive cloud and Tsunami for the Region (coordinate with MET/ATM TF and proposed RACP TF when necessary)	MET SG Task Force on the implementation of meteorological advisories and warnings (METWARN/ITF)	On going
2 (36)	APANPIRG D. 4/46 RAN/3 C.12/3 APANPIRG 5/3	C-Sustainability All GPIs	Subject: Provision of adequate MET services Task: Monitor performance based systems research and development, trials and demonstrations in the fields of MET and facilitate the transfer of this information and expertise between States.	A	1) Encourage States to conduct R&D, trials & demonstrations of new MET services; 2) Monitor global developments that may have beneficial consequences on regional planning activities;	MET SG	On-going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
	(TOR 3)				3) Consolidate information on new capabilities in the CNS/ATM system, for the Sub-Groups review and action; 4) Serve as a focal point for review of ongoing work of Regional formal and informal working groups that is relevant to MET; 5) Provide for coordinated training/seminars to keep all States informed on developments of trials and demonstrations.		
3 (37)	C 12/24	C-Sustainability GPI-19	Subject : Transition to the GRIB and BUFR coded WAFS products Task : Implementation of the transition to the GRIB and BUFR coded WAFS products	A	1) Monitoring of implementation of BUFR coded SIGWX forecasts 2) Monitoring of the migration to SADIS 2G 3) Assist in preparation for the new gridded products for turbulence, icing and cumulonimbus 4) Monitoring of the implementation of WIFS until cessation of ISCS G2 broadcast	MET SG WAFS Implementation Task Force WAFS/I TF WAFS/I TF	Completed Completed 2013 Completed

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
4 (38)	C12/36 APANPIRG C14/45	C- Sustainability GPI-19	Subject: Developing the new requirements for MET products and services in support of ATM.	A	1) Development of the initial draft of the MET Chapter; 2) Development of the MET components of the CNS/ATM concept/ strategy; 3) Inclusion of ATM requirements for MET information in the CNS/ ATM Plan; 4) MET/ATM Coordination Seminar – February 2006. 5) Conduct survey on ATM requirements for MET information 6) MET/ATM meeting in 2009 7) MET/ATM seminar in 2010 (in coordination with WMO)	CNS/MET SG with assistance of MET WG on CNS/ATM Plan CNS/MET SG METATM TF METATM TF MET ATM TF MET ATM TF	Completed Completed Completed Completed Reconvene Completed Completed
5 (39)	APANPIRG/13 D 13/28	A - Safety C- Sustainability GPI-19	Subject: To improve the efficiency of the regional and inter-regional OPMET exchange and the availability of OPMET information from the ASIA/PAC Region Task: Review and optimize the ROBEX scheme and other	A	1) Review and update regional ROBEX tables and relevant documents; 2) Propose optimization changes to the ROBEX scheme; 3) Improve the availability	MET SG OPMET Management Task Force (OPMET/M TF)	Recurrent task Completed On-going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
			OPMET exchanges; introduce monitoring and management procedures for the ROBEX centres and Regional OPMET data banks		of OPMET data at the Regional OPMET Data Banks (RODB); 4) Improve the availability of OPMET information from the Pacific States; 5) Introduce monitoring and management Procedures. 6) reconsider current RODB structure in light XML implementation		On-going Completed 2015
6 (43)		C- Sustainability GPI17,18,19,22	Subject: Implementation of data link Task: Encourage implementation	A	Encourage States to implement CPDLC, D-ATIS, D-VOLMET, PDC and DPC	MET SG CNS SG	
7 (45)	APANPIRG List of deficiencies	A – Safety GPI - 19	Subject: Implementation of SIGMET Task: Improve regional procedures and availability of SIGMET from ASIA/PAC States	A	1) Assist States in implementing SIGMET requirements; 2) Conduct regular SIGMET tests; 3) Review and update training and guidance material; 4) Regular monitoring on the availability and quality of SIGMET and advisories.	MET SG METWARN/I TF in coordination with OPMET/M TF	Recurrent task Recurrent task Recurrent task Recurrent task

* Number in bracket indicates sequential number since establishment of the Sub-group.

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 Asia/Pacific Seamless ATM Planning Group Outcomes

3.5.2 The First Meeting of the ICAO Asia/Pacific Seamless Air Traffic Management (ATM) Planning Group (APSAPG/1) was held in Bangkok, Thailand from 31 January to 3 February 2012. The meeting was attended by 48 participants from Australia, Bangladesh, Cambodia, China, Hong Kong China, India, Indonesia, Japan, Lao PDR, Malaysia, New Zealand, Philippines, Republic of Korea, Singapore, Thailand, United States, Viet Nam, IATA, IFATCA and CANSO.

3.5.3 Mr. Mike Haines, Manager Aeronautical Services of Civil Aviation Authority of New Zealand, and Mr. Takeshi Imagome, Director of Air Traffic International Affairs Office of Japan Civil Aviation Bureau (JCAB) acted as Co-chairs of APSAPG/1.

3.5.4 APSAPG/2 was held at Tokyo, Japan from 6 to 10 August 2012. The meeting was attended by 41 participants from Australia, Cambodia, China, Hong Kong China, India, Indonesia, Japan, Malaysia, New Zealand, Philippines, Republic of Korea, Singapore, Thailand, United States, CANSO, IATA and IFALPA.

3.5.5 Mr. Yoshiki Imawaka, Deputy Regional Director of ICAO Asia and Pacific Office, advised that Mr. Takeshi Imagome of the Japan Civil Aviation Bureau (JCAB) had taken a new position and would therefore be stepping down as an APSAPG Co-chair with immediate effect. Mr. Ng Shung Ching Colman, Assistant Director-General of Civil Aviation, Civil Aviation Department of Hong Kong, China was nominated to take Mr. Imagome's place, which was seconded by Japan and agreed by the meeting.

Definition of Seamless ATM Operations

3.5.6 CANSO suggested to the meeting that to facilitate discussions on a Seamless ATM plan for the region it was necessary at the onset for the APSAPG to agree on the definition of the term Seamless ATM operations. CANSO proposed the following definition:

Seamless ATM operations is defined as ATM operations in contiguous airspace that is technically and procedurally interoperable, universally safe, and in which all categories of airspace users transition between Flight Information Regions, or other vertical or horizontal boundaries, without requiring a considered action to facilitate that transition and without any noticeable change in:

- 1) Type or quality of service received;*
- 2) Air navigation and communications performance standards; and*
- 3) Standard practices to be followed.*

3.5.7 IATA also proposed the meeting adopt the CANSO definition of Seamless ATM. The meeting discussed the definition at length. IATA recalled that the CANSO definition had been endorsed by Air Navigation Service Providers (ANSPs) worldwide.

3.5.8 APSAPG agreed that there was no need to endorse a specific definition, but the CANSO definition was acknowledged. However, an alternative wording based on the CANSO definition, as there was concern about the usage of terms such as 'without considered action' when different airspace classes naturally changed the service level. The meeting agreed that the following alternative proposed by Australia was an appropriate description of Seamless ATM objectives:

The objective of Seamless ATM is the safe and interoperable provision of harmonized and consistent air traffic management to a flight appropriate to the airspace category and free of transitions, due to a change in the air navigation service provider or Flight Information Region.

Drivers for Seamless ATM

3.5.9 IATA noted that within the South China Sea, planning for enhanced surveillance using radar, Automatic Dependent Surveillance-Broadcast (ADS-B) and ADS-C (Contract) for remote areas was underway. However, planning had not progressed in a synchronized fashion in order to result in the development of a complete surveillance capability. Despite a positive business case, forthcoming ADS-B mandates, and equipage up 79% in the area, it was still not clear when users could expect surveillance-based service delivery.

3.5.10 IATA had conducted an analysis of the Singapore to Hong Kong, China city pair, and found that from 2004 to 2011 the average ‘block to block’ times had increased in the order of 2.9 to 3.9 minutes per flight; thus it was clear that the current ATM system was not providing the efficiencies of reduced fuel burn and emissions per flight that it needed to. Hong Kong, China had stated the increases in ‘block to block’ times could also be attributed to such factors as weather, airline fuel management techniques and type of aircraft, and that traffic growth over the 2004 – 2011 period had been 65%, or 7-8% per annum. IATA confirmed that the data had taken weather issues into account, and that there were no airline or aircraft factors that contributed to the increased sector times.

3.5.11 The meeting was informed that Asia/Pacific was the world’s fastest growing aviation market, and Asia Pacific currently handled 26% of global passenger numbers and this proportion is expected to increase to 30% of global traffic over the next three year – a 7% annual increase. Aircraft numbers were expected to grow three-fold over the next twenty years, with much of the increase occurring between Asia/Pacific city pairs. Capital expenditure in Asia/Pacific airport infrastructure was expected to top USD60B in the next 10 years, from a total global projected airport capital expenditure of USD150B.

3.5.12 It was considered as inconceivable that traffic increases of this magnitude could be handled effectively and efficiently without significant enhancement of the ATM processes. There was considerable development of ATM infrastructure by a number of States and ATM providers within their airspace – the challenge now was to ‘link’ this airspace with Seamless ATM.

3.5.13 IATA contended that the Asia/Pacific had the capability to leapfrog some NextGen and SESAR work. They commented that there had been no capacity improvement in this area for ten years, and that the ATM system was not keeping pace with traffic growth. The capability to deal with rapid traffic growth, similar to the capability in Europe and North America, was needed. Hong Kong, China noted that there had been significant ATM improvements over the years in the South China Sea, including South China Sea reorganization in 2001, RVSM in 2002 and the application of 50NM horizontal separation in 2008, with the next planned change being the implementation of 30NM separation based on RNP4 in December 2014. IATA stated that what was needed was a quantum leap to surveillance-based separations such as 5-10NM. Moreover, IATA stressed that there was a need to focus on improvement for airspace volumes, not specific ATS routes.

3.5.14 The meeting noted that the necessary enabling technology was present but it was somewhat fragmented, and being implemented slowly, mainly due to the very diverse APAC economies and environment, and terminal airspace congestion.

Planning Framework for Seamless ATM

3.5.15 The meeting noted that the current planning for Seamless ATM through the APSAPG and the adoption of the Asia/Pacific Air Navigation Concept of Operations were initiatives developed to give an overall framework for implementation planning for the region.

3.5.16 IFATCA was of the view that controllers had to be involved at all stages of planning and implementing a Seamless ATM Environment project in the Asia/Pacific Region in order to ensure that there was no misunderstanding of the objectives and final outcomes, and to avoid some of the earlier problems in the Single European Sky Automation Research (SESAR, Europe) and NextGen (USA) programmes.

3.5.17 It was highlighted that just as the controllers in the SESAR and NextGen projects faced varied professional and social challenges, Asia/Pacific controllers were likely to be faced with similar issues. However, some States in the region might face challenges not just involving operational issues, but also necessitating a change to their basic administrative and managerial model in terms of implementing Safety Management Systems (SMS) and 'Just Culture' principles.

3.5.18 IFATCA emphasized that it fully supported the establishment of a Seamless ATM environment within the Asia/Pacific Region. They highlighted the fragmented nature of ANSP provision in the Asia/Pacific Region, compared to the North American and European major traffic areas. Noting that the NextGen and SESAR programmes were quite slow and expensive, the meeting acknowledged the Asia/Pacific did not have to develop such extensive technology programmes.

3.5.19 IFATCA discussed the Functional Airspace Blocks (FAB) being used in Europe to optimize airspace. They noted that some FAB could not be developed as envisaged because of political or national security issues. For their part, the controllers were very concerned about ATC Centres being merged and the effect on the controller workforce, and the initial lack of engagement between EUROCONTROL and controllers was described as not assisting this process. The degree of recent coordination and cooperation between controllers and the Federal Aviation Administration (FAA) in NextGen system planning was acknowledged.

3.5.20 IFATCA stated that any change to Major Traffic Flows (MTF) could impact the many regional and domestic routes, particularly crossing routes. It was important that the APSAPG did not just focus on the MTF, but also included the airports, and terminal airspace elements. It was contended that one item that must be considered was controller workload and complexity using a safety case analysis. Controllers needed to be aware of the technology used by aircraft in addition to their own procedures and facilities.

3.5.21 IATA stressed that they were not pursuing a single sky, but seamless ATM. They noted that it cost EUR12B to provide European ATC, which was calculated to have an inefficiency cost of EUR4B. Of this, EUR3B was associated with the lack of Seamless ATM activity and EUR1B regarding disaggregation of ATC units or FIRs, thus a focus on Seamless ATM was the priority.

3.5.22 IATA suggested that where direct surveillance was available, 10NM separation should be provided by December 2014, and 30NM separation on all other South China Sea routes by December 2016, supported by ADS-C and Controller Pilot Data-link Communication (CPDLC).

3.5.23 IATA advocated adoption of the ICAO Aviation System Block Upgrades (ASBU) to ensure global harmonization, with an initial focus on BLOCK 0 to better utilize current avionics. There was consensus by the meeting that the ASBU concept was an appropriate guiding mechanism. However as the ASBU document was still being drafted and not formally endorsed until the AN.Conf/12, it could not be formally endorsed by APSAPG.

3.5.24 The Republic of Korea stated that each State had different capabilities and implementation situations, and that all ASBU elements could be implemented through the result of study and analysis. They noted that the capability matrix spread sheet being developed would be helpful to determine the implementations status and identify implementation strategies.

3.5.25 The meeting recalled that programmes such as NextGen had a common budget and a quite different situation to the individual Asia/Pacific States. Thus the Asia/Pacific Seamless ATM Plan would be conceptual in nature, containing principles and guidance.

3.5.26 ICAO presented information on the possible methodologies that could be used to facilitate the development of Seamless ATM in the Asia/Pacific Region. The meeting recalled that the ICAO Asia/Pacific Seamless ATM Ad Hoc meeting (Bangkok, 17 August 2011) work should focus on identifying Seamless ATM gaps, barriers and enablers for gate-to-gate operations on the busiest Asia/Pacific MTFs in an incremental manner (project orientated), with an operational plan for each MTF.

3.5.27 Through its direct reporting relationship to APANPIRG, APSAPG was given with a unique mandate and opportunity to address long-standing systemic ATM issues in the Asia/Pacific Region. The Terms of Reference (TOR) had been circulated to States after the Seamless ATM Ad Hoc meeting and endorsed by APANPIRG/22. The meeting reviewed the TOR, recalling that the expectation was for APSAPG to identify current gaps in capability, develop significant recommendations and deliver guidance for States. It was noted that the challenge for APSAPG was to be an agent of change, both as a model in its working relationships and through bold, visionary recommendations.

3.5.28 The Seamless ATM Ad Hoc meeting had stated that there should be a focus on the MTFs and 'low hanging fruits' (simpler projects with good deliverables and a higher probability of success). Therefore a comprehensive study of the Asia/Pacific MTFs was initiated by the Regional Office. The MTF Study included a minimum of two representative ATS routes from each MTF, and a number of short-haul city pair routes which were collectively intended to include as many major Asia/Pacific aerodromes as possible.

3.5.29 Each route was intended to be analysed from airport gate to airport gate, with a focus on aerodrome operations to determine the gap between the current level of ATM capability and Asia/Pacific Air Navigation Concept of Operations requirements as well as the ASBU concept (Block Zero – 0). The intention of the MTF Study was to provide accurate inputs into the Capabilities Matrix, and determine the portions of airspace that required an ATM service upgrade, an enhanced capability or a different approach by the States concerned.

3.5.30 The Seamless ATM Ad Hoc meeting had stressed that ground systems needed to be addressed, especially in the areas of aerodrome and terminal airspace complexity, taxiing and pushback, and runway capacity. The APSAPG/1 meeting noted the need for special analysis of the aerodrome environment, in addition to the ASBU elements, identify efficiency improvements and interoperability for the terminal environment, otherwise gains made in other areas could be lost. Thus, a study of aerodrome aspects, which included terminal airspace, would provide this focus.

3.5.31 The analysis of MTF airspace essentially created Functional Airspace Blocks (FAB), which was consistent with the European process. It was expected that these FAB would influence or affect non-FAB adjoining airspace due to common aircraft equipage requirements and ATM interfaces, so eventually contiguous airspace would share the same capabilities across the Region.

Civil/Military Cooperation

3.5.32 APSAPG/1 noted the crucial role of civil/military cooperation in Seamless ATM development, stressing the need to address this area.

3.5.33 APANPIRG/9 (August 1998) developed guidelines for civil/military cooperation. These guidelines appeared to be just as relevant today as they were in 1998. Notwithstanding this, progress in implementing the provisions in the Asia/Pacific Region appeared to be inconsistent. Thus it was considered appropriate to review and update the guidelines, in order to include the key elements of the 1998 guidelines as part of the APSAPG Asia/Pacific Seamless ATM Plan as appropriate. Incorporation into a formal Plan endorsed by each Asia/Pacific State for consideration as national legislation, policies and procedures could be a more effective method of promoting essential change in this area.

3.5.34 ICAO presented information on the assessment process used to incorporate civil/military principles into the early draft Asia/Pacific Seamless ATM Plan. There were 10 civil/military elements in the recent Seamless ATM State questionnaire, which were intended to contribute towards the overall 'seamless' assessment of airspace and systems of each State. In this connection, the civil/military elements constituted 29% of the overall assessment, reflecting the importance of this subject in terms of its effect on Seamless ATM operations. The principles appeared to be grouped into four major areas: trust, airspace, information sharing and the provision of joint systems or services.

Seamless ATM Assessment Survey

3.5.35 ICAO presented the results of the Asia/Pacific Seamless ATM Survey. The purpose of the questionnaire was to collect information regarding the status of current Asia/Pacific Air Navigation Service capabilities and aircraft equipment in order to support Seamless ATM planning. The survey results received thus far were collated into a Seamless ATM Assessment spreadsheet, in order to provide an overall measure of assessment and comparison.

3.5.36 The quantification of answers was achieved by using a simple word picture assessment process. In this connection, the information also provided valuable information on capability and planning that assisted the early drafting of the Asia/Pacific Seamless ATM Plan itself.

3.5.37 Of the 30 administrations surveyed, a total of thirteen (13) administrations responded. The results indicated that there were three general groups of administrations in terms of their Seamless ATM capability. The first group of eight administrations in the top third already had relatively Seamless ATM capability.

3.5.38 Most States providing ATM services within the Pacific Region were represented in this top group. Conversely, only three administrations from the Asia Region indicated a reasonable degree of current Seamless ATM capability. The remaining two groups either had significant gaps in Seamless ATM capability, but were expected to be working towards interoperability and enhanced systems, or did not respond to the survey. In the latter case the default results (if not known by other means) were assigned a nil (zero) Seamless ATM rating.

3.5.39 It was expected that States would provide further information to the Regional Office that could provide a more robust picture of Seamless ATM capability. However this needed to be provided before the APSAPG/3 meeting, when data analysis supporting the preparation of the Asia/Pacific Seamless ATM Plan was expected to be completed.

3.5.40 The Secretariat had developed a Capabilities Matrix to provide a target and means of monitoring the progress of ASBU implementation, which utilised the Seamless ATM Survey results. The Matrix detailed the ASBU Block 0 (systems available by 2013) and non-ASBU components such

as civil/military cooperation that would be expected to support Seamless ATM, and is appended in draft form at **Appendix 1**. The meeting endorsed this approach, stating that it would be a good tool to identify gaps.

Seamless ATM Principles

3.5.41 Draft Seamless ATM Principles had been initially developed from discussion at the ICAO Asia/Pacific Seamless ATM Symposium and Ad Hoc Meeting (Bangkok, Thailand, 15 to 17 August 2011) and reviewed at APSAPG/1 and the ATM/AIS/SAR/SG/22 meeting. The Draft Principles were intended to provide the basis for Seamless ATM policy and were thus crucial to set the over-arching expectations for the development of the Plan, and State actions consequential to the Seamless ATM Plan.

3.5.42 With the addition of the principle regarding simulators and the deletion of the Doc 4444 principle, there were 53 Draft Principles. These Draft Principles were extensively discussed and analyzed by the meeting. After review, the remaining 37 Draft Principles as amended were incorporated into the Draft Plan for further review at APSAPG/3.

Economic Benefits of Seamless Airspace

3.5.43 IATA presented information on the critical importance of aviation to economies and the historically high cost of aviation fuel. Noting that the objective was to achieve a single airspace continuum free of operational discontinuities and inconsistencies, IATA stressed that the expected economic benefits to be derived from Seamless ATM included, for example, passenger time savings, lower fares and rates, productivity improvements, stimulation of related industries, and transfer of high-technology skills.

3.5.44 If seamless airspace was fully realized, IATA stated that fewer ATM facilities covering wider areas could be envisaged. Thus during the transition towards seamlessness, some economic and organizational issues were likely to emerge, such as the establishment of a common charging scheme, as well as possible principles for the distribution of revenues among different providers.

3.5.45 Australia considered that business cases needed to be conducted by the implementation body that was investing. In this respect, APSAPG could assist in the development of this material. ICAO stated that this group was high-level so it was not necessary for APSAPG to include specific business case studies. Hong Kong China concurred with this view, stating that there was an expectation that the AN.Conf/12 would help to clarify ASBU business case matters to the States.

3.5.46 IATA proposed that APSAPG set up a small group comprised of States and International Organizations to determine a methodology to define the economic benefits of Seamless Airspace. IATA was prepared to commit resources to work with States and other organizations to define and quantify the likely benefits. The meeting acknowledged IATA's offer and requested that they lead the Economic Contact Group which was established during APSAPG/2. The USA also agreed to assist with economic data and assumptions from their NextGen studies.

3.5.47 The meeting noted that intent was not to develop detailed economic analysis of all recommendations but to create studies of example cases comparing current operations with potential Seamless ATM environments, which could be used to assist the education process for senior decision-makers. Such models could be scalable and would need to include some studies of potential capacity in the aerodrome and en-route environments. The meeting noted that the Seamless ATM Plan would need to be regularly reviewed, and updated in areas such as the economic analysis.

ASBU Element Assessment

3.5.48 Hong Kong, China provided a preliminary assessment on the three new modules that had been added to the ASBU Working Document since Version 2:

- *Initial Capability for Ground Surveillance* (B0-84);
- *Increased Effectiveness of Ground-based Safety Nets* (B0-102); and
- *Meteorological Information Supporting Enhanced Operational Efficiency and Safety* (B0-105).

3.5.49 Hong Kong, China recommended that the AIDC, CDM, ATFM, and ADS/CPDLC Block 0 elements should be considered as minimum operational and system needs and thus should be collaboratively implemented within the Asia/Pacific. To optimize cost-effectiveness, Hong Kong, China stated that it was important to highlight potential system interoperability issues induced by implementing different versions of individual ASBU modules such as AIDC (Versions 1.0, 2.0, 3.0, etc.) and/or AIXM (Versions 3.3, 4.5, 5.1, etc.). In addition, States were urged to give due consideration on the interoperability and backward compatibility between systems being implemented.

3.5.50 Thailand initiated a process of assessing regional modules of ASBU Block 1 with regard to the priority of Block 0 regional modules. It was noted that module *B0-30: Service Improvement through Digital AIM* was originally classified as non-critical. However, the module was related to 3 Regional Block 1 modules so it needed a higher priority.

3.5.51 Japan proposed an approach to identify key and minimum requirements for Seamless ATM by showing international ATFM initiative in East Asian region relating to *B0-35 Improved Flow Performance Through Planning Base on a Network-wide View* in ASBU Block 0.

3.5.52 Australia outlined the importance of the specific ATM safety priorities of the Asia/Pacific region forming a key part of the consideration of an updated draft Global Air Navigation Plan (GANP) and draft Aviation System Block Upgrades at the 12th Air Navigation Conference (AN.Conf/12, Montreal, 17-30 November 2012). Australia noted that the regional priorities, which first and foremost should focus on enhanced safety, may not be the same as those planned in Europe or North America, and nor may they be addressed with identical solutions being identified in those regions.

3.5.53 Australia suggested that any Asia/Pacific GANP and ASBU position statement must reflect the diverse nature of the States in the region and the challenges in meeting future forecast air traffic growth. In particular, Australia stated that regard must be given to focusing on priorities and proposals that will enhance aviation safety in the Asia/Pacific region. While noting that the draft GANP/ASBU represent an important first step toward performance-oriented strategic planning for the diverse nature of the States in this region, Australia expressed its concern regarding the limited time available for states to properly study and respond to the documentation prior to the AN.Conf/12 decision-making. The meeting agreed with this as part of the draft Position Statement.

3.5.54 The Secretariat presented a draft Asia/Pacific Position Statement on the ASBU initiative. The 48th Conference of Directors General of Civil Aviation Asia and Pacific Regions (DGCA/48, New Caledonia, 10 to 14 October 2011) had requested APSAPG to study the proposed ASBU and provide advice on the benefits, business case and implications to States and Administrations and explore formulating a regional position prior to the AN.Conf/12.

3.5.55 The APASPG/2 extensively discussed the draft Position Statement, and after modifying its content accordingly, agreed to a revised draft. The meeting incorporated the inputs from Australia, Hong Kong, China, Japan and Thailand into the list of element implementation priority. APANPIRG/23 agreed to the following Conclusion:

Conclusion 23/ 49 Asia/Pacific Position Statement on ASBU

That, the Asia/Pacific Position Statement containing the response to the Draft Aviation System Block Upgrade (ASBU) Document appended as **Appendix 2 to the Report on Agenda Item 3.5** be adopted for States to use as a reference in formulating their position for the 12th Air Navigation Conference .

Seamless ATM Draft Plan

3.5.56 In accordance with the APSAPG Terms of Reference (TOR), a draft Seamless ATM Plan outline was required to be developed for APANPIRG/23 (10-14 September 2012), with the completed Plan to be submitted to APANPIRG/24 in 2013.

3.5.57 The APASPG/2 meeting discussed the draft at length, and amended the draft accordingly. There was considerable discussion about the terms used to indicate the expectations of ATM service levels, and how these expectations might be presented in later versions. It was stressed at APANPIRG/23 meeting that there needed to be a substantial effort by APSAPG members to plan beyond Block 0, carry out necessary research, develop draft material, and review draft excerpts for the Asia Pacific Plan at the subsequent APSAPG meetings.

3.5.58 The draft Asia/Pacific Seamless ATM Plan (**Appendix 3** to the Report on agenda item 3.5) was presented to APANPIRG for review of the draft as a framework, containing the basic structure, introductory material and agreed Seamless ATM Principles. APANPIRG/23 thanked the Secretariat for the great effort in compiling the draft APAC Seamless ATM Plan. The completed document would become useful guidance material to assist the implementation of seamless ATM. The meeting noted that the completed document should look at user expectations as well as States and ANSP's requirements, achieving seamless ATM across the APAC regions in a truly collaborative, practical and visionary manner

3.5.59 **Civil Aviation and the Environment State Action Plan**

3.5.60 The Meeting received an update on ICAO activities to assist States in the preparation of action plans on CO₂ emissions reduction activities. The Meeting recalled that ICAO developed, in collaboration with an ad-hoc group from the ICAO Committee on Aviation Environment Protection (CAEP) composed of States and stakeholders, the document *Guidance Material for the Preparation of States' Action Plans*, which serves to guide States, step-by-step, through the process of preparing and submitting an action plan. A dedicated interactive web-interface was also developed to facilitate the submission of States' action plans to ICAO.

3.5.61 In addition, in order to provide practical assistance to States in their preparation of action plans on CO₂ emissions reduction activities, ICAO held six hands-on training workshops in 2011 in Mexico City, Mexico, Bangkok, Thailand, Dubai, UAE, Nairobi, Kenya, Paris, France and Montréal, Canada. Over the course of these six workshops, ICAO trained national focal points from over 80 States.

3.5.62 The action plans are a key area of the Organization's work priorities, in preparation for the 38th Session of the ICAO Assembly. The action plans provide a unique opportunity for States to both showcases their initiatives to improve fuel efficiency and reduce emissions, and to articulate their assistance needs. The information included in the plans will allow for the assessment of potential future progress toward the achievement of global aspirational goals set forward by ICAO Assembly

Resolution A37-19. Consequently, active involvement of Member States is critical to the success of this initiative and to the ability of ICAO to effectively develop policies and practices toward the environmental sustainability of air transport.

3.5.63 States may choose amongst a basket of measures to be included in their action plans, e.g. aircraft-related technologies, operational improvements, market-based measures and sustainable alternative fuels. The ICAO Fuel Savings Estimation Tool (IFSET), which is available for free on the ICAO public website, has been developed by the ICAO with support from States and international organizations to be used by States to estimate the fuel savings and corresponding environmental benefits from the implementation of operational improvements, as part of the development of States' action plans.

3.5.64 At the time of APANPIRG/23 meeting, the ICAO has received 46 State Action Plans, representing approximately 62.13 per cent of international Revenue-ton-kilometer (RTK). The ICAO continues to support States in the development of their action plans by contacting national focal points and providing technical assistance, upon request.

3.5.65 The Meeting was apprised that ICAO will hold the Assistance for Action – Aviation and Climate Change Seminar from 23 to 24 October 2012, in Montréal, Canada. The seminar will focus on the assistance needs identified by States in their action plans.

APANPIRG/23 noted the information and adopted the following conclusion:

Conclusion 23/50: States' Action Plan on Environment

The States

- a) continue to consider environmental issues in the planning and implementation of regional air navigation systems;
- b) bring to the attention of the ICAO specific areas where additional guidance on environmental benefits would be valuable;
- c) use of IFSET to estimate the fuel savings and corresponding environmental benefits from the implementation of operational improvements, as part of the development of States' action plans;
- d) note the availability of further assistance by ICAO in the preparation and submission of States' action plans; and
- e) attend the Assistance for Action – Aviation and Climate Change Seminar in Montreal from 23 to 24 October 2012.

3.5.66 Collaborative Decision Making for City Pairs

3.5.67 CANSO informed the meeting that CANSO and ACI had recently signed a memorandum of cooperation at the global level to promote the roll out of CDM programs world-wide. ACI and CANSO would also develop a joint best practices guide to CDM implementation, taking into account existing documentation and the use of standard definitions, protocols and procedures to facilitate interoperability. Such a global practical guide to CDM implementation could serve a complementary role to the guidance material published by ICAO.

3.5.68 CANSO also highlighted about their pilot CDM project for the Bangkok-Singapore facilitated by them. The project team was co-chaired by AEROTHAI and CAAS and comprised representatives from AEROTHAI and CAAS as well as the intermediate Air Navigation Service Providers DCA Malaysia, the Airports of Thailand, Changi Airport Group, Thai Airways and Singapore Airlines. Since its inception in June 2011, the project team had built the model and designed the interfaces and methods for information exchanges between the parties concerned. The work culminated in two live trials in July and August 2012, each of a week's duration involving eight daily return flights between Bangkok and Singapore. A meeting of the project team was held on 28 August 2012 in Hong Kong to review the data collected from the trials. The Bangkok-Singapore CDM project was the first CDM project aimed at integrating airport CDM with in-flight CDM which if successful could serve as the model for other city pairs across the region.

3.5.69 CANSO noted that CDM is an important module of the ICAO ASBU and provided an excellent opportunity in the development of the region's strategy for a seamless sky. The meeting was requested to note the information in the paper and to encourage closer collaboration among airports, ANSPs and airlines in the development and implementation of system-wide CDM for specific city pairs in the region.

3.5.70 USOAP Programme – Public Health Emergency Preparedness Protocol Questions, Continuous Monitoring Approach (CMA)

3.5.71 APANPIRG noted that to mitigate the impact of public health emergencies (PHE) on the aviation sector, emergency preparedness is essential. ICAO informed the meeting that to encourage the aviation sector to work with the public health sector in preparedness planning for public health emergencies, changes have been made to several ICAO Standards and Recommended Practices (SARPs), and has also developed guidelines to encourage States to implement articles of relevance to aviation from the WHO International Health Regulations (IHR 2005).

3.5.72 APANPIRG also noted the challenges with regard to implementation of the ICAO Health Related SARPs and Guidelines as different ICAO Annexes, i.e. Annex 6, 9, 18, Annex 11/Pans ATM, and Annex 14 come into play. ICAO SARPs are audited periodically as part of the ICAO Universal Safety Oversight Audit Programme (USOAP). The meeting took note that as the USOAP Programme transitions towards the Continuous Monitoring Approach (CMA), from 2013 the USOAP audit protocol will include Protocol Questions on public health emergency (PHE) planning.

3.5.73 ICAO has established the Cooperative Arrangement for the Prevention of Spread of Communicable Disease through Air Travel or CAPSCA Programme to develop harmonized multi-sector guidance for States to facilitate effective management of public health emergencies in the aviation sector. CAPSCA provided a platform, unique in aviation, to help meet the challenges of multi-sector preparedness planning. CAPSCA assistance visits to individual States served as a mechanism for improved preparedness planning. APANPIRG/23 adopted the following conclusion:

Conclusion 23/51 — ICAO Public Health Emergency related SARPs

That, States/Administrations:

- a) should develop, update and test aviation public health emergency (PHE) preparedness plan in collaboration with public health authorities, in compliance with related ICAO SARPs and WHO IHR (2005), and prepare for the ICAO USOAP Continuous Monitoring Approach (CMA) audit which, from 2013, will include protocol questions concerning PHE related ICAO Standards and Recommended Practices; and

- b) consider become participating members of the ICAO CAPSCA Asia Pacific project, if not yet members, and accept PHE Preparedness Assistance Visits by the ICAO CAPSCA Asia Pacific Project, by sending a letter to the ICAO APAC Regional Office.

3.5.74 Inter-Regional Co-Operation to Achieve “Seamless” Operations and Air Traffic Management

3.5.75 IATA summarized the development of an Arabian Sea/Indian Ocean (ASIO) User Preferred Routing (UPR) Zone and highlighted the co-operation between many states from three ICAO regions together with a number of airlines and the INSPIRE partnership. It showed what can be achieved by like-minded proactive effort from all stakeholders to progress Seamless operations.

3.5.76 APANPIRG noted this productive effort and the model in Seamless planning and to proactively engage with other ICAO Regions to foster global seamless operations.

The meeting:

- encouraged ICAO regional office to strengthen inter-regional coordination by:
 - o inviting concerned States from other Regions to appropriate meetings; and
 - o ensuring ICAO Regional Officers attend appropriate meetings held in other regions;
- encouraged States to expedite the planning of airspace blocks such as the UPR Zone initiative to support Seamless ATM implementation at the earliest opportunity; and
- noted the effectiveness of State collaboration in developing the UPR Zone as a model to progress the Asia Pacific Seamless ATM Plan implementation.

3.5.77 Ensuring Infrastructure Capability will Meet Future Air Transport Capacity and Efficiency Demands to Realize the Economic Benefit which Aviation will bring to Asia Pacific States and Communities

3.5.78 IATA highlighted the Airline Industry’s concern at the increasing level of delay at many airports and major routes questioning the ability of the Asia Pacific ATM infrastructure to meet future air traffic demand. The meeting noted the proposed ASEAN Single Aviation Market will be implemented in 2015 and the potential loss of economic benefit to the Region if capacity constraints limit traffic levels. Airlines had reported increased delay and capacity constraints at many airports and airlines’ leading to increased concern at the cost and inconvenience of delay.

3.5.79 IATA outlined their program for 2013 to identify key airports with capacity constraints and to work with airports and ANSP on determination and agreement of practical capacity levels. At these selected locations IATA also noted their intention to facilitate Aerodrome Collaborative Decision Making (A/CDM) agreements and to participate in existing enroute CDM programs.

3.5.80 IATA also questioned the current ICAO processes to successfully manage the Seamless ATM program implementation noting that ICAO Europe Region had delegated implementation of Europe wide ATM upgrades to Euro control some year ago. IATA had agreed to develop the Seamless ATM cost benefit analysis and will complete an initial draft for APSAPG/3 early in 2013.

APANPIRG/23 noted the request from IATA that States;

- o Support the discussion at key airports to develop realistic capacity evaluation;
- o Support the establishment of A/CDM at the selected airports;
- o Support the dialogue to improve gate-to-gate CDM along major air routes across State boundaries;
- o Support IATA in developing the cost/benefit case for Seamless ATM under APSAPG.

3.5.81 IATA stated that APSAPG need to address implementation issues and shall discuss seamless ATM progress with the ASEAN and APEC bodies. APANPIRG/23 requested the APSAPG to consider seamless ATM implementation issues in their final report to APANPIRG/24 and to recommend appropriate mechanism for implementation. APANPIRG noted that ICAO is in discussion with ASEAN and APEC on certain matters.

3.5.82 Sub-Regional Air Traffic Flow Management (ATFM) Concept with Collaborative Decision Making (CDM)

3.5.83 A joint paper by Hong Kong, China, Singapore and Thailand was presented to update the meeting on a collaborative effort by the three Administrations to develop a sub-regional ATFM concept. Aeronautical Radio of Thailand Limited (AEROTHAI), the Hong Kong Civil Aviation Department (HKCAD) and the Civil Aviation Authority of Singapore (CAAS) manage significant air traffic movements in this region. In 2011, these three ANSPs each handled an average annual movement of 300,000 flights. The unique and common challenge faced by the three ANSPs provides an opportunity for the three ANSPs to collaborate toward developing an ATFM concept with CDM. The composition of air traffic at these hubs which are predominantly international air traffic would mean that current localised ATFM concepts would not serve these international hubs with the fullest benefits.

3.5.84 HKCAD, AEROTHAI and CAAS will be exploring the concept of networked CDM to manage the traffic flows between these three hubs at a sub-regional level. Given the high volume of international traffic at the three hubs, the collaboration could act as a “Petri Dish” to seed such concepts and also provide a test-bed facility for further research in applying ATFM at a regional level. Through collaboration and information sharing, such concept could potentially be further expanded to manage air traffic in the air-hubs’ catchment areas. These catchment areas could be a union of areas defined as flight time from within 4 to 5 hours range from these hubs. The concept could potentially serve as virtual ATFM units to manage air traffic flows between major air-hubs in the sub-region.

3.5.85 Bangkok-Singapore CDM Initiative

3.5.86 Singapore on behalf of CANSO, Malaysia and Thailand updated the progress on the Bangkok-Singapore Collaborative Decision Making (CDM) Initiative. Under the auspices of CANSO, the aviation partners in Singapore, Malaysia and Thailand had launched a pilot “Bangkok – Singapore Collaborative Decision Making (CDM) Project” in June 2011 with the aim to improve Air Traffic Management (ATM) efficiency between the two major cities in the Asia-Pacific region. The pilot project aims to demonstrate benefits and will establish best practices for other city pairs in the region.

3.5.87 The meeting was informed that the Bangkok-Singapore CDM project trials were successfully carried out in July and August 2012 involving eight daily return flights operated by Singapore Airlines and Thai Airways. The information on the flights were shared in near real-time with all the parties using a data template hosted on cloud computing. The trial allowed partners to

familiarize with the concept of CDM and to enable all stakeholders to share a common picture of the flights in progress.

3.5.88 The meeting noted that one of the significant benefits was the ability for the stakeholders to better plan the operational execution of the participating flights. For example, there could be a better matching of flight planning and tactical stand planning which would lead to better resource management by the ground handlers and airport operators. Another example was that Air Traffic Controllers (ATC) can plan the ground traffic movement and minimize the flights' departure delay by having knowledge of its Targeted-Off-Block Time (TOBT). The TOBT, as declared by the airline, would provide ATC with the predictability to execute tactical plans to enhance ground movements. The participating airlines also suggested that with better predictability, they would have the confidence to further refine their flight scheduling buffers. This would potentially translate to man-hour costs and fuel savings.

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Seamless ATM Implementation	ASBU Block 0 elements (18)																		State	Regional Elements (7)			State
	B0-05	B0-10	B0-15	B0-20	B0-25	B0-30	B0-35	B0-40	B0-65	B0-70	B0-75	B0-80	B0-84	B0-85	B0-86	B0-101	B0-102	B0-105	Totals	APT	ACCESS	DAT	Totals
United States	2	2	2	2	2	1	2	2	2	0	1	2	2	2	1	2	2	2	31	2	2	1	11
India	1	2	1	1	1	1	1	2	2	2	2	2	2	0	1	2	2	2	27	1	2	2	12
Australia	1	2	0	1	2	0	2	2	2	1	2	2	2	2	1	2	2	2	28	2	2	2	12
New Zealand	1	2	1	1	2	1	1	2	2	1	2	1	2	0	1	2	2	2	26	2	2	0	12
Singapore	2	2	1	1	0	1	1	2	2	1	2	1	2	2	0	2	2	2	26	2	2	2	13
Hong Kong, China	1	2	1	1	1	1	1	2	2	1	2	2	2	1	2	2	1	2	27	2	1	2	9
Republic of Korea	2	2	0	1	2	1	1	2	2	1	2	0	2	0	2	2	2	2	26	2	0	0	9
Fiji	1	2	0	0	2	0	0	2	1	1	0	0	1	2	1	2	1	2	18	2	2	2	11
Japan	2	2	0	1	2	1	2	2	2	1	2	0	2	0	0	2	1	2	24	2	1	0	10
Thailand	0	1	1	0	0	0	1	2	0	1	2	1	2	2	2	2	1	2	20	1	2	0	9
Malaysia	0	2	1	0	1	0	1	2	0	1	2	0	2	0	0	2	2	2	18	0	0	0	5
Indonesia	1	0	0	0	1	0	1	2	1	1	0	0	2	0	0	2	2	1	14	0	0	2	8
Philippines	1	2	0	1	0	0	1	0	2	1	0	0	0	0	0	2	1	0	11	2	0	0	5
Afghanistan	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	4	0	0	0	0
French Polynesia	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
China	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DPR Korea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lao PDR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maldives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mongolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myanmar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nauru	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nepal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pakistan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Papua New Guinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solomon Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sri Lanka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viet Nam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Element Total	15	23	8	10	18	7	15	26	20	13	19	11	25	13	11	26	21	23		20	16	13	
APAC %	47%	39%	14%	17%	31%	12%	26%	44%	34%	22%	32%	19%	43%	22%	19%	44%	36%	39%		34%	27%	22%	

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Civ/Mil Elements (10)		% Military	SUA	International	Integrated	Joint Aids	Shared	Common	Common	State CM	State Grand Total		
Body	Liaison	SUA	Review	SUA	ATM	Aerodromes	Data	training	procedures		Value	%	
2	2	1	1	2	1	2	2	2	2	17	59	84%	United States
2	2	2	2	2	2	2	2	2	2	20	59	84%	India
2	1	2	2	0	1	2	2	2	2	16	56	80%	Australia
0	2	2	2	2	2	2	2	2	2	18	56	80%	New Zealand
2	2	2	0	0	0	2	1	2	2	13	52	74%	Singapore
0	1	2	0	2	2	2	2	2	2	15	51	73%	Hong Kong, China
2	2	0	2	0	2	2	2	2	2	16	51	73%	Republic of Korea
2	2	2	2	2	2	2	2	2	2	20	49	70%	Fiji
1	2	2	1	0	2	2	0	2	2	14	48	69%	Japan
2	2	0	2	2	1	2	2	0	0	13	42	60%	Thailand
2	2	1	0	0	1	2	2	2	2	14	37	53%	Malaysia
0	2	2	0	2	0	0	1	1	1	9	31	44%	Indonesia
2	2	2	0	2	0	0	1	2	2	13	29	41%	Philippines
0	0	0	0	0	0	0	0	0	0	0	4	6%	Afghanistan
0	0	0	0	0	0	0	0	0	0	0	4	6%	French Polynesia
0	0	0	0	0	0	0	0	0	0	0	0	0%	Bangladesh
0	0	0	0	0	0	0	0	0	0	0	0	0%	Cambodia
0	0	0	0	0	0	0	0	0	0	0	0	0%	China
0	0	0	0	0	0	0	0	0	0	0	0	0%	DPR Korea
0	0	0	0	0	0	0	0	0	0	0	0	0%	Lao PDR
0	0	0	0	0	0	0	0	0	0	0	0	0%	Maldives
0	0	0	0	0	0	0	0	0	0	0	0	0%	Mongolia
0	0	0	0	0	0	0	0	0	0	0	0	0%	Myanmar
0	0	0	0	0	0	0	0	0	0	0	0	0%	Nauru
0	0	0	0	0	0	0	0	0	0	0	0	0%	Nepal
0	0	0	0	0	0	0	0	0	0	0	0	0%	Pakistan
0	0	0	0	0	0	0	0	0	0	0	0	0%	Papua New Guinea
0	0	0	0	0	0	0	0	0	0	0	0	0%	Solomon Islands
0	0	0	0	0	0	0	0	0	0	0	0	0%	Sri Lanka
0	0	0	0	0	0	0	0	0	0	0	0	0%	Viet Nam
19	24	20	14	16	16	22	21	23	23				
32%	41%	34%	24%	27%	27%	37%	36%	39%	39%				

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Element	Values*	
	0. Non-ASBU/Seamless ATM activity	1. Initial development supporting ASBU/Seamless
B0-05 CDO	Use of conventional stepped arrival procedures	STAR with flexible PBN procedures or ATS surveillance-based procedures
B0-10 FUA	SUA is not subject to FUA (such as activation by NOTAM)	Partial flexibility of controlled or special use airspace
B0-15 AMAN-DMAN	No formal runway sequencing management	Basic runway sequencing procedures
B0-20 CCO	Use of conventional departure procedures	Flexible PBN or surveillance-based procedures in use to RNAV SID
B0-25 AIDC	ATS messages conducted by voice and/or AFTN	AIDC testing
B0-30 AIS-AIM+	Partial Phase 1 AIM transition	Phase 1 and 2 AIM transition
B0-35 ATFM	No formal ATFM activity	Basic ATFM, no automated decision support tools
B0-40 ADS-C, CPDLC	ADS-C, CPDLC not used in oceanic/remote airspace	Either ADS-C or CPDLC used for oceanic airspace
B0-65 PBN	Approach procedures with no vertical guidance	Approach procedures with vertical guidance
B0-70 WAKE	Applied minima more conservative than PANS ATM	Application of pre-2012 wake separation minima
B0-75 SMS	No electronic surface movements surveillance	Electronic surface movements surveillance
B0-80 CDM	No formal airport CDM	Basic airport CDM in use
B0-84 ADS-B, MLAT	No ADS-B or MLAT ground-based surveillance where possible	ADS-B trial or provided as an add-on to MLAT
B0-85 ATSA	No ADS-B aircraft requirements	ADS-B Out aircraft mandate in law
B0-86 ITP	No use of ITP in oceanic or remote airspace	ITP trial planned or in progress
B0-101 ACAS	No specific aircraft safety net requirements	ACAS I required
B0-102 NET	No ATM safety nets in use	Partial implementation of ATM safety nets, mode S
B0-105 MET WARN	No formal meteorological status warnings	Basic non-digital meteorological warnings
AD CERT	No State aerodrome certification rules	Aerodrome certification, not covering all four GPI elements
FIR	More than two FIRs and ACCs, no rationalisation	Rationalisation of FIR boundaries or ACCs planned
NAV	No PBN ATS route or airspace structure	Partial PBN airspace/route structure, RNAV specifications
SUR	Limited or nil ATS surveillance where possible to deploy	Use of procedural systems monitored by ATS surveillance
APT	No formal airport capacity analysis	Airport runway capacity analysis undertaken (AAR)
ACCESS	Procedural FLAS within ATS surveillance coverage	Limited FLAS used only for specified occasions
DAT	No data sharing between Area Control Centres	FIRB and inter-ACC ATS surveillance data sharing
CM BODY	No formal body to coordinate civil-military activities is in place	Civil-military meetings are held to discuss strategic issues
LIAISON	No formal civil-military liaison takes place for tactical responses	Civil-military tactical liaison is in place for special events
% MILITARY SUA	30% or more of airspace is military special use airspace	15-29% of of airspace is military special use airspace
SUA REVIEW	Special use airspace is not regularly reviewed for use, size, etc.	SUA is regularly reviewed but not by an independent body (not airspace users)
INTERNATIONAL SUA	Restricted and/or prohibited areas are designated in international waters	Military danger areas are designated in international waters
INEGRATED ATM	No integration of civil and military ATM systems	Partial integration of civil and military ATM systems
JOINT AIDS, ADS	Not civil-military joint provision of navigation aids or aerodromes	Joint provision of some naviation aids
SHARED DATA	No ATS surveillance data is shared between civil and military ATM units	Civil ATS surveillance data is shared with military ATM units
COMMON TRAINING	Common training is not conducted between civil and military ATM units	Common training is conducted for special events
COMMON PROCED'S	Civil and military ATM units have minimal common procedures	Civil and militry ATM units have common procedures for special events

*Applied to international aerodomes, airspace and ATS routes

Appendix 2: Asia/Pacific Aviation System Block Upgrade Position Statement

1. The Asia/Pacific notes that the ASBU initiative represents an important first step toward a strategic planning direction that is performance-oriented, and should be the subject of further work to determine their final status, effectiveness, coverage and application by ICAO.
2. The Asia/Pacific supports the ASBU initiative and is planning to incorporate these elements as a key part of the Asia/Pacific Seamless ATM Plan.
3. Due to the diverse nature of the States' aviation environments and the air traffic challenges already facing the Asia/Pacific Region (in progressing the finalisation of an updated GANP and the ASBU's), ICAO must have regard to the priorities (**Annex 1**) and proposals that will enhance air traffic and aviation safety in the Region.
4. The Asia/Pacific expresses its concern regarding the limited time available for States to properly study and respond to the documentation prior to the AN.Conf/12 decision-making. The Asia/Pacific also requests any economic analysis data on the ASBU elements at the earliest opportunity.
5. The expectations for regional planning and reporting of ASBU implementation, including use of the Air Navigation Reporting Form, need to be clearly articulated.
6. The Asia/Pacific suggests that there are a number of technical, operational and economic improvements that could be made to the ASBU Document, as detailed in **Annex 2**.

Annex 1: Asia/Pacific ASBU Block 0 Priorities

PIA	Element	Economic Analysis	Priority
PIA 1	B0-65 Optimization Of Approach Procedures Including Vertical Guidance	-	2
	B0-70 Increased Runway Throughput Through Optimized Wake Turbulence Separation	-	3
	B0-15 Improve Traffic Flow Through Runway Sequencing (AMAN/DMAN)	-	2
	B0-75 Safety and Efficiency Of Surface Operations (A-SMGCS)	Yes	3
	B0-80 Improved Airport Operations Through Airport-CDM	-	2
PIA 2	B0-25 Increased Interoperability, Efficiency And Capacity Through Ground-Ground Integration (AIDC)	-	1
	B0-30 Service Improvement Through Digital Aeronautical Information Management	-	1
PIA 3	B0-10 Improved Operations Through Enhanced En-Route Trajectories (CDM, FUA)	-	1
	B0-35 Improved Flow Performance Through Planning Based On A Network-Wide View	-	1
	B0-84 Initial Capability For Ground Surveillance	Yes	1
	B0-85 Air Traffic Situational Awareness (ATSA)	-	2
	B0-86 Improved Access To Optimum Flight Levels Through Climb/Descent Procedures Using ADS-B	-	3
	B0-101 ACAS Improvements	Yes	2
	B0-102 Increased Effectiveness Of Ground-based Safety Nets	-	2
	B0-105 Meteorological Information Supporting Enhanced Operational Efficiency and Safety	-	2
PIA 4	B0-40 Improved Safety And Efficiency Through The Initial Application Of Data Link En-Route	-	1
	B0-05 Improved Flexibility And Efficiency In Descent Profiles (CDO)	-	2
	B0-20 Improved Flexibility And Efficiency Departure Profiles - Continuous Climb Operations (CCO)	-	2

Priority 1 = critical upgrade

Priority 2 = recommended upgrade

Priority 3 = may not be universally implemented

The allocation of priority is based on factors including its importance in promoting Seamless ATM.

Annex 2: ASBU Element Improvement Assessment

1. B0-25 *Ground-Ground Integration*: there was a lack of guidance on the future telecommunication system needed to support these systems, while the Flight and Flow Information for a Collaborative Environment (FF-ICE) concept was still being debated. The capacity of the Aeronautical Message Handling System (AMHS) system to manage this was not clear without a requirement. Regarding Air Traffic Services Inter-facility Data-link Communication (AIDC), the cost-benefit statement should reflect the benefit of DARP being supported by AIDC and the minimization of Large Height Deviations (LHDs) which could lead to a mid-air accident.
2. B0-70 *Wake Turbulence*: Any decision support tools that enable this standard to be applied (even for the first step of the six categories) would need to be available in 2013, however the draft module stated that ground system improvements were ‘not applicable’. This module would only be a higher priority for high capacity aerodromes. The procedures and systems that support this module should be the subject of robust testing. There may also be flight plan implications for this standard to be applied correctly.
3. B0-75 *Improved Runway Safety*: did not contain critical elements such as aerodrome certification and aerodrome warnings, which were included in a separate Asia/Pacific element. However it is understood that these elements were ‘mapped’ to B0-75, although there was no extra text in the draft document that referred to this. Implementation of Advanced Surface Movements Guidance Control Systems (ASMGCS) and Cockpit Moving Map may not be a high priority in the Asia/Pacific except at high density aerodromes where the cost benefits of mandating ASMGCS and Cockpit Moving Map were positive.
4. B0-86 *Climb/Descent Procedures using ADS-B (In-Trail Procedure – ITP)*: this module may not be a high priority for implementation, given the expected low usage in the Pacific and/or Indian Oceans and the possible availability of easier-to-use separations such as 30NM using Controller Pilot Data-Link Communications/Automatic Dependent Surveillance – Contract (CPDLC/ADS-C), 15NM using separations based on Global Navigation Satellite Systems and Very High Frequency (GNSS and VHF), and separations based on the forthcoming PBN Required Navigation Performance (RNP)2 standard.
5. B0-101 PIA3 *Airborne Collision Avoidance System Improvements*: should address Terrain Awareness Warning Systems (TAWS), to minimise collision with terrain when airborne. It was not clear in the module whether Traffic Collision Avoidance System (TCAS) version 7.0 or 7.1 was the expected standard, or that either was applicable. Given the extra cost implications for version 7.1, the benefits needed to be better articulated.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

D R A F T



ASIA/PACIFIC SEAMLESS ATM PLAN

Version 0.6 (APANPIRG), August 2012

This Plan was developed by the Asia/Pacific Seamless ATM Planning Group
(APSAPG)

Approved by APANPIRG/xx and published by the
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INTRODUCTION

Seamless ATM

1.1 The 46th Directors General Civil Aviation (DGCA) Conference (Osaka, October 2009) was the genesis of Asia/Pacific Seamless Air Traffic Management¹ (ATM) discussion, endorsing the Kansai Statement (**Appendix 1**). The DGCA Conference requested the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to take a lead role in development of Seamless ATM in the Asia/Pacific.

1.2 The ICAO Asia/Pacific (APAC) Seamless Air Traffic Management (ATM) Symposium and Ad Hoc Meeting (Bangkok, Thailand, 15 to 17 August 2011) developed:

- a) proposed Asia/Pacific Seamless ATM Planning Group (APSAPG) objectives;
- b) draft Seamless ATM principles;
- c) civil/military cooperation Seamless ATM aspects;
- d) the requirement for Aviation System Block Upgrade (ASBUs) to form a key part of Seamless ATM planning; and
- e) the need for a capabilities matrix to provide a target and means of progressing to the Seamless ATM objectives.

1.3 The Global Air Navigation Industry Symposium (GANIS, Montréal, 20-23 September 2011) introduced the ASBU concept. This inferred an iterative improvement, from Block 0 (zero) to 3. Although the implementation of all ASBU elements were not mandatory, it was intended to achieve the highest level of conformance; thus supporting global interoperability and Seamless ATM.

1.4 APANPIRG/22 agreed to the creation of APSAPG in 2011 under Decision 22/56, with a primary goal to develop an Asia/Pacific Seamless ATM Plan (henceforth known as the 'Plan').

1.5 References within the Plan to 'States' are intended to include Special Administrative Regions and territories. A List of Abbreviations is included at **Appendix 2**.

1.6 The Plan does not refer to 'continental', 'remote' and 'oceanic' areas to describe an assumed geographical area of application, as many Asia/Pacific States have islands or archipelagos that can support a higher density of CNS systems than an 'oceanic' environment. Thus the Plan categorises airspace by reference to its CNS (Communications, Navigation and Surveillance) capability as:

- a) Category A: terminal operations;
- b) Category B: en-route airspace within direct² ATS communications and surveillance coverage; and
- c) Category C: en-route airspace not within direct ATS communications and surveillance coverage.

¹ Seamless ATM is the term used in this Plan to describe all aspects of flight operation from airport gate to airport gate, such as aerodrome operations, Air Traffic Control (ATC) and the provision of navigation aids.

² Services that do not depend on a third party Communication Service Provider (CSP)

Plan Objective

1.7 The Plan objective is to facilitate Asia/Pacific Seamless ATM operations, by developing and deploying ATM systems capable of ensuring safety and efficiency of air transport throughout the Asia/Pacific. The Plan is intended to provide a framework for a transition to a Seamless ATM environment, in order to meet future performance requirements. **Figure 1** and **Figure 2** provide data indicating the projected air traffic growth which has necessitated the Seamless ATM approach.

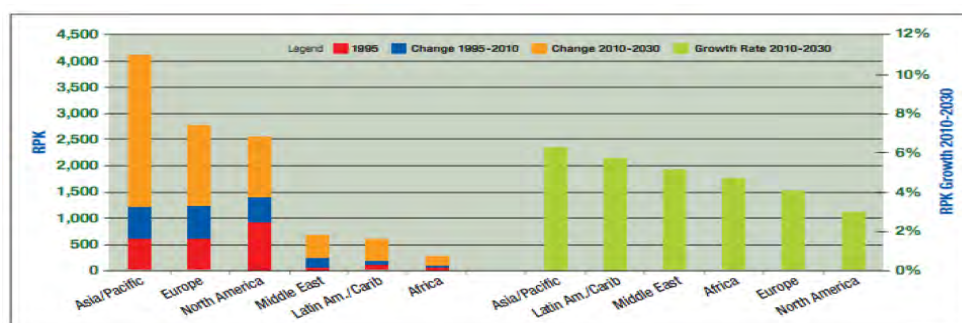


Figure 1: Passenger Traffic Forecasts – Top Traffic Flows in 2030 (ICAO 2010)

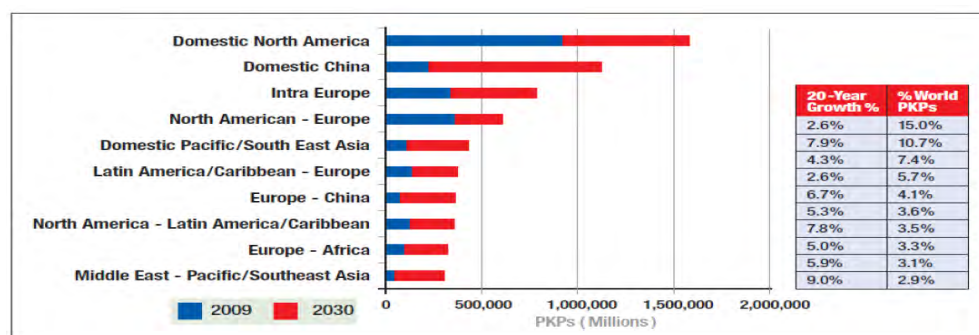


Figure 2: Top 10 Traffic Flows in 2030 (ICAO 2010)

1.8 The overall objective is to provide the basis for timely, coordinated and efficient deployment of the new technologies and procedures across the Region, taking into account individual State obligations and ICAO initiatives, including the Global Air Navigation Plan (GANP, ICAO Doc 9750). In this context, the Plan incorporates and builds upon the Asia/Pacific Air Traffic Flow Management (ATFM) Concept of Operations and the Asia/Pacific Air Navigation Concept of Operations (both hereinafter referred to as ‘CONOPS’), effectively superseding these frameworks.

1.9 The Plan provides the opportunity for the Asia/Pacific to obtain the benefit of research and development currently being conducted by the NextGen programme (United States of America), the European Single European Sky ATM Research (SESAR), and Japanese Collaborative Actions for Renovation of Air Traffic Systems (CARATS).

1.10 This Plan addresses the full range of ATM stakeholders, including civil and military ANS providers, civil and military aerodrome operators as well as civil³ and military airspace users. The Plan has been developed in consultation with States and International Organizations (IO).

³ Civil airspace users include scheduled aviation, business aviation and general aviation.

1.11 ASBU Block 0 modules contain technologies, systems and procedures which were expected to be available from 2013. However, the Plan also has references to ASBU Block 1, 2 and 3 modules, which have an expectation of deployment from 2018, 2023 and 2028 respectively. Where such technology, systems, standards and procedures are available earlier than these dates and appropriate deliverables can be provided, the intention is to establish aggressive implementation schedules in order to provide the earliest possible benefits.

Air Navigation Service Provider Summary

1.12

Aerodrome Operator Summary

1.13

Civil Airspace User Summary

1.14

Military Airspace User Summary

1.15

Plan Structure

1.16 The Plan references different levels. At the top level is a global perspective, which is guided mainly by references to the GANP and the *Global ATM Operational Concept* (Doc 9854). Beneath this is regional planning primarily provided by this Plan and other regional guidance material, in order to define the goals and means of meeting objectives for State planning, such as:

- Regional Air Navigation Plan (ANP) objectives;
- the Seamless ATM performance framework with a focus on technological and human performance within ASBU Block 0 elements, non-ASBU elements (mainly emanating from the CONOPS), and civil/military cooperation elements;
- a deployment plan with specific operational improvements, transition arrangements, expected timelines and implementation examples; and
- an overview of financial outcomes and objectives, cross-industry business and performance/risk management planning.

1.17 The intended Plan readership at the top level are policymakers and Director Generals, whereas lower levels are intended for airspace planners and ANSPs, aerodrome operators, airlines and military agencies. In response, States should provide commitments and agreed implementation actions acknowledged by stakeholders, in order to contribute to achieving the objectives of Seamless ATM and the requisite performance objectives in the areas of safety, environment, capacity and cost-efficiency.

1.18 ICAO Doc 9854 contains a vision of an integrated, harmonized, and globally interoperable ATM System, with a planning horizon up to and beyond 2025. The ICAO *Manual on Global Performance of the Air Navigation System* (ICAO Doc 9883) provides guidance on implementing a performance-oriented ATM System. The *Manual on ATM System Requirements* (ICAO Doc 9882) contains system requirements related to the eleven Key Performance Areas (KPA), as well as a number of general performance oriented requirements. In accordance with the expectations of these documents, the Plan establishes the following performance objectives to facilitate Seamless ATM operations, for implementation in accordance with the ASBU timeframe:

- a) Preferred Airspace and Route Specifications (PARS); and
- b) Preferred ATM Service Levels (PASL).

1.19 The PARS is intended to contain the expectations for airspace and ATS routes, including aircraft equipage. The PASL is intended to contain the expectations for ANSP service provision.

1.20 The Asia/Pacific Regional Air Navigation Plan (Doc 9673) is expected to incorporate key components of this Plan, and information on the mechanisms that enable these objectives to be met. However, in order for all administrations to incorporate these regional performance expectations into their planning and implementation processes, it is important that the Plan is endorsed by Asia/Pacific Directors General. In addition, political buy-in would be greatly enhanced by endorsement from regional political bodies, such as the:

- Association of Southeast Asian Nations (ASEAN);
- Asia Pacific Economic Cooperation (APEC); and
- South Asian Association for Regional Cooperation (SAARC).

1.21 **Appendix 6** provides an example of a Seamless ATM planning framework developed by New Zealand.

SEAMLESS ATM PRINCIPLES

Definition

- 2.1 APSAPG noted the following description as the CANSO definition of Seamless ATM:

Seamless ATM operations is defined as ATM operations in contiguous airspace that is technically and procedurally interoperable, universally safe, and in which all categories of airspace users transition between Flight Information Regions, or other vertical or horizontal boundaries, without requiring a considered action to facilitate that transition and without any noticeable change in:

- 1) Type or quality of service received;*
- 2) Air navigation and communications performance standards; and*
- 3) Standard practices to be followed.*

- 2.2 The objectives of Seamless ATM were agreed by APSAPG as follows:

The objective of Seamless ATM was the safe and interoperable provision of harmonized and consistent air traffic management service provided to a flight, appropriate to the airspace category and free of transitions due to a change in the air navigation service provider or Flight Information Region.

- 2.3 There were considered to be three major areas of Seamless ATM Principles, involving People (human performance), Facilities (physical equipment), and Technology and Information. The 37 Principles are included as **Appendix 3**, and are referenced in the Recommendations as appropriate.

SPECIFICATIONS AND IMPLEMENTATION

Aviation System Block Upgrade (ASBU)

Background

3.1 At the Global level ICAO initiated the ASBU initiative as a programme framework that develops a set of ATM solutions or upgrades that exploits current equipage, establishes a transition plan and enables global interoperability. ASBUs comprise a suite of modules organised into flexible and scalable building blocks, where each module represents a specific, well bounded improvement. The building blocks that can be introduced and implemented in a State or a region depending on the need and level of readiness, while recognizing that all the modules are not required in all airspaces. The ASBUs describe a way to apply the concepts defined in the Doc 9854 with the goal of implementing regional performance improvements, and are used in the proposed new edition of the GANP to guide implementation.

3.2 ICAO estimated that US\$120 billion would be spent on the transformation of air transportation systems in the next ten years. While NextGen and SESAR accounted for a large share of this spending, parallel initiatives are underway in many areas including the Asia/Pacific, North and Latin America, Russia, Japan and China. ATM modernization was a very complex but necessary task, given the benefit of these initiatives as traffic levels rise. It was clear that to safely and efficiently accommodate the increase in air traffic demand — as well as respond to the diverse needs of operators, the environment and other issues, it was necessary to renovate ATM systems, to provide the greatest operational and performance benefits.

3.3 ASBU were comprised of a suite of modules, each having the following qualities:

- a clearly-defined measurable operational improvement and success metric;
- necessary equipment and/or systems in aircraft and on ground along with an operational approval or certification plan;
- standards and procedures for both airborne and ground systems; and
- a positive business case over a clearly defined period of time.

Asia/Pacific ASBU Implementation

Global and Regional Elements

Airport Operations

Airspace

Performance-based Navigation

ATS Surveillance Services

Civil/Military Cooperation

Flexible Use Airspace

Special Use Airspace

Civil/Military Coordination

Data Sharing

Asia/Pacific Civil/Military Seamless ATM Implementation

Preferred Airspace and Route Specifications (PARS)

Aerodrome Operations

En-route Airspace

Flight Information Regions

Safety Nets

Civil/Military Cooperation

Preferred ATM Service Levels (PASL)

Aerodrome Operations

Terminal Operations

En-route Operations

ATC Capacity

Priority

Human Performance

ATS Systems

Civil/Military Cooperation

ASIA/PACIFIC PERFORMANCE ANALYSIS

Aerodrome Analysis

Major Traffic Flow Study

Upper Airspace Air Navigation Services Delegation

TRANS-REGIONAL ISSUES

ECONOMIC AND ENVIRONMENTAL ASPECTS

RECOMMENDATIONS

Endorsement

Specifications

Aerodrome Operations

Aeronautical Information Management (AIM)

Airspace Optimisation

Air Traffic Flow Management

Civil/Military Cooperation

Conflict Detection and Resolution

Enhanced Decision Support Tools & Performance Based Navigation

The Role of the Human

Network Operations Planning (NOP)

Risk Management

Safety Nets

System Interoperability

Trajectory Management

REVIEW

8.1 The Plan is required to be updated to take into account ASBU Block 1, 2 and 3 modules when these and their associated technology become mature.

8.2 The Plan also requires periodic updating in respect of economic information contained therein.

8.3 As an iterative process, the Plan requires regular updating to keep current with changes in technology, political considerations and human performance. It is intended that the ATM Sub-group conduct a complete review of the Plan every two years, in order to keep APANPIRG informed of required changes.

Appendix 1: KANSAI Statement

The Directors General of Civil Aviation (DGCA) of the Asia and Pacific Regions met for the 46th DGCA Conference in Japan, 12-16 October, 2009. Recalling that the 45th Conference had endorsed the Theme Topic for the 46th DGCA Conference as “Seamless Sky: Bringing Together the Asia/Pacific Regions,” Directors General of the Region held a productive discussion focusing on three aspects of the “Seamless Sky,” namely Air Traffic Management (ATM), Air Cargo Security, and Aviation Safety, and agreed to issue this Kansai Statement.

KANSAI STATEMENT

1. We recognized that as civil aviation develops and globalization progresses, harmonization in civil aviation systems is becoming critically important in the Asia and Pacific Region, which has been characterized by the diversities of the member States. What people expect from harmonization in civil aviation is that aircraft operators will become capable of seamlessly flying between regions, that the whole of the network will be secured at the agreed level, and that transparent and interoperable standards will be set among States and regions. In this regard, “Seamless Sky” is particularly important in the areas of air traffic management, aviation security and aviation safety.
2. Regarding Air Traffic Management (ATM), we recognized that the ICAO has been leading the development and implementation of the Global Air Traffic Management system with the implementation target of 2025. The Global Air Traffic Management system will be based on the components described in the Global ATM Operational Concept. We also recognized that the United States and Europe have been developing their future air traffic modernization programmes. Taking such global trends of future ATM system into consideration, we recognized the necessity of planning the future ATM system for the Asia and Pacific Region by the active collaboration and participation of the whole of the Region. In this regard, we agreed that APANPIRG be the starting platform to discuss and plan the future ATM system of the Asia and Pacific Region including targets and a time schedule.
3. Regarding aviation security, we recognized the significance of enhancing air cargo security. Such efforts will enable member States to protect the flow of air cargo, raise security standards and facilitate international trade in the Asia and Pacific Region. To achieve these desired outcomes effectively, member States are encouraged to collaborate with one another and with ICAO towards developing internationally harmonized measures and processes in air cargo security. We agreed that the further sharing of information and best practices should be promoted, and to consider including provisions on air cargo security into Annex 17, taking into account the need to protect the entire cargo supply chain.
4. Regarding the aviation safety, we acknowledged the ICAO’s leadership in the improvement of aviation safety. We recognized the importance of the member States’ role in ensuring that their air operators establish and maintain the highest standards in safety through the proper implementation of Safety Management System as envisaged under the State Safety Programme. In addition, we recognized the importance of the safety monitoring activities regarding foreign aircraft by the member States in the Region. We agreed to further enhance the cooperation in these efforts and activities in the Region in a harmonized manner.
5. We are determined to realize the Seamless Sky in the Asia and Pacific Region from this conference onwards. We agreed to make efforts to move forward toward the harmonized aviation in the Asia Pacific Region in cooperation with all the member States and the ICAO Asia Pacific Regional Office.

Appendix 2: List of Abbreviations and Terminology

ATM	Air Traffic Management
CARATS	Collaborative Actions for Renovation of Air Traffic Systems
SESAR	Single European Sky ATM Research

(To be completed)

Appendix 3: Seamless ATM Principles

People: Cultural and Political Background

1. High-level political support (including development of educational information for decision-makers) to support Seamless ATM initiatives, including military cooperation and AIM.
2. Education and implementation of non-punitive reporting and continuous SMS improvement systems.

Aviation Regulations, Standards and Procedures

3. Harmonised regional or sub-regional rules and guidelines, modelled on the regional application of common regulations incorporated by reference into local legislation.
4. Shared ATM operational standards, procedures, guidance materials through common manuals and templates.
5. The promotion of mutual recognition of ATM qualifications between States.
6. An emphasis on delivery of ATM services based on CNS capability, resulting in flexible, dynamic systems.
7. The use of high-fidelity simulators to train controllers on the optimal application of ATC separations and procedures that support Seamless ATM applications, emergency and contingency responses, testing of software releases, and may serve as a backup ATM platform⁴

ATM Coordination

8. Sub-regional ATFM based on system-wide CDM serving the busiest terminal airspace and MTF.
9. Cross-border/FIR cooperation for use of aeronautical facilities and airspace, collaborative data sharing, airspace safety assessment and ATM Contingency planning.
10. Encouragement of military participation in civil ATM meetings and in ATS Centres where necessary.

Airspace Organisation

11. Promoting flexible use airspace arrangements and regular review of airspace to ensure it is appropriate in terms of purpose, size, activation and designation.
12. The optimisation of airspace structure through amalgamation and use of technology.

⁴ A key component of Seamless ATM is the ability of controllers to operate, and have confidence in, the new environment. Simulators are an essential part of this training.

Facilities: Aerodromes

13. To encourage aerodrome operators to actively participate in ATM coordination in respect of Airport CDM development and operational planning, including aerodrome complexity and capacity.
14. Planning and coordination with local authorities and government agencies to take into account environmental issues, obstacles, aerodrome and PBN development.

ATS Units

15. Collaboration by ANSPs for evaluation and planning of ATM facilities.
16. Optimization of ATM facilities through amalgamation and the use of technology, including automation, satellite-based systems and remote facilities.

Navigation Aids

17. The continued rationalisation of terrestrial navigation aids to satellite-based procedures, while retaining a minimum network necessary to maintain safety of aircraft operations.
18. Support for a GNSS-based global PBN approval standard.
19. Regional cooperation for augmentation systems in terms of interoperability and increased service areas, and a GNSS ionospheric monitoring network.

Telecommunication

20. Encouragement of the use of ground-ground ATN/AMHS and diverse satellite communication systems.
21. Enhancement of data-link capabilities (VHF including VDL M2, SATCOM).
22. Where cost beneficial and appropriate, the implementation of:
 - SATVOICE technologies and standards;
 - HF data-link;
 - VSAT networks in support of COM and SUR.
23. The prioritisation of AIDC systems to alleviate ATC coordination issues.

ATS Surveillance

24. The encouragement of ADS-B and/or MLAT implementation to improve ATS surveillance coverage, redundancy and multiple tracking capability.
25. Establishment of ADS-C where radar, ADS-B (including satellite –based ADS-B) and/or MLAT is not possible.
26. Expansion of ATS surveillance data-sharing initiatives.

Technology and Information: Flight Operations

- 27. Implementation of UPR and DARP where practicable.
- 28. Implementation of CDO and CCO where possible.
- 29. The encouragement of appropriate technologies that support Trajectory-Based Operations.

Aeronautical Data

- 30. Early implementation of AIM, including cooperative development of aeronautical databases and SWIM to support interoperable operations.

ATM Systems and Safety Nets

- 31. Application of ground-based safety nets, which includes tactical and strategic conflict probing (such as APW, STCA) and MSAW.
- 32. Support for Inter-facility Flight Data Processing System capability.
- 33. Collaborative development of CDM, ATFM, A/MAN and D/MAN support tools.
- 34. Encouragement of Digital ATIS and VOLMET information systems.
- 35. Encourage sharing of air traffic data between military ATM systems and civil ATM systems.

ATM Modernisation Projects

- 36. Inter-regional cooperation ('clustering') for the research, development and implementation of ATM projects.
- 37. A focus on technologies for earliest deployment and best cost benefits.

Appendix 4: Seamless ATM Examples

(To be completed)

Appendix 5: New Zealand Seamless ATM Planning Framework

Background

1.1 A performance-based planning framework, derived from ICAO planning frameworks, has been adopted for the New Zealand project. The Plan brings together airspace, CNS, ATM, aerodromes, AIM, and meteorology work streams. The Plan also considers over-arching issues, such as regulatory requirements (including rules, operational approvals, etc.), aircraft requirements, licensing and training requirements, security and environmental matters.

1.2 The following factors are drivers for change from equipment-based to performance-based system:

- many airline and modern general aviation aircraft have been equipped for Global Navigation Satellite Systems (GNSS) navigation;
- Required Navigation Performance (RNP) approaches have been established;
- the establishment of enhanced ATS surveillance such as MLAT to assist in the situational awareness of air traffic; and
- a single aeronautical database that allows the Aeronautical Information Publication and aeronautical charts to be produced from one database, thereby reducing errors.

1.3 Considerable effort has been undertaken in recent years on improving individual elements of the New Zealand national airspace and air navigation system, including:

- Airspace Policy;
- a PBN Implementation Plan;
- Aeronautical Information Service (AIS) to Aeronautical Information Management (AIM) Roadmap which includes development of the Aeronautical Information Exchange Model (AIXM) database for AIM;
- plans for improved ATM and ATS surveillance.

1.4 However, a much greater degree of coordination is needed between government and the industry in order to manage change in the airspace and air navigation system effectively, efficiently and safely. In particular, changes are needed to reduce the risk of inappropriate and wasted investment in technologies and equipment, and to reduce any risk of disruption due to lack of coordination between industry, the air navigation services provider (ANSP), the regulator, and government. Five key policy areas that would need to be addressed to enable these changes were identified:

- a) implementation of a suitable planning approach to facilitate the changes in the airspace and air navigation system;
- b) effective management by phasing the system changes;
- c) establishment of principles for the designation of airspace in the future system;
- d) better integration of decision-making on airspace and land use management (which involves coordination with local authorities and increasing awareness of aviation requirements); and
- e) streamlining of changes to regulatory requirements wherever possible.

1.5 As part of the Plan development, New Zealand will coordinate with neighbouring States in accordance with the concept of Seamless ATM.

Appendix 6: Requirements Map

ASBU Element	Global/Regional Element	Civil/Military Element	Plan Recomm.	Seamless Principle
B0-05 CDO, STAR				
B0-10 FUA, UPR, DARP				
B0-15 AMAN/DMAN				
B0-20 CCO, SID				
B0-25 AIDC, ATN				
B0-30 AIM				
B0-35 ATFM				
B0-40 ADS-C, CPDLC				
B0-65 AIRPORT PBN				
B0-70 WAKE TURB				
B0-75 ASMGCS, CMM				
B0-80 AIRPORT CDM				
B0-84 ATS SUR				
B0-85 ATSA				
B0-86 ITP				
B0-101 ACAS				
B0-102 SAFETY NETS				
B0-105 MET WARN				
	AIRPORT CERT			
	AIRPORT CAPACITY			
	AIRSPACE: FIRS			
	AIRSPACE: CLASS			
	AIRSPACE: RVSM			
	AIRSPACE: PRIORITY			
	NAV: PBN ROUTES			
	SUR: ATC STDS			
	SUR: DATA SHARING			
		STRATEGIC LIAISON		
		TACTICAL LIAISON		
		MILITARY SUA %		
		SUA REVIEW		
		INTERNATIONAL SUA		
		ATM INTEGRATION		
		JOINT AD/NAV AIDS		
		SHARED DATA		
		COMMON TRAINING		
		COMMON PROC		

(To be completed)

Appendix 7: List of References

(To be completed)

**AGENDA ITEM 4: REGIONAL AIR NAVIGATION
DEFICIENCIES**

Agenda Item 4: Regional Air Navigation Deficiencies

4.1 ADDRESSING REGIONAL AIR NAVIGATION DEFICIENCIES – Transition from Five Regional Databases to A Single Global Database

4.2 The uniform methodology for the identification, assessment and reporting of air navigation deficiencies (henceforth referred to as Uniform Methodology) is being used regularly by all PIRGs, as a part of its agenda, for addressing regional air navigation deficiencies. To support the implementation every PIRG has developed its own unique deficiency database as a means of sharing safety information related to air navigation systems and viewed/used by that respective region(s) only.

4.3 Each of this regional deficiency databases has its architecture, protocols and access rights. In view of region specific databases, they are not available for worldwide viewing and usage. Although this approach is satisfactory from regional perspective, it needs to be extended globally in order to be consistent with the principles of sharing safety information worldwide leading to complete transparency.

4.4 Building on the current PIRG/regional efforts, ICAO has developed a prototype system for the management of air navigation deficiencies at the global level and has been incorporated in the integrated Safety Trend Analysis and Reporting System (iSTARS) platform. Access to iSTARS is through the safety page of www.icao.int. iSTARS is a web-based system which groups together different safety related datasets and allows for effective integrated safety analysis. The establishment of a centralized database for regional air navigation deficiencies on iSTARS would result in significant benefits through the harmonization of data structure and content, as well as by providing uniform access to the respective Regional Offices, Member States and other authorized users thus leading to improved information sharing and complete transparency.

4.5 This centralized system initiated in November 2011 was populated with data provided by all regions and fully supports the Uniform Methodology. The data integration process revealed instances of corrective actions that were either incomplete or inconsistent or showed incorrect completion dates. It has also been noted that for many deficiencies, the expected corrective action completion date is well passed the deadline without any indication of the deficiency being resolved. On the basis of regional coordination and the feedback received, ICAO has further improved the centralized database on iSTARS and is now ready for evaluation by States. Further to comments that will be received by PIRGs/States, ICAO will mature the system for worldwide use. The user guide will assist in accessing the data from iSTARS. The complete transition from the current five regional air navigation databases to single centralised database on iSTARS is scheduled for December 2012.

4.6 In finalizing the discussion on this subject, the Meeting agreed to the following Conclusion:

Conclusion 23/52: Transition from Five Regional Deficiency Databases to Single Global Database

That States and International organization,

- a) note the approach to transfer five regional air navigation deficiency databases into a single centralized database on iSTARS platform by December 2012;
- b) test the centralized database on iSTARS platform using the guidance;
- c) Update the data as necessary in coordination with ICAO APAC Regional Office; and

- d) provide feedback to ICAO APAC Regional Office on the use of centralized database available in iSTARS, by 30 November 2012.

Status of Air Navigation Deficiencies in the Asia/PAC Region

4.7 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.

4.8 The online deficiency database is available through the ICAO APAC website www.bangkok.icao.int via secure access provided by the Regional Office to States and International Organizations.

Deficiencies in the ATM/AIS/SAR fields

4.9 The meeting reviewed the List of ATM deficiencies updated by ATM/AIS/SAR SG which was based on information provided by concerned States.

4.10 The meeting noted that the following states submitted requests to close their deficiencies:

China advised the ATM/AIS/SAR/SG/22 that the current routing B215 KUQA A460 REVKI to Alma Ata met the requirements for traffic from Urumqi to Alma Ata (Almata) and requested deletion of R216 from the BANP (14 April 03). China coordinated with Kazakhstan to delete R216 from the BANP; no information has since been received from the EUR/NAT Office regarding concerns from Kazakhstan.

China advised the AAITF/7 meeting that WGS-84 had been fully implemented.

Democratic People's Republic of Korea advised by letter dated 20 March 2012 that WGS-84 implementation was complete and effective 03 May 2012.

Solomon Islands advised on 14 March 2012 at the AAITF/7 meeting that WGS-84 had been implemented on 31/01/2011.

Timor-Leste advised by email dated 24 April 2012 that WGS-84 implementation was complete (note: this item was not on the Deficiencies List).

Tonga advised by letter dated 12 July 2011 that the requirements for Annex 6 (Carriage of ACAS II and Carriage of Pressure Altitude Reporting Transponder) were published in the AIP August 2006.

Viet Nam advised the ATM/AIS/SAR/ SG/22 that the target date for implementation of ICAO Airspace Classification is November, 2012.

Indonesia presented information of the restructurization of some ATS Routes within Jakarta FIR and Ujung Pandang FIR including establishment of L504, and as a result requested the closure of the air navigation deficiency on this matter.

New Zealand advised that AIP had been implemented in Cook Islands. The Secretariat requested that New Zealand ask the Cook Islands administration to contact ICAO.

4.11 The updated List of Air Navigation Deficiencies in the ATM/AIS/SAR field is in **Attachment A** to the Report on Agenda Item 4.

Deficiencies in the AOP field

4.12 The meeting noted that Fiji, India, Maldives and Thailand have updated the status of their deficiencies.

4.13 The meeting noted the findings observed by the AGA mission in Brunei, Laos and Mongolia. The list of identified deficiencies is placed at **Attachment B1**. The meeting urged States concerned to provide the necessary resources for the elimination of the deficiencies.

4.15 The updated List of Air Navigation Deficiencies in the AOP field is in **Attachment B** to the Report on Agenda Item 4.

Deficiencies in the CNS field

4.16 The meeting noted the list of Air Navigation Deficiencies in CNS Field which was reviewed and updated by CNS/MET SG/16.

Air-ground VHF Communication in Yangon FIR

4.17 The meeting noted that a report was received from IATA in April 2012 on the performance of VHF, HF and ADS-C/CPDLC communications in Yangon FIR which stated that about 63% reports from pilots had indicated normal air ground communication over Yangon FIR. The meeting also noted the results of the survey conducted from 2 to 13 April 2012 which shows that out of the total 349 aircrafts from 11 airlines which participated in the survey, 50 reported no communication established at all and a further 129 reported problems of one sort or another (HF, VHF or Data link). 170 aircraft established contact with no reported problem.

4.18 The meeting also noted that DCA Myanmar has made efforts in close coordination with IATA and ICAO Regional Office. However, it was recognized that:

- For VHF communication, some limitation area still exists;
- For HF communication, the administration has installed 1 kW high power HF facilities but some problems still exist; and
- For ADS-C/CPDLC, although new ATM system has been installed, but it could not be used because of need to coordinate with CSP - SITA to upgrade the interface from X.25 communication protocol to IP protocol. The matter is still under discussion.

4.19 The meeting further noted that DCA Myanmar is working with IATA towards achieving a position whereby current IFBP requirements can be removed.

Navigation Aids Performance deficiencies in Philippines

4.20 Disruption of Air Traffic Services in Manila FIR was reported on 13 September 2009 for about two hours when standby power supply source failed to take over the load when the main power failed. The navigations aids including ILS 06/24 and DVOR/DME at Ninoy Aquino International Airport (NAIA) had been put out of service caused by typhoon “Ondoy” on 26

September 2009. It was considered a deficiency in CNS field subject to remedial action by the Civil Aviation Authority of Philippines.

4.21 The meeting noted that the new CNS/ATM project is expected to be operational by 2015. In a letter CAAP informed Regional office on nav aids performance and about the newly commissioned ILS at NAIA with a request to remove the deficiency on ILS elements from the list of deficiencies. ICAO Regional Office informed CAAP that the deficiency will be removed when the new DVOR/DME becomes operational. Philippines informed the CNS/MET SG/16 meeting that the project for the DVOR/DME has been delayed and it is estimated to be completed by the end of 2012.

Poor ground/ground Communication between Afghanistan and Pakistan

4.22 Issue related to the unreliability of AFS communication between Afghanistan and Pakistan was brought to the notice of APANPIRG/21. Lack of reliable communication infrastructure between Afghanistan and Pakistan, poor performance of Aeronautical Fixed Service including data communication between Kabul and Karachi and ATS voice communication between Lahore and Kabul had become issues of concerns. Karachi – Kabul AFTN circuit was out of service from 31 August 2011 resulting from unserviceable VSAT system. 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.

4.23 A COM coordination meeting with Afghanistan and Pakistan was held in Karachi, in June 2012. The meeting developed a remedial plan with three action times to be implemented in three phases:

- Action Item 1: Near-term by end of September 2012, fully utilize the VPN circuit operational since January 2012 for exchange of AFTN traffic and organize training for users if required;
- Action Item 2: Mid-term by end of March 2013, harmonize VSAT terminal equipment and select common network service provider to recover the VSAT Links; and
- Action Item 3: Long-term by end of June 2014, establish 2 MB dedicated landline connection with multiplexers between Afghanistan and Pakistan to support both data and voice communication between COM centre and ACCs.

4.24 The updated List of Air Navigation Deficiencies in the CNS field is given in **Attachment C** to this paper.

Deficiencies in the MET field

4.25 Deficiencies in the MET fields

4.26 The CNS/MET SG/16 meeting noted the APANPIRG Conclusion 22/51 to add the deficiency for lack of SIGMET in the equatorial region and, as a result, there are now 20 MET deficiencies listed in the data base.

SIGMET related

4.27 In relation to the deficiency **AP-MET-16**, concerning the establishment of a MWO and the issuance of SIGMET for DPR Korea, the SG recalled that SIGMET test results from November 2011 showed that SIGMET were received from Sunan MWO, although with some errors and a dissemination issue that required remedies as noted by the OPMET/M TF/10 meeting (April 2011). Furthermore, China reported that DPR Korea participated in the SIGMET advisory trial in

Asia, from 4 May to 30 July 2011, and issued a total of 4 SIGMETs (in response to SIGMET advisories) without formatting errors. In light of the discussion above, the CNS/MET SG/16 meeting agreed to remove the deficiency **AP-MET-16** from the list of APANPIRG deficiencies provided that each of the following conditions are met:

- a) DPR Korea submits in writing an official report to the Regional Office providing full details of the action taken to rectify the deficiency; and
- b) The Regional Office validates that the action taken in the report satisfactorily rectifies the deficiency.

4.28 In relation to the deficiency **AP-MET-11**, concerning the requirements for MWO to be established at Phnom-Penh international airport that have not been met, the SIGMET-related part of the deficiency was removed (APANPIRG/22) due to the bilateral agreement for SIGMET issuance with China.

4.29 Indonesia advised the SG meeting that it has commenced developing procedures for issuance of SIGMET for volcanic ash compliant with ICAO provisions to address the deficiency **AP-MET-06**, concerning SIGMET for volcanic ash not issued according to the requirements. Similar deficiencies **AP-MET-07** and **AP-MET-08** in the Philippines and Papua New Guinea, concerning SIGMET for volcanic ash not issued according to the requirements, still require corrective action.

4.30 In relation to the deficiency **AP-MET-12**, concerning requirements for issuance and dissemination of SIGMET that have not been fully implemented, in Lao PDR, RODB Bangkok reported (OPMET/M TF/10, April 2012) that only limited SIGMET had been received from Lao PDR. On the other hand, China reported that Lao PDR participated in the SIGMET advisory trial in Asia, from 4 May to 30 July 2011, and issued a total of 18 SIGMETs. However, the SIGMET test results from November 2011 indicated that Lao PDR did not participate in the SIGMET tests. Noting that (in relation to **AP-MET-12**) APANPIRG/22 required that SIGMET is issued routinely when warranted, the evidence above may suggest that further monitoring of progress with regards implementation of SIGMET procedures is warranted for Lao PDR and RODB Bangkok was encouraged to conduct further monitoring of SIGMET issuance in Lao PDR.

4.31 The deficiency **AP-MET-14**, concerning requirements for issuance and dissemination of SIGMET that have not been fully implemented, continues in Nepal. Furthermore, Papua New Guinea, Solomon Islands and Nauru were added to the database for deficiencies **AP-MET-22**, **AP-MET-23** and **AP-MET-24** concerning the lack of SIGMET issued for the Port Moresby, Honiara, and Nauru FIRs (APANPIRG Conclusion 22/51 refers). To correct these deficiencies in the short term, the development of bi-lateral agreements on the issuance of SIGMET on the behalf of each State is encouraged, noting that it would require donor States. The ICAO Secretariat has contacted the States concerned with regards the status of their corrective action plans.

WAFS forecasts for flight briefings

4.32 WAFS forecasts for flight briefings can be obtained (via the public Internet) by the WAFS Internet File Server (WIFS) or the SADIS FTP. It was noted that authorized registration and utilization of WIFS will assist in removing the deficiencies **AP-MET-18**, **AP-MET-19** and **AP-MET-20** concerning briefing and flight documentation not provided as required for Kiribati, Nauru and Solomon Islands. In relation to the similar deficiency **AP-MET-09**, concerning briefing and flight documentation not provided as required and WAFS products not available in Cambodia, no further update was provided with regards the corrective action plan to have SADIS FTP operational in 2011.

Observations

4.33 METAR is necessary for flight calculations and flight planning and optimizing routes for alternates. A meteorological observing station is needed in Nauru to correct the deficiency **AP-MET-21** concerning no METAR/SPECI observing program in place. Nauru was expected to take corrective action and seek donors for an observing system. Similarly, with the deficiency **AP-MET-02** concerning METAR from Kiribati not available on regular basis, Kiribati's MET authority was expected to take action to provide regular observations and reports, which would involve seeking donors for an observing system and the activation of an authorized WIFS account.

4.34 In relation to the Solomon Islands deficiency **AP-MET-01**, concerning weather information that was inadequate and not provided on a regular basis, corrective action involving the installation of an AWOS at Honiara International Airport (through international assistance from New Zealand) has progressed to the point where the AWOS is nearing final operational commissioning.

Volcanic ash observations and dissemination

4.35 In relation to the deficiency **AP-MET-03**, concerning information on volcanic activity not provided regularly to ATS units and MWOs in Indonesia, corrective action has progressed to the point where MoUs were signed (in 2010) and the Volcanic Activity Report Dissemination System was activated (in May 2012) to strengthen the dissemination of volcanic activity reports. Furthermore, Indonesia advised that the Volcanic Activity Report Dissemination System successfully transmitted all reports generated based on recent observations conducted by the local volcano observatories. However, a comparison of the volcanic activity reports from the Indonesian system with the volcanic ash advisories issued by Darwin VAAC showed some inconsistencies that may require further investigation to determine the effectiveness of the Volcanic Activity Report Dissemination System. In light of the discussion above, the CNS/MET SG/16 meeting agreed to remove the deficiency **AP-MET-03** from the list of APANPIRG deficiencies provided that each of the following conditions are met:

- a) Indonesia submits in writing an official report to the Regional Office providing full details of the action taken to rectify the deficiency including satisfactory resolution of the inconsistencies noted between the volcanic activity reports and Darwin VAAC advisories; and
- b) The Regional Office, in consultation with the IAVWOPSG, validates that the action taken in the report satisfactorily rectifies the deficiency.

4.36 No further updates were provided in relation to the deficiencies **AP-MET-04** and **AP-MET-17** concerning information on volcanic activity not provided regularly to ATS units and MWOs in Papua New Guinea and Tonga, which required the development of procedures for the exchange of volcanic information and, in particular, Letters of Agreement between the MET Service Providers, ATS and volcano monitoring authorities.

4.37 The updated List of Air Navigation Deficiencies in the MET field is given in **Attachment D** to this paper.

4. 38 APANPIRG agreed to the following Conclusion:

Conclusion 23/53 – Update of ATM/AIS/SAR, AOP, CNS and MET Deficiency List

That, the ATM/AIS/SAR, AOP, CNS and MET Deficiency List be amended as detailed in **Attachment A** to D to the Report on Agenda Item 4.

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Attachment A to the Report on Agenda Item 4

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE ATM 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
Route Implementation	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. No information received from the European Office regarding concerns by Kazakhstan.	China/ Kazakhstan ICAO	Captured in Chapter 2 of the Route Catalogue.	B
Route Implementation	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 holistic sub-regional review of ATS routes were being undertaken by Indonesia and Singapore.	Indonesia/ Singapore	ATS Route L504 implemented, ATM/AIS/SAR/SG/2 2 WP40 refers.	B
WGS-84	Bhutan	Requirements of Paragraph 3.7.1 of Annex 15 WGS-84 - Not implemented	2/7/1999	Data conversion completed, but not published		Bhutan	TBD	A
WGS-84	China	Requirements of Paragraph 3.7.1 of Annex 15 WGS-84 - Not implemented	2/7/1999	Differences to Annex 15 – Aeronautical Information Services are notified	-	China	China advised the AAITF/7 that WGS-84 had been implemented.	A
WGS-84	DPR Korea	Requirements of Paragraph 3.7.1 of Annex 15 WGS-84 -	-	-	-	DPR Korea	DPRK advised by letter dated 20 March 2012 that implementation	A

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Attachment A to the 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
		Not implemented					would be effective on 3 May 2012.	
WGS-84	Kiribati	Requirements of Paragraph 3.7.1 of Annex 15 WGS-84 - Not implemented				Kiribati	TBD	A
WGS-84	Solomon Islands	Requirements of Paragraph 3.7.1 of Annex 15 WGS-84 - Not implemented				Solomon Islands	The Solomon Islands advised on 14 March 2012 that WGS-84 had been implemented on 31/01/2011.	A
WGS-84	Nauru	Requirements of Paragraph 3.7.1 of Annex 15 WGS-84 - Not implemented		Conferring with consultant		Nauru	TBD	A
WGS-84	Vanuatu	WGS-84 - Implemented at main airports	2/7/1999			Vanuatu	1999	A
Airspace Classification	China	Requirements of Paragraph 2.6 of Annex 11 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
Airspace Classification	Kiribati	Requirements of Paragraph 2.6 of Annex 11 Airspace	7/7/99			Kiribati	TBD	A

Attachment A to the 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
		Classification - not implemented						
Airspace Classification	Nauru	Requirements of Paragraph 2.6 of Annex 11 Airspace Classification - not implemented	7/7/99			Nauru	TBD	A
Airspace Classification	Papua New Guinea	Requirements of Paragraph 2.6 of Annex 11 Airspace Classification - not implemented	7/7/99			Papua New Guinea	Project in place	A
Airspace Classification	Solomon Islands	Requirements of Paragraph 2.6 of Annex 11 Airspace Classification - not implemented	7/7/99			Solomon Islands	TBD	A
Airspace Classification	Viet Nam	Requirements of Paragraph 2.6 of Annex 11 Airspace Classification - not implemented	7/7/99			Viet Nam	ATM/AIS/SAR/SG/2 2 Target date for completion: November 2012.	A
AIP Format	Cook Islands	Requirements of Chapter 4 of Annex 15 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	A

Attachment A to the 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
							with assistance of New Zealand	
AIP Format	Kiribati	Requirements of Chapter 4 of Annex 15 AIP Format - not implemented	7/7/99			Kiribati	ATM/AIS/SAR/SG/18 (June 2009) was advised AIP in draft stage	A
AIP Format	Nauru	Requirements of Chapter 4 of Annex 15 AIP Format - not implemented	7/7/99			Nauru	ATM/AIS/SAR/SG/18 (June 2008) was advised work soon to start	A
AIP Format	Papua New Guinea	Requirements of Chapter 4 of Annex 15 AIP Format - not implemented	7/7/99			Papua New Guinea	TBA	A
SAR capability	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
SAR capability	Maldives	Annex 12 requirements not implemented. No agreements with adjacent States.	24/4/97	SAR services and facilities provided (details to be confirmed). SAR agreements with neighboring 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
Carriage of ACAS II	Bhutan	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U

Attachment A to the 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
Carriage of ACAS II	Cook Islands	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
Carriage of ACAS II	Kiribati	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
Carriage of ACAS II	Marshall Islands	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U
Carriage of ACAS II	Micronesia	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
Carriage of ACAS II	Nauru	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
Carriage of ACAS II	Palau	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U
Carriage of ACAS II	Papua New Guinea	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	TBD	U
Carriage of ACAS II	Solomon Islands	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U
Carriage of ACAS II	Tonga	Annex 6 requirement not implemented.	26/8/05	-	Tonga - implement Annex 6 as required.	Tonga	Tonga-advised by letter of 12 July 2011 that the requirements were published in the	U

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Attachment A to the 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
							AIP August 2006	
Carriage of ACAS II	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
Carriage of Pressure Altitude Reporting Transponder	Bhutan	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Cook Islands	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Kiribati	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Marshall Islands	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05	ACAS II required.	Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Micronesia	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Nauru	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Palau	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U

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Attachment A to the 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
Carriage of Pressure Altitude Reporting Transponder	Papua New Guinea	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Solomon Islands	Requirement of Chapter 6 of Annex 6 not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U
Carriage of Pressure Altitude Reporting Transponder	Tonga	Annex 6 requirement not implemented.	26/8/05	ACAS II required.	Tonga - implement Annex 6 as required.	Tonga	Tonga-advised by letter of 12 July 2011 that the requirements were published in the AIP August 2006	U
Non Provision of Safety-related Data	Bangladesh	Requirement of Paragraph 3.3.4.1 of Annex 11 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
Non Provision of Safety-related Data	Lao PDR	Requirement of Paragraph 3.3.4.1 of Annex 11 not implemented.	11/9/09		Lao PDR - provide the safety-related data as required.	Lao PDR		U
Non Provision of Safety-related Data	Papua New Guinea	Requirement of Paragraph 3.3.4.1 of Annex 11 not implemented.	21/8/06		Papua New Guinea - provide the safety-related data as required.	Papua New Guinea	TBD	U

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ATTACHMENT B to the Report on Agenda Item 4

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement s	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
Annex 14, Volume I	Nepal Katmandu International Airport	Runway/ taxiways	ICAO Mission of February 2008	Growth of thick grass on the airfield pavements.	Removal of grass from the pavement	Tribhuvan International airport/ CAAN		U
				Provision of RESA in accordance with section 3.5 of ICAO Annex 14, Volume I.	Provision of RESA		2015	U
				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

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement s	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
Annex 14, Volume I	Maldives 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.	U
				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. Taxi F Now T/W H will be decommissioned in March 2012	A
				Poor condition of alpha and bravo taxiways and shoulders	Improve the pavement conditions		Taxiway Bravo & Taxiway A repaired.	A
	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 have been submitted. RESA will be provided as per ICAO requirement by 2013	U

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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							
	Chennai International Airport	Runway	AGA mission January 2009	RESA not provided in accordance with Para 3.5 of Annex 14, Volume I requirements; 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 RESA	AAI	December 2012 RESA provided, however desired strength is yet to be provided.	U
					Provision of 300m strip width for full length of runway 07/25.	AAI	December 2013 Action initiated	A
	Mumbai International Airport	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; 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 RESA	MIAL	R/w-09 RESA provided R/w-14- June 2013	U
					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

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ATTACHMENT B to the Report on Agenda Item 4

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement s	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	Completed. Frangible fence erected	U
				Taxiway light foundations not flush with shoulder - section 9.9 of Annex 14, volume I.	Taxiway light foundations flushed with shoulder surface	DIAL	Completed. October 2011	A

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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Identification		Deficiencies			Corrective Action			
Requirement s	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
				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

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ATTACHMENT B to the Report on Agenda Item 4

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement s	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
Annex 14 Volume I	Bangladesh 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

APANPIRG/23
ATTACHMENT B to the Report on Agenda Item 4

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement s	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
Annex 14 Volume I	Thailand 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	DCA/AOT	Oct 2011	A
				RESA to satisfy Section 3.5 of Annex 14, Volume I requirements; and	Provide RESA		Oct 2011 RESA of r/w 36 is available. RESA for r/w 18 is in progress	U
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-On Going	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. Additional info requested from operator	A

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ATTACHMENT B to the Report on Agenda Item 4

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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	Myanmar 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

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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
				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 program	DCA Myanmar	End of 2011	A
Annex 14 Vol. I Amendment 6 § 10.1 § 10.2								

ATTACHMENT B to the Report on Agenda Item 4

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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	Fiji Islands 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	4 th Quarter 2013	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		Red flush fittings installed on taxiway A, G, B & H	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		Completed 2011	A
				Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA		3 rd quarter 2012	A
				Provision of Airfield signage in accordance with ICAO Annex 14, volume I, section 5.4	Provide signage as per ICAO standards		4 th Quarter 2013	A
		Bird Hazard		Establishment of a national bird committee in accordance with APANPIRG Conclusion 18/1.	Establish National Bird Committee		May 2012	B

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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	Nausori International Airport	Runway/ 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	4 th Quarter 2013	A
				Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	Provide RESA		4 th Quarter 2013	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		Holding lights available on both western and Eastern Taxiway	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		Completed 2011	A

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement s	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

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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	Vietnam 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

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AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

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 B1 to the Report on Agenda Item 4

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	Brunei Darussalam	Runway/ vegetation along pavement edges and strip higher than with the adjacent runway pavement; uneven the earth mounds	ICAO Mission of April 2011					A
	Brunei International Airport	faded rubber deposits and centre line and other markings;						A
	Taxiway	non provision of enhanced taxiway centre line marking in accordance with Para 5.2.8 of Annex 14, Volume I						A
		remove objects on taxiway strips; vegetation on pavement joints and sealing the joints.						A
	Apron	non provision of ICAO compliant signage in accordance with section 5.4 Annex 14, Volume I						A
	Rescue and Fire Fighting (RFF):	non provision of direct access for the rescue and fire fighting vehicles from the fire station into the runway;						A
		non provision of road holding position sign at all road entrances to a runway; and						A
	Wildlife Hazards:	Establishing a national bird control committee in accordance with APANPIRG Conclusion 18/1;						B

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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	Lao PDR	Runway/ provide RESA in accordance with section 3.5 of Annex 14, Volume I	ICAO Mission of March 2011					U
	Wattay International Airport	Remove rubber deposits and renew centre line markings.						A
	Taxiway	provide runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, Volume I						A
		provide enhanced taxiway centre line marking in accordance with Para 5.2.8 of Annex 14, Volume I						
	Rescue and Fire Fighting (RFF):	Provide road holding position sign at all road entrances to a runway;						A
	Wildlife Hazards:	Establishing a national bird control committee in accordance with APANPIRG conclusion 18/1.						B
	Luang Prabang International Airport	Runway renew the runway markings until the new runway is put in operation;						A
	Taxiway	provide enhanced taxiway centre line marking in accordance with standard in Para 5.2.8.11 of Annex 14, Volume I						A

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Identification		Deficiencies			Corrective Action			
Requirement	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
		provide runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, Volume I on new taxiways						A
	Rescue and Fire Fighting (RFF)	Provide road holding position sign at all road entrances to a runway						A
Annex 14 Volume I	Mongolia	Runway/ remove rubber deposits and renew centre line and other faded markings;	ICAO Mission of July 2011					A
	Ulaan Baatar International Airport	Resealing the cracks on pavement surface with sealants to prevent ingress of water and broken edges which could cause FOD issues.						A
	Taxiway	provide enhanced taxiway centre line marking in accordance with Para 5.2.8 of Annex 14, Volume I ; renewal of faded taxiway markings sealing cracks with approved sealant provide runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, provide taxiway hold position signs on all hangar taxiways at entrances to the active taxiways/runway.						A

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Identification		Deficiencies			Corrective Action			
Requirement	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
	Apron	sealing the cracks on the apron surface						A
	Airfield signage	providing ICAO compliant signage in accordance with section 5.4 Annex 14, Volume I and to cut the vegetation in front of the signs.						A
	Wildlife Hazards	establishing a national bird control committee in accordance with APANPIRG conclusion 18/1; collect wildlife reports and forward to ICAO for inclusion in the ICAO 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.

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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.	1998	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.	DCA Myanmar	Revised target date is end of 2011	A
		Improvement has been observed and pilot reports continued to indicate occasional communication difficulties.	Early 2008		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.		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.	
		Further improvement has been observed with occasional communication problems reported.	June 2011		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		Further improvements need to be taken by the DCA Myanmar including both operational and technical arrangements	
		From 2 to 13 April 2012, a survey was conducted by IATA. 129 of 349 aircraft from 11 airlines reported problems of one sort or another (HF, VHF or Data Link) 50 reported no communication had been established.	April 2012		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;			

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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 Navaids and navigation service	Philippines	Un-serviceability of both the ILSs and the DVOR at Manila airport	19 June 2010	A letter from CAAP informed that the ILS system with associated DME had been commissioned in January and April 2011 respectively. Arrangement for continuous DVOR/DME operation was made by temporarily relocating old DVOR/DME facilities from another place.	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. Power supply module has been replaced; For DVOR/DME, a plan to replace temporary aging facilities with new system is in place which was expected to be completed in early 2012	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 the new DVOR/DME is put into operation.	A
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 A COM coordination meeting – Afghanistan and Pakistan was held in June 2012 in Karachi, Pakistan. A Remedial action plan was developed.	In March 2012, initial discussion on improvement of AFS communication was held at a special ATS coordination meeting. The COM coordination meeting in June 2012 developed a remedial action plan with three action items: 1. Near-term by end of September 2012, fully utilize the VPN circuit operational since January 2012 for exchange of AFTN traffic, organize users' training if required; 2. Mid-term by end of March 2013, harmonize VSAT terminal equipment and select common network service provider to recover the VSAT Links; 3. Long-term by end of June 2014, establish 2 MB dedicated landline connection with multiplexers between	Ministry of Transport and Civil Aviation Afghanistan and CAA. Pakistan	July 2014	A

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Identification		Deficiencies			Corrective Action			
Requirement	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action
					Afghanistan and Pakistan to support both data and voice communication between COM centres and ACCs.			

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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 Is. AP-MET-01	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. <i>Note: OPMET/M TF to carry out survey</i>	2011	A
Meteorological observations and reports. (Annex 3, Chapter 4)	Kiribati AP-MET-02	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 remedies. Activation of WIFS will assist in overcoming deficiency.	Directorate of Civil Aviation, Kiribati. <i>Note: OPMET/M TF to carry out survey</i>	2011	A

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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, 3.6, 4.8)	Indonesia AP-MET-03	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, 3.6, 4.8)	Papua New Guinea AP-MET-04	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 <i>Note: ICAO Regional Office to monitor</i>	TBD (no action plan submitted to RO)	A

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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 SIGMET for volcanic ash (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Indonesia AP-MET-06 Philippines AP-MET-07 Papua New Guinea AP-MET-08	Requirements for issuance and proper dissemination of SIGMET, including SIGMET for volcanic ash, have not been fully implemented	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 (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	a) State's Met authorities b) ICAO to implement the SIP. c) ICAO Regional Office to co-ordinate and monitor.	To be advised	U
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

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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 *
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 been met.		MWO not established due to lack of trained personnel and technical facilities. No SIGMET service for Phnom Penh FIR	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
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

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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 *
MWO for Pyongyang FIR and SIGMET (Annex 3, Chapter 3 & 7; ASIA/PAC FASID Table MET 1B)	DPR Korea AP-MET-16	Requirements for meteorological watch office (MWO) to be established at Pyongyang international airport have not been met.	2008	MWO not established due to lack of trained personnel and lack of resources. No SIGMET service for Pyongyang FIR Reported by RO mission	MWO established in February 2009 as reported by State. DPR. Korea is subsequently producing SIGMET on a regular basis and is routing SIGMET to 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.	General Administration of Civil Aviation (GACA) DPR Korea	Jan 2012	A
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 Nauru 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

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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
Provision of SIGMET information (Annex 3, Chapter 7)	Papua New Guinea AP-MET-22 Solomon Islands AP-MET-23 Nauru AP-MET-24	Lack of SIGMET issued for the Port Moresby, Honiara, and Nauru FIRs.	9/09/2011	IATA emphasized the importance of having hazards reported in this large sub-regional area that straddles the equator and deemed this situation unsafe and unacceptable to airline operations.	ICAO: States concerned are urged to take urgent action to seek assistance from a State in a position to do so to provide the service until such time the States concerned can provide their own SIGMET.			U

AGENDA ITEM 5: FUTURE WORK PROGRAMME

Agenda Item 5: Future Work Programme

Schedule of Future meetings

5.1 The meeting agreed that the tentative schedule of meetings for the rest of 2012, 2013 and 2014 should be as follows (Notes: A decode of acronyms has been included in **Appendix A** to the Report on Agenda Item 5):

2012 – Outstanding Meetings

ATNICG WG/10	26-28 Sep	Bangkok
ISTF/2	15-17 Oct	Bangkok
ADS-B WG/8	5-7 Dec	Myanmar
GLS Seminar	6-7 Dec	Sydney Australia
PBN implementation workshop & TF 10	10-14 Dec	Nadi, Fiji
2013		
APSAR/TF & APSAPG/3	21-25 January	Chennai India
SEACG/20 & SAIOACG/3	18-22 Feb	Bangkok
MET/R TF/3 & Seminar	4-8 March	Bangkok
MET/H TF/3 & ROBEX WG/11	11-15 March	Bangkok
RACP/TF/2	12-15 March	Bangkok
ATNICG/8	19-22 March	Indonesia
FIT-Asia/2 & SEMINAR	27-29 March	Bangkok
RASMAG/18	1-4 April	Bangkok
ADS-B SITF/12	15-19 April	India
QA seminar AAITF/8	6-10 May	Mongolia
MET SG/17	14-17 May	Bangkok
CNS SG/17	14-17 May	Bangkok
ATM/SG/23	20-24 May	Bangkok
AOP/WG/1	21-23 May	Bangkok
APSAPG/4	3-7 June	Hong Kong China
APANPIRG/24	24-26 June	Bangkok
2014		
PBN/TF/11	TBD	
SEACG/21	TBD	
SAIOACG/4	TBD	
RASMAG/19	TBD	
ATNICG/9	March	TBD
RACP/TF/3	TBD	
MET/H TF/4 & ROBEX WG/12	TBD	Bangkok
MET/R TF/4	TBD	Bangkok
ADS-B SITF/13	TBD	Hong Kong, China
ATM/SG/24	June	Bangkok
AOP/WG/2	June	Bangkok
AAITF/9	TBD	
MET SG/18	July	Bangkok
CNS SG/18	July	Bangkok
APANPIRG/25	8 -12 September	Bangkok

5.2 The meeting noted that the Provisional Agenda for APANPIRG/23 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.

5.3 The meeting was informed that in 2011 about 40 meetings and seminars were convened at the APAC office including some which were hosted by the APAC States. The Group expressed appreciation to the member States Administrations for hosting the meetings and seminars. The meeting also expressed appreciation to Myanmar, India and Indonesia for offering to host ADS-B WG/8 (Dec 2012), ADS-B SITF/12(April 2013) and ATNICG/8 (March 2013) respectively.

Amendment to APANPIRG Procedural Handbook

5.4 The meeting noted that the third edition of the APANPIRG Procedural Handbook was published in 1998 and since then a number of changes were introduced. The meeting received the draft Fourth Edition of the APANPIRG Procedural Handbook that includes the revised Terms of Reference (May 2010), Asia Pacific Supplement to the Uniform Methodology for the identification, assessment and reporting of Air Navigation deficiencies, Terms of Reference of APANPIRG Chairperson, first Vice Chairperson and second Vice Chairperson and term of the Sub group Chairperson and Vice Chairperson.

5.5 The Fourth Edition of the APANPIRG Procedural Handbook is placed at **Appendix B** to the Report on Agenda Item 5.

Scheduling of Meetings in ICAO Assembly Year 2013

5.6 The meeting noted that the 47th DGCA Conference (Macao 2010) agreed that during the ICAO Assembly Year the DGCA conference should be held in a reasonable timeframe before or after the ICAO Assembly.

5.7 The meeting reviewed the ICAO draft program keeping in view the overall objective of efficient management of meetings, cost effectiveness and resources within the Regional Office for 2013 (Assembly Year) on:

- *Reduction in number of APANPIRG meeting days from 5 to 3;*
- *Holding RSAG APAC meeting back to back with APANPIRG meeting*
- *Holding DGCA Conference consecutively with APANPIRG and RASG meetings.*

5.8 The meeting agreed:

- APANPIRG will decide on the number of working days (5, 4 or 3) for its future meetings based on the experience gained in the conduct of APANPIRG/24 meeting within 3 days; members agreed to provide their views at the next APANPIRG meeting;
- APANPIRG/23 decided that the Group should meet once a year in order to allow the contributory bodies to review the various air navigation challenges in the Asia Pacific Region;
- States/Administrations agreed to strictly adhere to the submission of papers within the deadline indicated in the invitation letter. Late submission of papers if requested by a State should be referred to Chairman APANPIRG for a decision;

- ICAO Secretariat agreed to post the papers on the APAC web site two weeks in advance of the meeting. A summary of the draft decisions and draft conclusions should also be posted on APAC web site;
- APANPIRG agreed to extend working hours for APANPIRG/24 from 0900 hours to 1600 hours.
- APANPIRG agreed that the sub group chairpersons discuss with the secretariat on reducing the working days of its CNS and MET Sub Group meeting from 5 days to 4 days initially on trial basis;
- APANPIRG noted that the authority for adoption of Conclusions and Decisions arising from its sub groups should rest with it, considering that the outcomes are presented to Air Navigation Commission. However APANPIRG agreed to observe for a year or two before delegating authority to its sub group on adoption of certain conclusions and decisions of low complexity.

APANPIRG/23
Report on Agenda Item 5

APPENDIX - A
ACRONYMS

AAITF	Aeronautical Information Services – Aeronautical Information Management Implémentation Task Force
ADS-B SITF	ADS-B Study and Implementation Task Force
ADS-B WG	ADS-B Working Group
AIS	Aeronautical Information Services
AOP/WG	Aerodrome Operations and Planning Working Group
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Group
APSAPG	ICAO Asia Pacific Seamless ATM Planning Group
ATFM	Air Traffic Flow Management
ATM/AIS/SAR/SG	ATM/AIS/SAR Sub-Group of APANPIRG
ATM/SG	ATM/ Sub Group
ATN IC G	Aeronautical Telecommunication Network Implementation and Coordination Group
BBACG	Bay of Bengal ATS Coordination Group
BOB RHS/TF	Bay of Bengal Reduced Horizontal Separation Implementation Task Force
CNS	Communications, Navigation and Surveillance
CNS/MET SG	CNS/MET Sub-Group of APANPIRG
CNS/SG	CNS Sub-Group of APANPIRG
D-FIS	Data Link Flight Information Service
FIT-Asia	FANS Interoperability Team-Asia
FIT-BOB	FANS 1/A Implementation Team, Bay of Bengal
FIT-SEA	FANS 1/A Implementation Team, South East Asia
GLS Seminar	GNSS Landing System
IAVWOPSG	International Airways Volcano Watch Operations Group
MET	Meteorology
MET/ATM TF	Meteorology/Air Traffic Management Task Force of MET/SG
MET/H TF	Meteorological Hazards Task Force of MET/SG
MET/R TF	Meteorological Requirements Task Force of MET/SG
MET SG	Meteorology Sub-Group of APANPIRG
METWARN/I TF	Meteorological Advisories and Warnings Implementation Task Force of MET/SG
OPMET/M TF	Operational Meteorological Management Task Force of MET/SG
PBN	Performance Based Navigation
PBN TF	Performance Based Navigation Task force
RACP/TF	Regional ATM Contingency Planning Task Force
RASMAG	Regional Air Space Monitoring Advisory Group
RNP-SEA/TF	South East Asia RNP Implementation Task Force
ROBEX WG	Regional OPMET Bulletin Exchange Working Group of MET/SG
SAIOACG	South Asia/Indian Ocean ATM Coordination Group
SAREX	Search and Rescue Exercise
SEACG	South East Asia ATS Coordination Group
TRASAS	Trans-Regional Airspace and Supporting ATM Systems Steering Group
WPAC/SCS RSG	Western Pacific/South China Sea RVSM Scrutiny Working Group



**ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG)**

PROCEDURAL HANDBOOK

~~THIRD EDITION – AUGUST 1998~~
FOURTH EDITION - February 2012

[illegible]

2

1. Introduction

1.1 The Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) Procedural Handbook is an informal publication prepared by the Secretariat, intended to provide, for easy reference of interested parties, a consolidation of material, particularly of a procedural nature, about the work of the APANPIRG and its contributory bodies. It contains the Terms of Reference of the APANPIRG recommended by the Air Navigation Commission and approved by the Council of ICAO. It also contains the working arrangements and internal instructions developed by the Group for the practical application of its Terms of Reference.

1.2 The document describes; Terms of Reference; Composition; Position within ICAO; Working Arrangements; Rules of Procedure and Practices governing the Conduct of Business.

1.3 The framework of Part and Sections headings in addition to the page numbering has been devised to provide flexibility and the facilitation of the revision of additional or new material. Each Part includes an Introduction giving its purpose and status. A Table of Contents is also provided which serves also as a subject index and as a check list for the current pages.

1.4 All pages bear the date of issuance. Replacement pages will be issued as necessary and any portion of a page that has been revised will be identified by a vertical line in the margin. Additional material will be incorporated in the existing Sections or will be the subject of new Sections, as required.

1.5 Changes to text will be identified by a vertical line in the margin in the following manner;

N	for new or revised text;
E	for editorial modification that do not alter the substance or meaning of the text;
D	for deleted text

For practical reasons, this shall not be applied to title pages or to the routine insertion and deletion of Conclusions and Decisions. The absence of change bars, when data or page numbers have changed, will signify reissue of the section concerned or rearrangement of text (e.g., following an insertion or deletion with no other changes).

1.6 The Procedural Handbook will be distributed to Members and Observers of APANPIRG, the ICAO Secretariat, and to other States and international organizations participating in meetings, contributing to, or having interest in the work of the APANPIRG and/or its Contributory Bodies.

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ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG)

PROCEDURAL HANDBOOK

PART I

TERMS OF REFERENCE,
COMPOSITION AND POSITION IN ICAO OF THE APANPIRG

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1. **Background**

1.1 The Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) has been established by the ICAO Council in 1991[C-MIN.133/18, 26 June 1991].

1.2 This Section sets out the Terms of reference of the APANPIRG and its position with in ICAO. These guidelines will govern the groups working arrangements including relation with States, international organizations and ICAO specialized regional bodies, the Rules of Procedure for the conduct of its meetings and those of its contributory bodies.

2. **Terms of Reference of the APANPIRG**

2.1 The Terms of Reference of APANPIRG was approved by the Council of ICAO in 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, C190/4 25 May 2010]. The Membership and Terms of Reference are as follows:

2.1.1 **Membership**

All ICAO Contracting States, who are service providers in an air navigation region and part of that region's Air Navigation Plan, 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.

2.1.2 **Terms of Reference of APANPIRG**

The objectives of the Group are to:

- 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 (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.

2.1.3 **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.

3. Composition of the APANPIRG

3.1 The APANPIRG is composed of all APAC member States providing air navigation services in the Asia and Pacific Regions.

3.2 The Group shall normally invite representatives of international organizations recognized by the Council as representing important civil aviation interests to participate in its work in a consultative capacity.

3.3 User States may participate as observers in APANPIRG meetings. Also other APAC International Organizations and/or bodies may also participate when invited specifically by the APANPIRG.

3.4 States should ensure that their representatives to be designated as members of APANPIRG have knowledge and good experience in the provision of the full range of international air navigation systems and serve for a sufficiently lengthy period to maintain continuity in the activities of APANPIRG. The designated representative can be assisted, when required, by technical advisers during meetings of the APANPIRG.

4. Creation and dissolution of contributory bodies

4.1 To assist in its planning and implementation work, APANPIRG may create contributory bodies (sub-groups), charged with preparatory work on specifically defined problems requiring expert advice for their resolution. Representation in such sub-groups should be by specialists in the subjects concerned and familiar with the area under consideration. The establishment and the work of sub-groups shall be governed by the following considerations:

- a) a sub-group shall be formed when it is clearly established that it can make a substantial contribution to the resolution of the problem(s) in question;
- b) it shall be given clear and concise terms of reference describing not only its task but also an expected target date for its completion;
- c) its composition shall be such that, while being kept as small as possible, all States and organizations which can make valid contributions are given the opportunity to

- participate in it;
- d) its work progress and co-ordination requirements shall be subject to review by the Group to avoid duplication of effort in fields already covered by other activities; and
- e) a sub-group shall be dissolved when it has either completed its assigned task or it has become apparent that work on the subject in question cannot be usefully continued.

5. **Position within ICAO**

5.1 APANPIRG shall be the guiding and co-ordinating organ for all activities conducted within ICAO concerning the Air Navigation System for the Asia and Pacific Regions. However it shall not assume authority vested in other ICAO bodies, except where such bodies have specifically delegated their authority to the Group. The activities of the Group shall be subject to review by the Council.

5.2 The work of groups established and meetings held within the framework of ICAO, concerned with the Asia and Pacific air navigation system shall be coordinated with the APANPIRG to ensure full harmonization with all regional activities regarding the development and operation of the Asia/Pacific system.

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ASIA/PACIFIC AIR NAVIGATION PLANNING AND
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PART II

WORKING ARRANGEMENTS

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1. Relations with States

1.1 States located geographically in the Asia and Pacific Regions, States having dependent territories in these Regions, and States having aircraft on their register that operate in these Regions, shall be kept fully informed of activities of the APANPIRG. To achieve this objective, States should receive, regularly:

- a) Proposed agenda for meetings of the Group;
- b) The reports on meetings of the Group; and as appropriate
- c) The summaries of reports on meeting of its contributory bodies.

1.2 States should ensure necessary co-ordination and follow-up of the APANPIRG activities within their Administrations.

1.3 APANPIRG may obtain information from Asia and Pacific provider States on specific questions and offer them advice on specific proposals for action.

2. Relations with other Bodies and Organizations

2.1 APANPIRG shall keep itself informed of the activities of other bodies and organizations to the extent that such activities are likely to have an impact on the planning and operations of the Asia and Pacific air navigation system.

2.2 When necessary, the APANPIRG shall provide information and advice to such bodies and organizations, if this is required, to:

- a) avoid duplication of studies and/or effort; and
- b) engage their assistance in matters that, while having a bearing on the air navigation system, are outside the competence of ICAO and/or the Terms of Reference of the Group.

3. Administration of the APANPIRG

3.1 The APANPIRG shall be administered as follows:

- a) by a Chairperson, elected from the Representatives designated by member States of the Group. A First and Second Vice-Chairperson shall be elected from the said representatives; and
- b) by **ICAO Regional Director, Asia and Pacific Office** designated as Secretary APANPIRG by the Secretary General of ICAO. In the execution of duties the Secretary will be supported by the Asia and Pacific Regional Office.

3.2 The Chairperson, in close co-ordination with the Secretary, shall arrange for the most efficient working of the Group. The Group shall always work with a minimum of formality and paperwork.

3.3 Between meetings of the APANPIRG or its contributory bodies, some subjects may be dealt with by correspondence among appointed Representatives of Member States through the Secretary of the APANPIRG or the Secretary of the sub-group concerned. However, if States are to be consulted this should be done through the ICAO Regional Director, **Asia and Pacific Office**.

4. Meetings of the APANPIRG

4.1 Based on the advice of the designated representatives and Secretary, the Chairperson shall decide the date and duration of meetings of the Group.

4.2 Meetings are normally convened at the location of the ICAO Regional Office in Bangkok. If a State offers to host a meeting it shall be responsible for providing a venue, services and all costs of travel and subsistence allowance for secretariat attendees.

4.3 Members may be accompanied by their advisers. Total attendance should be kept to a minimum consistent with the topics to be discussed to maintain the desired informality of proceedings.

4.4 The ICAO Regional Office in Bangkok shall normally provide the requisite secretariat services to APANPIRG.

5. Establishment of Sub-Groups

5.1 To assist it in its work, APANPIRG may create sub-groups, charged with preparatory work on specific problems requiring expert advice for their resolution.

5.2 The establishment and the work of sub-groups shall be governed by the procedures in Part I, paragraph 4.1

5.3 Participation in sub-groups should be by specialists in the subjects under consideration. Such specialists should be provided by States (), and international organizations having relevant experience in the field concerned.

5.4 Secretaries of sub-groups established by the Group will be appointed by the Secretary of APANPIRG.

6. Working Groups and Task Forces

6.1 The APANPIRG or its sub-groups may appoint working groups and /or task forces composed of experts from the Group or the sub-group to perform studies or prepare supporting documentation on defined subjects for consideration by the Group or sub-groups as a whole. User States and other international organizations may also be invited to provide experts to participate in these task forces, as required. **Chairperson of working groups and task forces may authorize co-opting of experts as advisors to provide technical inputs to the working groups and task forces when required.**

7. Role of Designated Members

7.1 Representatives of States designated as Members of APANPIRG shall assume the duties and responsibilities of ensuring the normal conduct of business of the Group. Members should attend regularly all the meetings of the Group and maintain the continuity of the Group's work in the interval between meetings. This may take the form of assignment of specific tasks to selected individual Members and/or participation in task forces as referred to in paragraph 6.1.

8. Status of Observers

8.1 According to the provision of Part I, paragraph 3.3, States that are neither located nor have aircraft on their register operating in the Asia and Pacific Regions will have the status of Observer at APANPIRG meetings.

8.2 According to the provisions of Part I, paragraph 3.2, International Organizations invited to participate at meetings of APANPIRG will have the status of Observer.

9. Co-ordination and reporting lines

9.1 APANPIRG reports to the ICAO Council through its Secretary and the ICAO Secretariat as follows:

- a) proposals for amendment of the Air Navigation Plan (facilities, services and Basic Operational Requirements and Planning Criteria) and proposals for amendment of the Regional Supplementary Procedures (SUPP) originated by the APANPIRG will be processed according to the approved amendment procedures;
- b) suggestions by the APANPIRG calling for amendment or modification of the provisions in the ICAO world-wide provisions (Annexes and PANS) will be submitted to the Air Navigation Commission (ANC) for consideration and action as appropriate;
- c) items concerning serious shortcomings in implementation of the Asia and Pacific Regional Plans will be reported to the States concerned, and, after all possible efforts for implementation have been exhausted to the attention of the ANC;
- d) specific policy issues emanating from the work of the APANPIRG and matters which impact other regions will be submitted to the Council;
- e) matters concerning the Group's terms of reference, its composition, position in ICAO and working arrangements, will be submitted to the Council.

9.2 Sub-groups report to APANPIRG. Co-ordination among sub-groups will primarily be ensured by the Group when establishing their terms of reference and work programme or taking action on their reports. In addition, the work of the contributory bodies should be co-ordinated through their respective Chairperson and Secretaries, assisted, as required, by the ICAO Secretariat, in the Asia and Pacific Office.

9.3 Routine relations between the APANPIRG or its contributory bodies and other ICAO groups and meetings concerning the Asia and Pacific Regions shall be conducted through the respective Secretaries and/or the ICAO Regional Director Asia and Pacific Office.

9.4 Relations with representatives of States designated as Members of APANPIRG and representatives of International Organizations regularly attending the meetings of the APANPIRG shall be conducted through the Secretary of APANPIRG. Other ICAO Regional Offices shall be kept informed of correspondence whenever it may have an impact on their work.

9.5 Relations with States and International Organizations whether represented in the Group, and relations with Asia or Pacific bodies and Organizations will normally be conducted through the ICAO Regional Director, Asia and Pacific Office.

9.6 Relations with the experts provided by States as Members of APANPIRG or sub-groups shall be conducted by the Secretary of the sub-group concerned.

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ASIA/PACIFIC AIR NAVIGATION PLANNING AND
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PROCEDURAL HANDBOOK

PART III

RULES OF PROCEDURES FOR THE CONDUCT OF
MEETINGS OF THE APANPIRG

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1. General

- 1.1 The APANPIRG shall always work with a minimum of formality and paper work. To

achieve this aim, the rules of procedure for the conduct of meetings should be as flexible and simple as possible. The Group is expected to conduct its business by general consensus of interested parties. The following provisions do not therefore include any procedures for handling motions or voting.

1.2 There shall be no minutes for the meetings of the Group. Reports on meetings should not include formal Statements by members or observers. However, where consensus was achieved after specific divergent views were expressed in relation to the decisions taken or the conclusions reached, those views shall be recorded as an integral part of the Report.

2. Participation

Note: The following rules of procedure are based on the provisions contained in paragraphs 3 of Part I and in paragraphs 2, 7 and 8 of Part II.

2.1 Representatives of Contracting States designated as Members of the APANPIRG should participate regularly in all meetings of the Group.

~~2.1.1 Subject to the applicable provisions in paragraph 3 of Part I, all APAC Contracting State of ICAO are entitled to participate in meetings of the APANPIRG, if it so wishes. To this effect, the State concerned should notify the Secretary of APANPIRG of its intention of being represented, not later than 30 days prior to the meeting in which it has decided to participate. Such notification should include an indication of the subjects in which that State is interested and the name and title of its representative(s).~~

~~Note: The notification referred above is not required by States having decided to attend regularly the meetings of the Group.~~

2.2 APANPIRG shall normally invite international organizations recognized by the Council as representing important civil aviation interests to participate in the work of the APANPIRG in a consultative capacity. Among the international organizations, ACI, CANSO, IBAC, IATA, ICCAIA, IFALPA and IFATCA should be invited on a regular basis. Other international organizations and/or Asia/Pacific bodies and organizations may participate when specifically invited by the Group.

2.3 The ICAO Regional Director Asia and Pacific Office should endeavour to ensure representation by States, International Organizations, Asia/Pacific bodies and organizations invited by the Group to participate in its meetings.

Note: The Secretary of the APANPIRG, in consultation with the Chairperson, shall undertake to keep the total number of participants to a level consistent with the required efficiency and informality of the proceedings.

3. Convening of Meetings

Note: Besides the working arrangements set forth in paragraph 4 of Part II, the rules of procedure below should be followed in convening meetings of the Group.

3.1 At each of its meeting APANPIRG should endeavour to agree on the date and duration of its next meeting.

3.2 According to its objectives the APANPIRG shall;

a) ensure the continuous and coherent development of the Asia and Pacific Regional

Plans as a whole and in relation to that of adjacent Regions; and

- b) identify specific problems in the air navigation field concerning the Asia and Pacific Regions and propose, in appropriate form, resolving action addressed to parties concerned.

Note: To achieve these objectives the convening of one meeting per year would generally suffice. Still, to safeguard coherent and orderly air navigation planning in the interest of States and airspace users in the Asia and Pacific Regions, the Group may determine the need for an additional meeting in any given year.

3.3 A letter for convening a meeting shall be addressed by the APANPIRG Secretary normally 90 days prior to the meeting, to representatives of:

- a) States designated as members;
- b) States not designated as Members, that have decided to attend regularly the meetings of the APANPIRG;
- c) International Organizations invited to participate regularly in the activities of the Group.

3.4 The convening letter should include the agenda, with explanatory notes to assist participants in preparing for the meeting.

3.5 The ICAO Regional Director, Asia and Pacific Office, shall ensure that States and International Organizations concerned are informed of the convening of APANPIRG meeting and the subjects planned for discussion. This should be done by a State Letter.

4. Establishment of the Agenda

4.1 The Secretary, in consultation with the Chairperson of APANPIRG, shall establish a draft agenda based on the work programme adopted.

4.2 The draft agenda shall be circulated with the convening letter, as specified in sub-paragraph 3.3 above, for comments.

4.3 Comments in relation to the draft agenda or the work of the Group received up to 10 days prior to the meeting will be presented to the meeting as a Working Paper.

4.4 At the opening of the meeting any State or international organization may propose the inclusion of additional items on the agenda, and this shall be accepted if most States attending so agree.

5. Languages

5.1 The language of the meeting of the APANPIRG shall be English.

5.2 The report on meetings and supporting documentation for meetings of the Group will be prepared in English.

6. Officers and Secretariat of the APANPIRG

Note: The following rules of procedure are supplementary to the working arrangements for

the administration of the APANPIRG contained in paragraph 3 of Part II.

6.1 APANPIRG/ 20 approved the Terms of Reference of Chairperson, First Vice Chairperson and Second Vice Chairperson as below:

- The Chairperson/First Vice Chairperson/Second Vice Chairperson shall be a serving official of their State Administration, holding position of progressive responsibilities. He/She should have vast experience in the administration and management related to international civil aviation matters.
- The term of the Chairperson, First Vice Chairperson and Second Vice Chairperson shall be for a maximum period of three years. If an elected Chairperson is due for retirement or resigns from his organization during this period, the Group may elect a new Chairperson

6.2 To ensure the necessary continuity in the work of the Group and unless otherwise determined by special circumstances, the Chairperson, the First Vice-Chairperson and Second Vice-Chairperson of the APANPIRG should assume their functions at the end of the meeting at which they are elected.

6.3 Designated Members of the Group may request that the election of the Chairperson and/or Vice-Chairpersons be included on the agenda.

6.4 The Secretary of the APANPIRG will serve as Secretary of the meetings of the Group and will be assisted by Officers of the ICAO Asia and Pacific Office.

6.5 Presentation of reports of sub-groups or of other ICAO regional planning groups or meetings should normally be made by the Secretary of the respective sub-group, regional planning group or meeting, as the case may be. Exceptionally, and in particular, when reports raise questions of principle or of a policy nature, the Group may request that their presentation be made by the Chairperson of the body concerned.

7. Meeting documentation

7.1 Documentation for meetings of the APANPIRG will be prepared by the ICAO Secretariat, member States and international organizations participating regularly in the activities of the Group. Distribution of the supporting documentation of APANPIRG, as well as the reports of the meetings will be posted on the APAC web page www.bangkok.icao.int under the APANPIRG and Sub Groups option, using the username and password provided to States.

7.2 Any State, international organization and Asia/Pacific body or Organization, attending or not, may submit material for consideration by APANPIRG. In cases where the material submitted is as supporting documentation on a specific subject, the originator is expected to attend the meeting to which it is presented, at least during the discussions on the subject concerned.

7.3 Supporting documentation shall be presented as:

- a) Working Papers
- b) Discussion Papers and Flimsies
- c) Information Papers

7.4 Working Papers are the main basis of the discussion on the various items of the agenda.

7.5 Working Papers shall be presented in a standardized format. Each paper should be limited to

one agenda item or sub-items and contain, as appropriate, introduction of the matter, brief discussion and conclusions with specific proposals for action.

7.6 Working Papers should be made available to the ICAO secretariat as early as practicable (14 days), before the meeting at which they are intended to be considered.

7.7 Working Papers shall be posted on the ICAO APAC web site by the secretariat

- a) ~~Representatives of States designated as Members of the Group;~~
- b) ~~States having notified the Secretary of their intention of being represented at the relevant meeting;~~
- c) ~~International organizations attending APANPIRG activities regularly; and~~
- d) ~~Provider States whose facilities and/or services are the subject of the paper.~~

7.7.1 ~~Other States or international organizations originating a Working Paper shall be provided with a copy of that particular Working Paper despite not attending the meeting of the Group to which it is submitted.~~

7.8 Discussion Papers and Flimsies are papers prepared on an ad hoc basis during a meeting, with the purpose of assisting participants in their discussions on a specific matter or in the development of conclusions for the draft report of the meeting.

7.9 Information Papers are intended solely to provide participants at a meeting with information on developments of technical or administrative matters of interest to the Group. Information papers shall be posted on the ICAO APAC website by the secretariat

7.10 In view of their nature, the distribution of Discussion ~~and Information~~ Papers shall be limited to participants at the meeting to which they relate.

8. Conclusions and Decisions of the Meetings

8.1 Action taken by the Group shall be recorded as:

- a) Conclusions; and
- b) Decisions

8.2 Conclusions deal with matters that, according to the Group's terms of reference, merit directly the attention of States, or on which further action is required to be initiated by the Secretary according to established procedures.

8.2.1 Conclusions are mainly aimed at the furtherance of studies and programmes being undertaken by the Group, its sub-groups and other ICAO Groups or meetings. For the implementation of conclusions, the Secretary shall:

- a) initiate the required action; or
- b) through the relevant ICAO Regional Office, invite States and international organizations or other bodies as appropriate to undertake the tasks called for by the Conclusion concerned; or

- c) refer them to Council and the Air Navigation Commission for appropriate action.

8.2.2 The Secretary will ensure that conclusions are transmitted to the States concerned through the relevant ICAO Regional Office and will take whatever action may be required to monitor their implementation.

8.3 Decisions relate solely to matters dealing with the internal working arrangements of the Group and its sub-groups.

9. Conduct of business

9.1 The meetings of the APANPIRG shall be conducted by the Chairperson or, in their absence, by the First or Second Vice-chairman of the Group, in that order.

9.2 At the first sitting of each meeting, following the opening by the Chairperson, the Secretary shall inform participants of the arrangements made for the conduct of the meeting, its organization, and of the documentation available for consideration of the different items on the agenda.

9.3 Every meeting of the APANPIRG will consider, as required:

- a) reports by its sub-groups;
- b) reports by regional bodies;
- c) specific implementation matters; and
- d) review and up-date of the Work Programme.

9.4 At each of its meetings, the Group shall establish a tentative meeting programme (including meetings of sub-groups) for, at least, the following two calendar years (cf. sub-paragraph 3.2 Part IV).

9.5 The Group shall at each of its meetings review its outstanding Conclusions and Decisions to keep them current and their number at a minimum consistent with the progress achieved in implementation.

10. Reports

10.1 Reports on meetings shall be of a simple layout and as concise as possible and shall include:

- a) a brief history of the meeting (duration, attendance, agenda and list of Conclusions and Decisions);
- b) a summary of the discussions by the Group on the different items of the agenda including, for each of them, the relevant Conclusion(s) and/or Decision(s);
- c) the work programme and future action by the Group; and
- d) the tentative programme of future meetings of the Group and of its sub-groups.

10.2 A draft report will be prepared by the Secretariat for approval by the Group before the closing of each meeting.

10.3 The approved Meeting Report shall be circulated by the Secretary to:

- a) Members of the Group; and
- b) Other States and international organizations and Asia/Pacific bodies and organizations having attended the relevant meeting.

10.4 The report shall also be posted on the ICAO APAC web site.

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ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG)

PROCEDURAL HANDBOOK

PART IV

RULES OF PROCEDURE FOR THE
CONDUCT OF MEETINGS OF THE CONTRIBUTORY
BODIES OF THE APANPIRG

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1. General

- 1.1 Contributory bodies (sub-groups) of the APANPIRG shall work with a minimum of formality

and paperwork. There shall be no minutes kept for the meetings.

2. Participation

Note: The following rules of procedure are based on the provisions contained in paragraph 5 of Part II.

2.1 Each sub-group of the APANPIRG shall be composed of experts to be provided by States, whether Members or not of the APANPIRG, international organizations and/or bodies and Organizations having experience in the relevant field.

2.2 When deciding the creation and establishing the mandate and terms of reference of any of its sub-groups, the Group shall indicate the States, international organizations and/or bodies and Organizations that are to be invited to provide experts for that body. The composition of sub-groups shall be kept as small as possible to ensure the efficiency of their work and the informality of proceedings.

2.3 States other than those specified by APANPIRG which can make valid contributions to the work of a sub-group body are entitled to provide experts for that body if they so wish. To this effect, they should notify the ICAO Regional Director, Asia and Pacific Office of their intention to participate and of the name and title of the expert(s) designated.

2.4 States and international organizations and/or Asia/Pacific bodies and organizations should ensure that the experts they provide as members in sub-groups of the APANPIRG have the required qualifications and experience to contribute to the work of the body concerned.

3. Convening of meetings

3.1 The date and duration of meetings of a sub-group of the APANPIRG shall be decided by the Chairperson, in consultation with Members and the Secretary of that sub-group.

3.2 As a rule, sub-groups should agree, at each meeting, on the date and duration of the next meeting and on a tentative schedule of future meetings to assist the APANPIRG in establishing its meeting programme (cf. sub-paragraph 9.4 of Part III).

3.3 For every meeting of a sub-group of the APANPIRG, a convening letter shall be addressed by the respective Secretary to the Members of that body. This convening letter should include the agenda, with explanatory notes as required, to assist participants in preparing for the meeting.

4. Establishment of the Agenda

4.1 The Secretary of a sub-group of the APANPIRG, after co-ordination with the ICAO Regional Office and in consultation with the Chairperson, shall establish a draft agenda based on the work programme adopted and the documentation available.

4.2 The draft Agenda shall be circulated with the convening letter and submitted to the meeting to which it refers, for approval.

5. Languages

5.1 The language of, and supporting documentation for, meetings of contributory bodies of the

APANPIRG (sub-groups, task forces) shall be English.

Note: Documentation prepared by States and international organizations should be forwarded to the Secretary of the Sub-group/Task Force, if possible, at least 14 days before the meeting preferably as an 'MS Word' attachment via e mail to apac@icao.int for which it is intended, to permit timely processing.

5.2 The reports of meetings of these bodies shall be in English.

6. Officers and Secretariat of sub-groups of the APANPIRG

6.1 Each sub-group of the APANPIRG shall at its first meeting elect, from the experts provided by States as Members of the sub-group, a Chairperson and a Vice-Chairperson would also be elected if needed

6.2 ~~To ensure the necessary continuity in the work and unless otherwise determined by special circumstances, the Chairperson and Vice-Chairperson of a sub-group should serve for an unspecified period.~~
Based on the Decision 22/53 of APANPIRG 22 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.

6.3 Members of a sub-group may request that the election of the Chairperson and/or Vice-Chairperson be included in its meeting agenda. ~~Elected officers may be re-elected.~~

7. Conduct of business

7.1 Meetings of a sub-group shall be conducted by its Chairperson or, in their absence, by the Vice-Chairperson.

7.2 Action proposed by a sub-group that requires the prior agreement of the APANPIRG before it can be implemented or otherwise, shall be recorded in its report as draft Conclusions or draft Decisions. All such proposed actions shall be considered by the APANPIRG at its next meeting after the issue of the sub-group's report.

8. Reports of meetings

8.1 Proceedings of meetings of sub-groups should be recorded in the form of a Report or a Summary.

8.2 A sub-group shall decide for each of its meetings whether a Report is required or whether a Summary will be sufficient. A summary would normally suffice when there is no meeting of the APANPIRG before the next scheduled meeting of the sub-group. A consolidated Report may be prepared covering more than one meeting.

8.3 A meeting of a sub-group will submit a Report whenever, it has:

- a) completed action on any part of its work programme; or
- b) found that it needs further directives or guidance from the APANPIRG to proceed in its work.

8.4 For all other meetings, the Secretary of that body will prepare a summary on the business conducted by the meeting to keep the APANPIRG and States informed of development in its activities.

8.5 Reports on meetings of sub-groups shall be of a simple layout and as concise as practicable. To the extent feasible the reports should be presented in a summary format setting aside reporting on non-essential proceedings and on matters of solely internal interest to the sub-groups themselves. They should normally cover:

- a) short introduction (brief history of the meeting, agenda, tasks at hand);
- b) in the sequence of the agenda, summary of findings on different tasks or specific elements of it including, as appropriate, draft conclusions and/or decisions; and
- c) the work programme and future meetings.

8.6 Reports or Summaries on meetings of sub-groups shall be posted on ICAO APAC web site.

8.7 Reports or Summaries on meetings of sub-groups shall be submitted to the APANPIRG for review and action. At each of its meetings, the APANPIRG shall review the reports or summaries on all meetings of its sub-groups having taken place since its last meeting also other available reports on earlier meetings of sub-groups still requiring action by the Group.

8.8 Action taken by the APANPIRG on reports of its sub-groups shall be the object of a Supplement to the Report concerned. This Supplement shall be circulated by the Secretary of the Sub-group concerned to the Members of that body and by the ICAO Regional Director, Asia and Pacific Office to the interested States, international and national Organizations and bodies concerned.

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ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG)

PROCEDURAL HANDBOOK

PART V

PROCEDURE FOR THE ENDORSEMENT AND APPLICATION OF
ASIA/PACIFIC REGIONAL GUIDANCE MATERIALS IN
VARIOUS AIR NAVIGATION FIELDS

AND

UNIFORM METHODOLOGY FOR THE IDENTIFICATION,
ASSESSMENT AND REPORTING OF AIR NAVIGATION
SHORTCOMINGS AND DEFICIENCIES

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1. PROCEDURE FOR THE ENDORSEMENT AND APPLICATION OF ASIA/PACIFIC REGIONAL GUIDANCE MATERIALS IN VARIOUS AIR NAVIGATION FIELDS**1. Procedure**

The following procedure suggested by APANPIRG/7 (Conclusion 7/39) for the processing of the ASIA/PAC regional guidance materials was noted by the ICAO Council (150/18) for inclusion in the Procedural Handbook.

- APANPIRG Sub-Groups and Task Forces as well as States of the ASIA/PAC Regions, in a position to do so, are encouraged to develop uniform guidance material for facilitating the implementation of international air navigation systems in the Asia/Pacific Region.
- Such guidance material should not conflict with ICAO Provisions.
- Such guidance material should be examined by the APANPIRG States and included in APANPIRG reports.
- With regard to cases where regional guidance material prepared by APANPIRG contributory bodies needs to be dealt more speedily, the material may be circulated to States for appropriate action following consultation with the APANPIRG Chairperson and examination by ICAO Headquarters.
- The material resulting from the above should be forwarded to States by the ICAO Regional Office recommending States to use/adopt the material to facilitate their work.

2. UNIFORM METHODOLOGY FOR THE IDENTIFICATION, ASSESSMENT AND REPORTING OF AIR NAVIGATION DEFICIENCIES

(Approved by the Council on 30 November 2001)

1. Introduction

1.1 Based on the information resulting from the assessment carried out by ICAO on the input received from various regions regarding shortcomings and deficiencies in the air navigation field, it became evident that improvements were necessary in the following areas:

- a) collection of information;
- b) safety assessment of reported problems;
- c) identification of suitable corrective actions (technical/operational/financial/organizational), both short-term and long-term; and
- d) method of reporting in the reports of ICAO planning and implementation regional groups (PIRGs).

1.2 This methodology is therefore prepared with the assistance of ICAO PIRGs and is approved by the ICAO Council for the efficient identification, assessment and clear reporting of air navigation deficiencies. It may be further updated by the Air Navigation Commission in the light of the experience gained in its utilization.

1.3 For the purpose of this methodology, the definition of deficiencies is as follows:

A deficiency is a situation where a facility, service or procedure does not comply with a regional air navigation plan approved by the Council, or with related ICAO Standards and Recommended Practices, and which situation has a negative impact on the safety, regularity and/or efficiency of international civil aviation.

2. Collection of information

Regional office sources

2.1 As a routine function, the regional offices are expected to maintain a list of specific deficiencies, if any, in their regions. To ensure that this list is as clear and as complete as possible, it is understood that the regional offices take the following steps:

- a) compare the status of implementation of the air navigation facilities and services with the regional air navigation plan documents and identify facilities, services and procedures not implemented;
- b) review mission reports with a view to detecting deficiencies that affect safety, regularity and efficiency of international civil aviation;
- c) make a systematic analysis of the differences with ICAO Standards and Recommended Practices filed by States to determine the reason for their existence and their impact, if any, on safety;
- d) review aircraft accident and incident reports with a view to detect possible systems or procedures deficiencies;
- e) review inputs, provided to the regional office by the users of air navigation services on the basis of Assembly Resolution A33-14, Appendix M;
- f) assess and prioritize the result of a) to e) according to paragraph 4;
- g) report the outcome to the State(s) concerned for resolution; and
- h) report the result of g) above to the related PIRG for further examination, advice and report to the ICAO Council, as appropriate through PIRG reports.

States sources

2.2 To collect information from all sources, States should, in addition to complying with the Assembly Resolution A31-10, establish reporting systems in accordance with the requirements in Annex 13, paragraph 7.3. These reporting systems should be non-punitive in order to capture the maximum number of deficiencies.

Users sources

2.3 Appropriate international organizations, including the International Air Transport Association (IATA) and the International Federation of Air Line Pilots' Associations (IFALPA) are valuable sources of information on deficiencies, especially those that are safety related. In their capacity as users of air navigation facilities they should identify facilities, services and procedures that are not implemented or are unserviceable for prolonged periods or are not fully operational. In this context it should be noted that Assembly Resolution A33-14, Appendix M and several decisions of the Council obligate users of air navigation facilities and services to report any serious problems encountered due to the lack of implementation of air navigation facilities or services required by regional plans. It is emphasized that this procedure, together with the terms of reference of the PIRGs should form a solid basis for the identification, reporting and assisting in the resolution of non-implementation matters.

3.1 In order to enable the ICAO PIRGs to make detailed assessments of shortcomings and deficiencies, States and appropriate international organizations including IATA and IFALPA, are expected to provide the information they have to the ICAO regional office for action as appropriate, including action at PIRG meetings.

3.2 The information should at least include: description of the deficiency, risk assessment, possible solution, time-lines, responsible party, agreed action to be taken and action already taken.

3.3 The agenda of each PIRG meeting should include an item on air navigation deficiencies, including information reported by States, IATA and IFALPA in addition to those identified by the regional office according to paragraph 2.1 above. Review of the deficiencies should be a top priority for each meeting.

The PIRGs, in reviewing lists of deficiencies, should make an assessment of the safety impact for subsequent review by the ICAO Air Navigation Commission.

3.4 In line with the above, and keeping in mind the need to eventually make use of this information in the planning and implementation process, it is necessary that once a deficiency has been identified and validated, the following fields of information should be provided in the reports on deficiencies in the air navigation systems. These fields are as follows and are set out in the reporting form attached hereto.

a) Identification of the requirements

As per ICAO procedures, Regional Air Navigation Plans detail *inter alia* air navigation requirements including facilities, services and procedures required to support international civil aviation operations in a given region. Therefore, deficiencies would relate to a requirement identified in the regional air navigation plan documents. As a first item in the deficiency list, the requirements along with the name of the meeting and the related recommendation number should be included. In addition, the name of the State or States involved and/or the name of the facilities such as name of airport, FIR, ACC, TWR, etc. should be included.

b) Identification of the deficiency

This item identifies deficiency and would be composed of the following elements.

- i) a brief description of the deficiency;
- ii) date deficiency was first reported;
- iii) appropriate important references (Meetings, Reports, Missions, etc)

~~Amendment No. 3~~
~~20.2.02~~

c) Identification of the corrective actions

In the identification of the corrective actions, this item would be composed of:

- i) a brief description of the corrective actions to be undertaken;
- ii) identification of the executing body;
- iii) expected completion date of the corrective action*; and
- iv) when appropriate or available, an indication of the cost involved.

* It should be noted that a longer implementation period could be assigned in those cases in which the expansion or development of a facility was aimed at serving less frequent operations or entailed excessive expenditures.

4. Assessment and prioritization

4.1 A general guideline would be to have three levels of priority organized on the basis of safety, regularity and efficiency assessment as follows:

“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

~~Amendment No. 3~~
~~20.2.02~~

5. Model Reporting Table for use in the Reports of PIRGs

5.1 Taking the foregoing into account, the model table at the Appendix is for use by PIRGs for the identification, assessment, prioritization etc. of deficiencies. It might be preferred that a different table would be produced for each of the different topics i.e. AGA, ATM, SAR, CNS, AIS/MAP, MET. However,

all tables should be uniform.

6. Action by the Regional Offices

6.1 Before each PIRG meeting, the regional office concerned will provide advance documentation concerning the latest status of deficiencies.

6.2 It is noted that the regional offices should document serious cases of deficiencies to the Air Navigation Commission (through ICAO Headquarters) as a matter of priority, rather than waiting to report the matter to the next PIRG meeting and that the Air Navigation Commission will report to the Council.

~~Amendment No.3~~
~~20.2.02~~

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE FIELD IN THE REGION

Identification		Deficiencies			Corrective action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Date of completion	Priority for action*
Requirement of Part .., paragraph (table) .. of the air navigation plan	Terra X Terra Y	Speech circuits not implemented Villa X - Villa Y	12/12/2..X	Co-ordination meeting between Terra X and Terra Y on 16/07/9X to finalize arrangements to implementation circuit via satellite	Implementation of direct speech circuit via satellite	Terra X	20/8/2..X	A

* Priority for action to remedy a deficiency 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.

-END-

3. ASIA/PACIFIC SUPPLEMENT TO THE UNIFORM METHODOLOGY FOR THE IDENTIFICATION, ASSESSMENT AND REPORTING OF AIR NAVIGATION DEFICIENCIES

(APANPIRG Conclusion 18/60)

1. INTRODUCTION

1.1. Considerable attention is being given by ICAO to eradicate deficiencies in the air navigation field. On 30 November 2001, the Council of ICAO approved the *Uniform Methodology for the Identification, Assessment and Reporting of Air Navigation Deficiencies* (hereinafter referred to as “Uniform Methodology”) for the efficient identification, assessment and clear reporting of air navigation deficiencies. A copy of the Uniform Methodology contained in the APANPIRG Procedural Handbook is available on the ICAO website: http://www.bangkok.icao.int/edocs/procedural_1998.pdf. This Asia/Pacific Supplement to the Uniform Methodology provides more detailed procedures and a management tool to assist the APANPIRG in applying the Methodology.

1.2. The Uniform Methodology contains the following definition of a deficiency.

A deficiency is a situation where a facility, service or procedure does not comply with a regional air navigation plan approved by the Council, or with related ICAO Standards and Recommended Practices (SARPs), and which situation has a negative impact on safety, regularity and/or efficiency of international civil aviation.

1.3. The first edition (2006) of the restructured Asia/Pacific Air Navigation Plan (ASIA/PAC ANP, Doc 9673), which is in two volumes: Volume I, Basic Air Navigation Plan (BANP), and Volume II, Facilities and Services Implementation Document (FASID) was published and circulated to States in 2006. An electronic version of the ANP is available on the ICAONET website. Access to ICAONET through username and password has been provided to all civil aviation administrations in the Region.

1.4. In certain areas, there may be deficiencies related to the organization, management and institutional aspects which affect the operation of civil aviation organizations. This could have a direct impact on the provision of air navigation facilities, services and procedures, which are elements listed in the ICAO Regional Plan. Deficiencies related to the primary national legislation and regulations and related to States’ safety oversight functions are dealt with by the ICAO Universal Safety Oversight Audit Programme (USOAP).

2. BACKGROUND

2.1 States, in recognition of their responsibilities under Article 28 of the Convention on International Civil Aviation for the provision of safe air navigation services, undertake to accord highest priority to the rectification and elimination of all identified air navigation deficiencies.

2.2 As required by APANPIRG, the ICAO Asia/Pacific Regional Office maintains an on-line database of deficiencies that exist in the Asia/Pacific Region and adopts the necessary procedures for the collection of information in order to identify, evaluate and classify deficiencies and priorities in accordance with the Uniform Methodology.

2.3 The purpose of this database of deficiencies is to share among States information about deficiencies in a transparent manner, to assist States to define their implementation priorities and to indicate remedial action required. Information on deficiencies from the database is provided to APANPIRG meetings for review under its terms of reference, *inter alia*, make detailed assessment of the safety impact of the

deficiencies as shown and propose remedial action required by States for subsequent review by the Air Navigation Commission and Council.

2.4 The format of reporting of resolution of deficiencies by provider States is in accordance with the Uniform Methodology. States are required to provide to the Regional Office, in a timely manner, an action plan comprising a detailed description of the actions to be taken for the expeditious rectification of the listed deficiencies.

2.5 The Regional Office submits the updated information to APANPIRG for further actions as deemed necessary, and coordinates with the provider States concerned on decisions taken by APANPIRG, the Council and Air Navigation Commission on the deficiencies.

2.6 APANPIRG and its respective Sub-Groups, as part of their TORs and Subject Tasks Lists, are intensifying their efforts in dealing with deficiencies, with a greater focus on prioritization and monitoring of corrective action taken by States and other responsible bodies.

3. OBJECTIVE

3.1 The main objective of this Supplement to the Uniform Methodology is to provide for a systematic approach to the management of deficiencies in the Asia/Pacific Region by detailing the procedures to be followed by the Users, States and the Asia/Pacific Regional Office in implementing the Uniform Methodology.

3.2 In addition, an objective of this Supplement is to provide clear definition of the responsibilities and obligations of the parties involved in the management of the deficiencies.

4. REGIONAL PROCEDURES

4.1 The process of dealing with deficiencies involves a number of stages as follows:

- Identification
- Assessment, prioritization and verification against ICAO documents
- States' validation of deficiencies reported
- Development of action plans for rectification and elimination
- Monitoring of follow-up actions
- Rectification of deficiency and removal from the list of Open deficiencies

4.2 The purpose of this section is to outline the procedures to be followed by the parties involved at each of the above stages to deal with the deficiencies. These procedures are presented in the form of a structured flow chart attached to this Supplement aimed at facilitating the actions required to eliminate the deficiencies.

Identification

4.3 In Appendix M to Assembly Resolution A35-14, Users of air navigation facilities and services are urged to report any serious problems encountered due to lack of implementation or unsatisfactory operation of air navigation facilities or services required by the air navigation plans. States should act on such reports to resolve the problem and when remedial action is not taken, Users should inform ICAO, through the medium of an international organization where appropriate.

Notification/Sources

- Users
- States
- Regional Office (information from missions, meetings, accident/incident reports)

4.4 The deficiencies identified shall follow the SMART concept where the description of a deficiency will be:

- Specific – clear task on what needs to be done
- Measurable – precise requirements
- Achievable – task sensible in scope
- Realistic – task has deadlines and completion requirements
- Time-bounded – sensible guide for completion and imposes a schedule

Assessment, Prioritization and Verification against ICAO documents

4.5 An assessment is made by the Regional Office to determine whether the reported deficiency is non-compliant with the ASIA/PAC ANP or relevant SARPs. If a deficiency exists, it is evaluated as to its effect on safety, efficiency and regularity, and under the Uniform Methodology, prioritized as follows:

- U - Urgent requirements having a direct impact on safety and requiring immediate corrective actions
- A - Top priority requirements necessary for air navigation safety
- B - Intermediate requirements necessary for air navigation regularity and efficiency

4.6 To facilitate the prioritization process, the Regional Office is guided by the principal that a deficiency with respect to an ICAO Standard is accorded a “U” status, while a non-compliance with a Recommended Practice or a PANS is considered as “A” or “B” subject to additional expert evaluation. The final prioritization of the deficiencies is the prerogative of APANPIRG.

Validation by States

4.7 The Regional Office, on determining that a reported deficiency exists and after initial assessment and prioritization, informs the State(s) concerned of the full details of the report and results of the assessment and advises that the deficiency will be recorded in the APANPIRG Deficiencies Database. The State(s) are requested to acknowledge and validate the deficiency, and to develop a Corrective Action Plan (CAP) to resolve the deficiency.

4.8 In the event of deficiencies which impose immediate large scale safety risks and their resolution by the State(s) concerned is not feasible in an acceptable timeframe, the Regional Office will notify the Air Navigation Commission as a matter of priority.

Development of CAPs

4.9 States are required to develop CAPs to rectify deficiencies in consultation with appropriate bodies with defined target dates based on the prioritization determined by the Regional Office. The following factors should be taken into account:

- deficiencies with “U” priority must be dealt with on a high priority basis;
- in developing the CAP, advice may be sought from the Regional Office, in particular, when international assistance (via the ICAO Technical Cooperation Programme or other means) is required;
- the CAP should be submitted to the Regional Office not later than one month after receiving the notification from the Regional Office;
- CAPs should in a concise and concrete format for inclusion in the Deficiency Database; if more detailed information is necessary, it should be provided as an Attachment;
- The CAPs are reviewed by the relevant APANPIRG contributing bodies where an assessment of the Plan is done at expert level and, if necessary, feed-back is provided to the State(s) concerned to optimize the Plan.
- APANPIRG at its regular meetings reviews the status of progress of all CAPs and provides advice to States as necessary.

Monitoring of follow-up actions

4.10 States should keep the Regional Office informed on progress with action taken to rectify deficiencies. The Regional Office may request updates as necessary to keep APANPIRG and its contributory bodies informed. Periodic annual updates should be made to the Regional Office no later than April each year.

4.11 The Regional Office will maintain regular contact with States and before the holding of APANPIRG and Sub-Group meetings, updates will be requested. An agenda item on deficiencies will be included on the Agenda of APANPIRG Sub-Groups and afforded a high priority by the meetings.

4.12 Users who reported deficiencies will be kept informed of progress and contacted before APANPIRG and Sub-Group meetings to seek their views on the status of deficiencies and any changes in circumstances.

Rectification of Deficiency & Removal from the Open List

4.13 States, on reporting that a deficiency recorded on the APANPIRG Deficiency Database has been rectified, will submit in writing an official report to the Regional Office providing full details of the action taken. On receipt of a report, the Regional Office will validate the action taken with the User who made the report. In the event that the User does not agree with the action taken, the deficiency will remain open until confirmation has been gained by all concerned. Once confirmation is made, APANPIRG will be informed, the status of the deficiency reviewed and removed from the Open List.

5. RESPONSIBILITIES

Regional Office

5.1 The Regional Office, as a primary party in the management of deficiencies, will keep under review and record the implementation by States of the requirements of the ASIA/PAC Basic ANP and FASID. This information will also be used to identify possible non-compliance that should be further assessed against the definition of deficiency. Records will also be kept on the differences to SARPs filed by States and follow-up actions taken as appropriate.

5.2 The main tool for managing the deficiency identification and resolution process is the APANPIRG Deficiency Database established and maintained by the Regional Office. Description of the database structure and functionality is provided in Attachment Secure access to the database is controlled by the Regional Office through a username and password.

5.3 When missions to States are conducted by the Officers, the mission reports should include a section on the status of existing deficiencies and identification of new deficiencies.

5.4 In line with its primary function of assisting States to which it is accredited to implement SARPs and Regional procedures, the Regional Office provides assistance to States in developing adequate remedial actions to correct air navigation deficiencies. This is done through regular correspondence and, when necessary, through missions to States for on-site evaluation and assistance in the development and implementation of CAPs.

States

5.5 For each deficiency that has been identified, evaluated and prioritized, the State(s) concerned need to establish a CAP for resolving the deficiency. Normally, a recommended action concerning the implementation of the respective ICAO SARP or regional procedure for which the deficiency is filed would be provided by the APANPIRG or the Regional Office. States are required to allocate sufficient resources for the timely elimination of deficiencies in order to reduce the negative impact on safety and/or efficiency.

5.6 Sufficient notification will be provided to States regarding the deficiencies as a first step towards establishing the corresponding CAP. This will be achieved primarily through such mechanisms as correspondence, review by APANPIRG sub-groups, working groups, task forces and other regional and sub-regional meetings. The Regional Office and States should use email where available for communications about deficiencies, including the provision of datasheets to States and corresponding CAPs from States.

5.7 States, upon receipt of the notification of identified deficiencies, should review, validate and comment upon the deficiency. Where actions have already been taken, the State should provide detailed information to the Regional Office in order to evaluate whether the deficiency has already been resolved.

5.8 States are required to keep deficiencies confirmed and included in the Database under review through the on-line facilities and provide updates as necessary to identify the progress on the action plan. The Regional Office may use periodic automated messages generated by the database to remind States to provide input to the Database.

5.9 States are required to respond promptly to regular correspondence sent by the Regional Office with an attached list of deficiencies as retrieved from the Database for each individual State. States should fill-in the necessary details in the datasheet forms in order to provide APANPIRG and its sub-groups, working groups and task forces with up-to-date material for review and consideration of the status of deficiencies and

any further actions necessary to be taken by States to expedite eliminate the deficiencies. An updated Status of deficiencies working document will be presented as core material to every APANPIRG meeting in accordance with the Terms of Reference of APANPIRG.

5.10 States' CAPs should include the corrective measures to be taken by the State and a target date by which the identified deficiencies will be resolved. The information provided through this formal coordination process will include:

- a description of the deficiency
- risk assessment
- evaluation of possible solutions and selection of the optimum solution
- Description of agreed action to be taken
- time-line including a firm target date for completion of the planned action
- responsible body in the State to undertake the corrective action including contact details of a designated person/position
- financing source (if applicable) or an indication of the international assistance required if the State is unable to resolve the deficiency on its own due to a lack of resources
- progress report as per the established timeline.

5.11 In accordance with the 11th Air Navigation Conference Recommendation 4/8, States are urged to identify areas of air navigation facilities and services where the establishment of multinational agreements or informal coordination groups may contribute to the resolution of deficiencies. This may be especially applicable to deficiencies which are region wide in nature and affecting a group of States, thus leading to general resolution at a regional or wider level.

Users

5.12 Appropriate international organizations, in their capacity as Users of air navigation facilities, should provide and update information on deficiencies on a regular basis to the Regional Office for validation and action in accordance with Assembly Resolution A35-14 Appendix M. In addition to this, the Users should notify the Regional Office as soon as a new deficiency is identified.

5.13 International Organizations should provide assistance in the independent verification of remedial actions taken by State(s). The 11th Air Navigation Conference Recommendation 4/8 encouraged Users of air navigation facilities and services to report to the Regional Office once they note that the remedial action on the deficiency they had reported has been taken.

APANPIRG

5.14 APANPIRG, as the primary coordinating body in the Asia/Pacific Region for all activities conducted within ICAO concerning the planning and implementation of the regional air navigation systems, meets at regular intervals. Its terms of reference includes *inter alia*, to identify specific problems in the air navigation field and propose in appropriate form, actions aimed at solving these problems. The List of Deficiencies in the air navigation field form part of the core material reviewed by APANPIRG meetings and recommendations for remedial actions are developed.

5.15 In order to ensure that a support mechanism is in place to deal with deficiencies, States must be fully committed to taking follow-up actions on the outcome of APANPIRG meetings. A person or position

should be nominated with sufficient decision-making authority to coordinate and oversee the States' CAP for the elimination of deficiencies.

6. OTHER MECHANISMS

6.1 The Regional Office, in coordination with States, will utilize other mechanisms for establishing measures for the resolution of deficiencies.

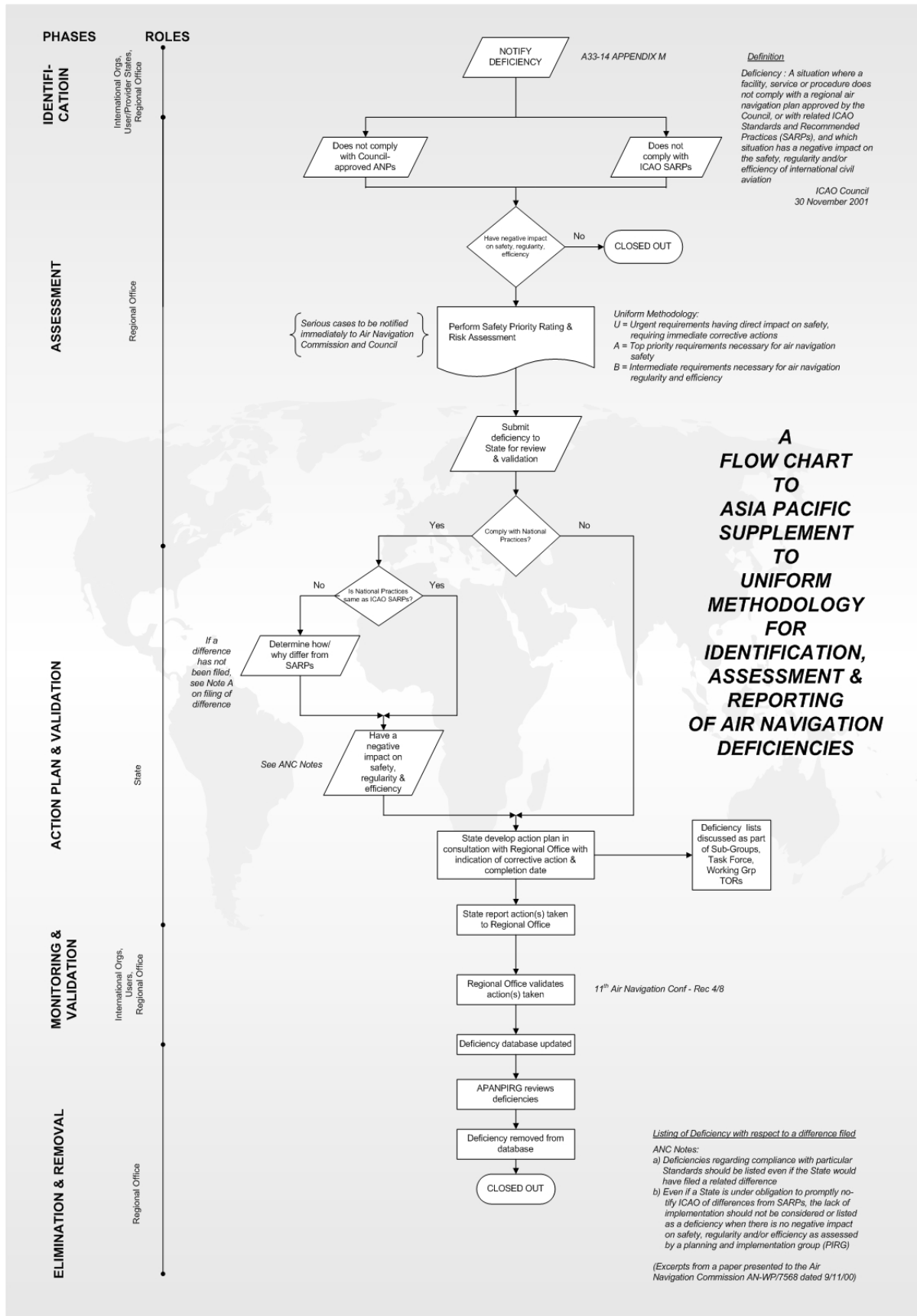
6.2 The various APANPIRG sub-groups, working groups, task forces and other regional and sub-regional meetings and special implementation projects (SIPs) will be utilized to discuss the implementation of ICAO SARPs and the requirements of the ASIA/PAC ANP in order to eliminate deficiencies.

6.3 The Annual Conference of Directors General of Civil Aviation is attended by State representatives in civil aviation at the highest level. Every opportunity should be taken at these conferences to address the need for political will to instill awareness and allocate appropriate and sufficient resources through effective plans of action that will eliminate deficiencies in a timely manner.

6.4 The International Financial Facility for Aviation Safety (IFFAS) has been established by the ICAO Council to assist States in financing aviation safety-related projects identified primarily through the ICAO Universal Safety Oversight Audit Programme (USOAP). The purpose of IFFAS is to provide financial assistance to States that need to apply corrective measures flowing from the USOAP audits but are unable to obtain the necessary funding through traditional means of financing. IFFAS will be operated in complete independence from ICAO's programme budget and is to be funded through voluntary contributions. The IFFAS mechanism will complement existing ICAO fund-raising mechanisms.

6.5 Other ICAO tools that may be used to address deficiencies include ICAO technical cooperation programmes (including COSCAPs), special implementation projects (SIP), seminars, workshops and training programmes.

6.6 Deficiencies identified during the USOAP audits will be dealt with under a separate programme in accordance with the Memorandum of Understanding between the Contracting State and ICAO. Until such time an appropriate mechanism is developed for the management of such deficiencies by the planning body, they shall not be included in this procedure.



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ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG)

PROCEDURAL HANDBOOK

PART VI

ASIA/PACIFIC PROVIDER AND USER STATES

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1. Purpose and Status

1.1 According to the APANPIRG working arrangements, all States concerned with the work of the Group shall be kept fully informed of its activities. To this effect, ICAO Regional Director shall:

- a) keep States informed of the convening of APANPIRG meetings and the subjects planned to be discussed (cf. Part III, paragraph 3.5); and
- b) post the reports on meetings of the Group and sub-groups (cf. Part II, paragraph 1.1) on ICAO APAC web site.

1.2 Asia/Pacific States are as follows:

ASIA/PAC PROVIDER STATES

Afghanistan	Kiribati	Papua New Guinea
Australia	Lao PDR	Philippines
Bangladesh	Malaysia	Republic of Korea
Bhutan	Maldives	Samoa
Brunei Darussalam	Marshall Islands	Singapore
Cambodia	Micronesia, F.S. Of	Solomon Islands
China	Mongolia	Sri Lanka
• Hong Kong China	Myanmar	Timor Leste
• Macao China	Nauru	Thailand
Cook Islands	Nepal	Tonga
DPR Korea	New Zealand	Tuvalu*
Fiji	Pakistan	United States
France	Palau	Vanuatu
India		Vietnam
Indonesia		
Japan		

 * Non Contracting State

ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG)

PROCEDURAL HANDBOOKPART VIIOTHER ASIA and/or PAC REGIONAL BODIES

AND INTERNATIONAL ORGANIZATIONS
DEALING WITH CIVIL AVIATION MATTERS IN THE ASIA/PAC REGIONS

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INTERNATIONAL ORGANIZATIONS

REGIONAL ECONOMIC COMMISSIONS

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

INTERNATIONAL ORGANIZATIONS

AIRPORTS COUNCIL INTERNATIONAL (ACI)

ASIA-PACIFIC TELECOMMUNITY (APT)

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

INTERNATIONAL COUNCIL OF AIRCRAFT OWNER AND PILOT ASSOCIATIONS (IAOPA)

INTERNATIONAL FEDERATION OF AIR LINE PILOTS' ASSOCIATIONS (IFALPA)

INTERNATIONAL FEDERATION OF AIR TRAFFIC CONTROLLERS' ASSOCIATIONS (IFATCA)

WORLD BANK

CIVIL AIR NAVIGATION SERVICES ORGANIZATION (CANSO)

INTERNATIONAL BUSINESS AVIATION COUNCIL

SOCIETE INTERNATIONALE DETELECOMMUNICATIONS AERONAUTIQUES (SITA)

AERONAUTICAL RADIO INC (ARINC)

UNITED NATIONS SPECIALIZED AGENCIES

INTERNATIONAL TELECOMMUNICATIONS UNION (ITU)

WORLD METEOROLOGICAL ORGANIZATION (WMO)

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AGENDA ITEM 6: ANY OTHER BUSINESS

Agenda Item 6: Any other business

6.1 Coordination meeting between Chairmen of Sub-Groups

6.1.1 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 9th September 2012.

6.1.2 The coordination meeting identified items and issues of common interest among the sub groups.

6.1.3 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. .

6.1.4 The Chairman of CNS/MET SG expressed concerns on potential overlap of activities with the Regional Aviation Safety Group (RASG) in the areas of runway safety with AOP WG, safety monitoring activities with RASMAG and Search & Rescue with ATM SG. He suggested a joint meeting between APANPIRG and RASG APAC and the right opportunity could be the June 2013 meetings.

6.1.5 In order to keep consistence with number of APANPIRG meetings, the coordination meeting also proposed that the meeting numbers of SGs continue from their previous meetings i.e ATM/23, CNS/17 and MET/17.

ATTACHMENTS TO THE REPORT

ATTACHMENT 1 to the APANPIRG/23 Report

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ATTACHMENT 1 to the APANPIRG/23 Report

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ATTACHMENT 1 to the APANPIRG/23 Report

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Paper No.	Agenda Item	Title	Presented by
INFORMATION PAPERS			
IP/1	-	Meeting Bulletin	Secretariat
IP/2	2	AN-Conf/12: Agenda and Invitation	Secretariat-HQ
IP/3	2	Establishment and Workings of RASG-APAC Sub-Groups	Secretariat
IP/4	3.5	CANSO IFSET Workshops for the Region	CANSO
IP/5	3.4	Implementation of Training Program for ATSEP as per ICAO Training Manual (DOC 7192) Part E-2	India
IP/6	3.2	ICAO/IATA/PBN GO Team Visit to India	India
IP/7	5	French Polynesia PBN Planning	French Polynesia
IP/8	5	DARP in Tahiti FIR	French Polynesia
IP/9	3.0	Asia and Pacific Initiative to Reduce Emissions (ASPIRE)	USA
IP/10	3.0	30 NM Lateral and 30 NM Longitudinal (30/30) Separation in the Anchorage Flight Information Region (FIR)	USA
IP/11	3.0	The Future of Oceanic Trajectory Based Operations (OTBO) and the Planned Operational Trials	USA
IP/12	3.2	Integration of Unmanned Aircraft Systems (UAS) into the United States' National Airspace System (NAS)	USA
IP/13	3.2	Asia/Pacific Region Actions as Part of the Global Search and Rescue System	USA
IP/14	3.4	System Wide Information Management Update	USA
IP/15	3.4	Information Management Based Network Planning	USA

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Paper No.	Agenda Item	Title	Presented by
IP/16	3.5	Optimization of Airspace and Procedures in Major Metropolitan Regions	USA
IP/17	3.5	Lost Fuel Burn Savings due to Lack of Future Air Navigation System (FANS) Equipment and Required Navigation Performance 4 (RNP 4) Certification	USA
IP/18	3.5	Automatic Dependent Surveillance – Broadcast (ADS-B) Program Overview	USA
IP/19	3.5	Automatic Dependent Surveillance – Broadcast (ADS-B) In-Trail Procedures (ITP) Operational Flight Trial Project Overview	USA
IP/20	3.5	Status Update for Development and Implementation of ADS-C Climb Descend Procedure	USA
IP/21	6	Next Generation Air Transportation System (NEXTGEN) Overview	USA
IP/22	3.4	Space Weather Phenomena	Secretariat
IP/23	3.2	Status of Implementation of ICAO FPL 2012 in India	India
IP/24	3.4	Exchange of XML-Coded OPMET and Digital NOTAM and over AMHS	India
IP/25	3.5	The New ATO Organization - An Emphasis on Operations and Program Execution	USA
IP/26	3.0	Required Communication Performance (RCP) and Required Surveillance Performance (RSP) Planning and Implementation	USA
IP/27	3.4	Status of ATC Surveillance Activities in Civil Aviation Authority of Mongolia (MCAA)	Mongolia
IP/28	3.2	Air Traffic Management Volcanic Ash Contingency Plan Template	Secretariat
IP/29	3.5	Summary of the Outcomes of the 13 th Cross Polar Trans East Air Traffic Management Providers Working Group (CPWG/13) Meeting	USA
IP/30	3.2	Implementation of the ICAO New FPL Format	Mongolia

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IP/31	3.2	PBN Implementation in Nepal Including RNP AR at Tribhuvan International Airport	Nepal
IP/32	3.5	Cambodia, Laos, and Vietnam PBN Implementation Plan	Cambodia
IP/33	3.5	Air Navigation Activities and Planning	LAO PDR
IP/34	3.5	The Current Status of RPAS regarding Integration into Non-Segragated Airspace	Japan

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WORKING PAPERS			
WP/1	-	Adoption of the Provisional Agenda	Secretariat/ RO
WP/2	1.1	Review of the Actions of the Air Navigation Commission on the Report of the 22 nd Meeting of the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG/22)	Secretariat-HQ
WP/3	1.2	Status of Implementation of APANPIRG/22 Conclusions and Decisions	Secretariat
WP/4	1.3	Status of Implementation of Outstanding APANPIRG Conclusions and Decisions	Secretariat
WP/5	2	Global Air Navigation Capacity and Efficiency Plan and ASBU Methodology	Secretariat-HQ
WP/6	2	Update of Runway Safety Enhancement Initiatives to APANPIRG	Secretariat
WP/7	3	Regional Performance Framework – Planning Methodologies and Tools	Secretariat-HQ
WP/8 Revision 1	3.0	Regional and National Performance Framework	Secretariat
WP/9	3.1	Aerodrome Obstacle Limitation Surfaces and Frangibility Requirements	Secretariat
WP/10	3.1	Airport Pavements - Design and Evaluation	Secretariat
WP/11	3.1	Regional Runway Safety Seminar, Bali 21 to 24 May 2012	Secretariat
WP/12	3.1 & 3.2	Implementation of “Dynamic Departure Slot Manager and TSAT Generator” at CSI Airport Mumbai	India
WP/13	3.0	Proposal for Revision of ICAO DOC 9673, Volume I - BANP	Secretariat
WP/14	3.2	Pre-Tactical Air Traffic Flow Management (ATFM) Mechanism in Hong Kong	Hong Kong, China
WP/15	3.2	ATM Contingency Plan- India	India

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Paper No.	Agenda Item	Title	Presented by
WP/16	3.2	ATM Improvement Initiatives in Indian Ocean and Arabian Sea Region of Indian FIRS	India
WP/17	3.2	ATM/AIS/SAR/SG Outcomes	Secretariat
WP/18	3.3	Regional Airspace Safety Monitoring Advisory Group Outcomes	Secretariat
WP/19	3.4	Application of GAGAN Signal-in-Space for Regional Harmonization	India
WP/20	3.4	Sharing of ADS-B Data and Establishment of a Database to Support ATC Operations and Safety Monitoring for the APAC Regions	Hong Kong, China
WP/21 Revision 2	3.4	ATN/AMHS Implementation Status in India and Harmonious Implementation of Swim over AMHS in the Region	India
WP/22	3.4	Report on the Sixteenth Meeting of CNS/MET Sub-Group	Chairman of CNS/MET SG
WP/23	3.4	Collaboration in ADS-B Implementation over the South China Sea and the Bay of Bengal	CANSO
WP/24	3.4	Development of APV (SBAS) - LPV Approach Procedures for GAGAN	India
WP/25	3.5	Asia/Pacific Seamless ATM Planning Group Outcomes	Secretariat
WP/26	3.5	Civil Aviation and the Environment State Action Plan	Secretariat-HQ
WP/27	3.5	Collaborative Decision Making for City Pairs	CANSO
WP/28	3.5	USOAP Programme – Public Health Emergency Preparedness Protocol Questions, Continuous Monitoring Approach (CMA)	Secretariat
WP/29	4	Status of Air Navigation Deficiencies in the ASIA/PAC Region	Secretariat
WP/30	4	Addressing Regional Air Navigation Deficiencies – Transition from Five Regional Databases into a Central Database	Secretariat-HQ
WP/31	5	Amendment to APANPIRG Procedural Handbook	Secretariat

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List of Information and Working Papers

Paper No.	Agenda Item	Title	Presented by
WP/32	5	Scheduling of Meetings in ICAO Assembly Year 2013	Secretariat
WP/33 Revision 2	5	APANPIRG Work Programme 2013+	Secretariat
WP/34	3.5	Inter-Regional Co-Operation to Achieve “Seamless” Operations and Air Traffic Management	IATA
WP/35	3.5	Ensuring Infrastructure Capability will Meet Future Air Transport Capacity and Efficiency Demands to Realize the Economic Benefit which Aviation will Bring to Asia Pacific States and Communities	IATA
WP/36	3.5	Sub-Regional Air Traffic Flow Management (ATFM) Concept with Collaborative Decision Making (CDM)	Hong Kong, China, Singapore and Thailand
WP/37	3.5	Bangkok-Singapore CDM Initiative	CANSO, Malaysia, Singapore and Thailand
WP/38	6	Report of Coordination Meeting between Chairmen of Sub-Groups	Chairmen of the ATM SG, CNS/MET SG and RASMAG

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APANPIRG/23 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/1	Transition to NEW FPL Format	That, States are urged to commence operational acceptance and processing of both PRESENT and NEW format FPL and ATS messages as early as possible, and in any event no later than 0000 UTC on 12 November 2012, in order to avoid the risks involved in direct transition from PRESENT to NEW processing.	ICAO APAC office	State Letter	September 2012
C 23/2	FPL Guidance Material Version 5	That, 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) is updated as Version 5 in accordance with excerpts contained in Appendix C to the Report on Agenda Item 3.2.	ICAO APAC office	State Letter Updated Guidance Material on ICAO ASIA/PAC Regional Office Website	September 2012
D 23/3	Dissolution of the Southeast Asia Route Review Task Force	That, the South East Asia Route Review Task Force (SEARR/TF), be dissolved and any on-going tasks be delegated to existing bi-lateral or multilateral groups as identified in the South East Asia Implementation Plan.	ICAO APAC Office	Notify concerned States through State Letter	September 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
D 23/4	Dissolution of the BOB-RHS/TF	That, the Bay Of Bengal Reduced Horizontal Separation Task Force (BOB-RHS/TF) be dissolved and any outstanding tasks be delegated to South Asia/Indian Ocean ATM Coordination Group (SAIOACG).	ICAO APAC Office	Notify concerned States through State Letter	September 2012
C 23/5	Asia/Pacific Air Navigation Concept of Operations Mandates	That, States intending to implement Performance-Based Navigation and Safety Nets may, after appropriate consultation with airspace users, designate portions of airspace within their area of responsibility: a) as providing priority for access to such airspace for aircraft with prescribed Performance-Based Navigation (PBN) specifications and supporting data-link equipage (ADS-C/CPDLC); and/or b) mandating the carriage and use of an operable Automatic Dependent Surveillance-Contract/ Controller Pilot Data-link Communications Systems (ADS-C/CPDLC) system, and mode A/C and/or mode S transponder.	ICAO APAC office	State letter	October 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/6	Basic Air Navigation Plan Amendment Procedure Template	That, for ease of reference and reduction of submission errors, the ICAO Regional Office should provide the Doc 9673 Amendment Procedure appended as Appendix E to the Report on Agenda Item 3.2 on the Asia/Pacific website, including requirements to provide detailed and accurate information, an appropriate chart in the case of ATS route amendments, and information on prior consultation with any affected States.	ICAO APAC office	State Letter Posted on APAC Web site	September 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/7	Asia/Pacific Region ATS Route Catalogue Update	That, ICAO should update the Asia/Pacific Region ATS Route Catalogue as Version 11 by: a) amending the administrative details as required; b) incorporating any ANS Deficiency changes approved by APANPIRG; c) incorporating new airspace user proposals presented at the ATM/AIS/SAR/SG/22 meeting; d) undertaking a review of existing routes within the Route Catalogue, in collaboration with affected States and administrations in order to update this information; and e) developing a new document structure organized by geographical reference that allows easy review.	ICAO APAC office	State Letter Update ATS Route Catalogue Upload to the ICAO APAC web site.	October 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/8	Annex 15 Promulgation Requirements Compliance	That, States should be urged to recognize the importance of Annex 15 compliance in respect of aeronautical data affected by major projects, by: a) establishing formal coordination between change originators and Aeronautical Information Service (AIS) units to ensure appropriate planning and that promulgation requirements were taken into account; and b) creating a mechanism to allow AIS personnel to decline requests that did not comply with Annex 15, except for urgent corrections, emergencies, and matters of national security.	ICAO APAC office	State letter Include in State Letter a request for States to report their actions to AAITF/8	October 2012
C 23/9	AIS-AIM Transition State Plans	That, States should develop a basic plan that identified the target completion dates of Transition elements in the AIS-AIM Roadmap and submit these plans to the Asia/Pacific Regional Office by 1 January 2013.	ICAO APAC office	State letter Attach to State Letter a Basic Plan template	October 2012
C23/10	AIM Quality Assurance Seminar	That, ICAO should conduct an AIM Quality Assurance Seminar in conjunction with the Aeronautical Information Services – Aeronautical Information Management Implementation Task Force (AAITF).	ICAO APAC office	Conducted seminar in conjunction with AAITF/8	May 2013

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/11	Duplication and Amendment of 5LNC	Recognizing that with the increasing use of Five Letter Name Codes (5LNC), it was not practical to avoid any duplication of 5LNC worldwide, and that States often used discretion in managing both duplications and minor changes of waypoint position that may not strictly be in accordance with the provisions of Annex 11, Appendix 1; ICAO is requested to consider: a) reviewing and updating Annex 11 to ensure its provisions related to 5LNC are appropriate; and b) standards for Flight Management Systems (FMS) that ensure logic checks on duplicated waypoint entries are highlighted to pilots.	ICAO APAC office	IOM to ICAO HQ	September 2012
D 23/12	Establishment of APSAR Task Force	That, an Asia/Pacific Regional SAR Task Force (APSAR/TF) be established, reporting to the ATM Sub-Group of APANPIRG, in accordance with the Terms of Reference as shown in Appendix I to the Report on Agenda Item 3.2.	ICAO APAC office	Conduct APSAR/TF/1 meeting State Letter	July 2013

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/13	Data-link Performance Monitoring Seminar	That, recognizing the key role data-link performance had in supporting PBN implementation; ICAO should conduct a Data-Link Performance Monitoring Seminar in conjunction with a Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia) meeting.	ICAO APAC office	Data-Link Performance Monitoring Seminar run in conjunction with <u>FIT-Asia/2</u> State Letter	March 2013
C 23/14	Asia/Pacific Regional RVSM Monitoring Statement	That, the Asia/Pacific Regional RVSM Monitoring Statement attached as Appendix A to the Report on Agenda Item 3.3 be endorsed.	ICAO APAC office	State Letter Upload to the ICAO APAC website	September 2012
C 23/15	Long-Term Non- RVSM Approved Aircraft	That, States are urged in a timely manner to: a) update Regional Monitoring Agency data on RVSM approved aircraft; and b) respond to, and take action regarding RMA queries on long-term data indicating that aircraft were not approved.	ICAO APAC office	State Letter State Letter to include request that States report progress to RASMAG/18	October 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/16	Safety Monitoring Data Provision	That, recognizing the importance of data collection for safety monitoring purposes, States be urged to: a) provide data as requested by Regional and En-Route Monitoring Agencies (RMA/EMA) in accordance with the RMA Manual (Doc 9937) and EMA Manual (either through a formal agreement or an informal understanding as appropriate); and b) provide available ADS-B data for height-keeping monitoring to RMAs when requested.	ICAO APAC office	State Letter State Letter to include request that States report progress to RASMAG/18	October 2012
C 23/17	Asia/Pacific IP SNDCF ICD	That, the Asia/Pacific Internet Protocol (IP) Sub-Network Dependent Convergence Function (SND CF) Interface Control Document (ICD) provided in Appendix A to the Report on agenda item 3.4 be adopted as regional guidance material.	ICAO APAC office	States notified and the GM posted on the APAC website	October. 2012
C 23/18	More Efficient Functioning of AMC	That, ICAO be requested to invite EUROCONTROL AMC to consider the provision of more efficient function to enable States to identify recent changes from the previous AIRAC Cycle and to develop means of automation for providing updated AMHS Address Information.	ICAO APAC office	Eurocontrol AMC requested to take action through ICAO Paris Office	November. 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/19	Sample TMC for ATN/AMHS Interconnection Trials	That, the sample Technical Memorandum of Cooperation (TMC) for ATN/AMHS interconnection trial between States, provided in Appendix B to the Report on agenda item 3.4 be adopted as regional guidance material for reference by States.	ICAO APAC office	TMC for ATN/AMHS posted On APAC website and States notified	October. 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/20	Inter-regional APAC/NAT AIDC Task Force	That, a) the Terms of Reference of the inter-regional APAC/NAT AIDC Task Force provided by NAT System Planning Group at Appendix C to the Report on agenda item 3.4 be endorsed; b) States in Asia/Pacific Regions with experience of AIDC implementation be encouraged to participate in the Task Force to contribute for finalization of inter-regional ICD for AIDC; c) the outcome of the task force should be coordinated with APANPIRG through the CNS Sub-group; and d) States be urged to share their AIDC implementation plan with the neighbouring States in order to implement AIDC in a timely manner.	ICAO APAC office	States notified and TF established according to the TOR	November 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/21	IMS Operational Concept	That, ICAO be invited to	ICAO HQ	IMS operational concept of IMS and IPv6 network configuration developed	March. 2013
		a) develop IMS Operational Concept and expedite finalization of IPv6 network configuration; and b) conduct cost-benefit analyses for the implementation of an IPv6 network and IMS/SWIM at regional level.	ATNICG	CBA for IPv6 and IMS/SWIM implementation conducted	April 2013

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/22	Support of AMSS in the new/replacement SATCOM System	That, States, implementing new/replacement SATCOM data-link systems be invited to consider the following in their study for next generation systems in support of AMSS: a) the system to be compatible with one of the existing and/or future AMSS systems such as INMARSAT to support AMSS data link interoperability; b) to establish an operational environment which will enable seamless AMSS operation for AESs, and architecting AMSS systems with appropriate reliability both in space and ground segments; and c) to include function of SATVOICE for ATS services.	ICAO APAC office	States concerned notified	October. 2012
C 23/23	FANS 1/A over Iridium (FOI) for ATS Communication	That, considering that FANS 1/A over Iridium (FOI) is expected to be useable for CPDLC and ADS-C operations using Iridium Next beginning in 2015, FOI be accepted as one of the viable means for conducting ATS data-link communications in the ASIA/PAC Region.	ICAO APAC office	States informed by State letter & Regional Strategy of the Air-Ground Data Link amended to include FOI	November 2012 May 2013
C 23/24	Workshop on RCP and RSP	That, ICAO be invited to organize a workshop on RCP and RSP in the Asia/Pacific Region.	ICAO APAC office	Workshop on RCP and RSP conducted	Nov. 2013

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/25	Adoption of 1st Edition of Satellite Voice (SATVOICE) Guidance Material (SVGGM)	That, the 1 st Edition of the Satellite Voice (SATVOICE) Guidance Material (SVGGM) provided in Appendix D to the Report on agenda item 3.4 be adopted.	ICAO APAC office	States notified about the GM and It is posted on the APAC website	December. 2012
C 23/26	Asia/Pacific GLS Seminar	That, ICAO plans an Asia/Pacific GNSS Landing System (GLS) Seminar to provide information on emerging GLS technology, airport and airline GLS planning, and the development of applicable standards.	ICAO APAC office	State concerned coordinated and GLS Seminar conducted	December 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
D 23/27	Revised PBN/TF Terms of Reference	That, the following amendments are made to the PBN/TF Terms of Reference: 3) Identify other issues/action items arising from the work of ICAO or for consideration by ICAO in order to facilitate regional and global harmonization of existing as well as future applications, and where appropriate, provide responses and support to the ICAO ~~RNPSOR~~ PBNSG. 4) Assist States in the preparation and review of their PBN implementation documentation and provide feedback to ensure regional harmonization and for possible inclusion in ICAO-developed model documentation. 5) Monitor the progress of State PBN implementation, identify constraints to implementation and capture information on the effectiveness (tangible benefits) of State PBN applications. 7) Address other regional PBN implementation issues, including the development of staff resources and skills, as needed by safety management. Coordinate and consult with ICAO FPP, COSCAP, industry partners and volunteering administrations who are providing support to State PBN implementation.	ICAO APAC Office	PBNTF notified about the approval of revised TOR	December. 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/28	Sharing of Ionospheric Data	That, the States which are not participating in the Ionospheric Studies Task Force be urged to share ionospheric data from their national sources with the Task Force to support development of regional ionospheric models for GBAS and SBAS.	ICAO APAC office	States requested to provide the required data for sharing with the Task Force	October. 2012
C 23/29	Navigation Strategy for the Asia/Pacific Region	That, the revised navigation strategy provided in Appendix E to the Report on agenda item 3.4 be adopted for the Asia/Pacific Region.	ICAO APAC office	States notified and revised Navigation strategy posted on the website	November. 2012
D 23/30	Revised Terms of Reference and Subject/Tasks List of ADS-B Study and Implementation Task Force	That, the revised Terms of Reference and updated Subject/Tasks List of ADS-B Study and Implementation Task Force provided in Appendices F and Appendix G to the Report on agenda item 3.4 be adopted.	ICAO APAC office	ADS-B SITF notified about approval of revised TOR and Task List	April 2013

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/31	Guidance Materials on ASTERIX Category 21 Messages & Advice to Military Authorities regarding Sharing of ADS-B Data	That, the following ADS-B implementation guidance materials be adopted: a) generation, processing and sharing of ASTERIX Category 21 ADS-B Messages provided in Appendix H to the Report on agenda item 3.4; and b) advice to military authorities regarding sharing of ADS-B data provided in Appendix I to the Report on agenda item 3.4.	ICAO APAC office	States notified about the adopted regional GMs and the GMs posted on the APAC website	December 2012
C 23/32	Amendment to ADS-B Implementation Guidance Document (AIGD)	That, the AIGD be amended to include a sample template on harmonization framework for ADS-B implementation as provided in Appendix J to the Report on agenda item 3.4.	ICAO APAC office and States	AIGD amended to include the template and posted on APAC Website. Sample used by States	April 2013

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/33	Database of Blacklist Airframe broadcasting misleading ADS-B Data	That,	ICAO APAC office and Australia	Database established at request of ICAO RO	February. 2013
		a) Australia be requested to establish and maintain a Database of Blacklist airframe broadcasting misleading ADS-B data for sharing with other Administrations in the Asia/Pacific Region; and b) States implementing ADS-B based surveillance service be encouraged to provide the identified occurrences of airframe broadcasting misleading data to Australia for entry into the ADS-B Blacklist Database.	ICAO APAC office	States requested to provide the required data for sharing	March 2013
C 23/34	Sharing of ADS-B data to support ATC operations and safety monitoring	That, States be urged to provide ADS-B data for sharing to support ATC operations and safety monitoring.	ICAO APAC office	States requested to provide Data to regional airspace monitoring agencies	March 2013
C 23/35	Surveillance Strategy for the Asia/Pacific Region	That, the revised surveillance strategy for the Asia/Pacific Region provided in the Appendix K to the Report on agenda item 3.4 be adopted.	ICAO APAC office	States notified and the revised Strategy posted on APAC website	November 2012
C 23/36	Nomination of Contact Focal Point	That, States be urged to nominate/reconfirm Contact Focal Points for WRC-15 and inform ICAO APAC Office about their contact details.	ICAO APAC office and States	Focal Points for WRC-15 nominated or confirmed by States	February. 2013

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/37	Preparations for WRC-15	That,	ICAO APAC Office States	a) National position for WRC-15 developed in line with ICAO position by States;	September. 2013
		b) States actively participate and support WRC-15 aeronautical spectrum issues through national and international meetings including APT Preparatory Group for WRC-15, ITU-R Working Party 5B and JTG 4-5-6-7; and		b)States actively participated various forum for WRC-15;	December. 2014
		c) States be encouraged to establish consultative groups of aviation industry participants to assist in the preparations for WRC-15 as appropriate.		c)ICAO state letter issued urging States to establish industry consultative group	January. 2013
C 23/38	A SIP Workshop on Radio Spectrum Management	That, a Special Implementation Programme (SIP) Workshop on radio spectrum management including revision to the overall ICAO Spectrum Policy and relevant frequency assignment planning criteria be organized in the Asia/Pacific Region.	ICAO APAC office	SIP Workshop on radio spectrum management conducted	July 2014

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/39	User readiness for transition from GRIB1 to GRIB2 code form WAFS Forecasts	That, ICAO urges States/users of WAFS forecasts in the ASIA/PAC Region to accelerate preparations for transition from WMO GRIB1 to GRIB2 WAFS forecasts if not already done so.	ICAO APAC office	State Letter	September 2012
C 23/40	Update to the ASIA/PAC FASID Table MET 6	That, the ASIA/PAC FASID Table MET 6 be amended to reflect the requirements provided by States for primary Internet-Based service for WAFS Forecasts as provided in Appendix P to the Report on agenda item 3.4.	ICAO APAC office	Amendment to ASIA/PAC FASID Table MET 6	November 2012
C 23/41	VAAC Backup Procedures in the ASIA/PAC Region	That, Australia, Japan and New Zealand considers the further development of: a) VAAC Backup Procedures in the Asia-Pacific Region, as given at Appendix Q to the Report on agenda item 3.4, in order to include Tokyo, Wellington and Darwin VAACs; and b) Procedures for VAAC Backup Tests between Tokyo, Wellington and Darwin VAACs for inclusion in the Asia/Pacific Regional SIGMET Guide.	a) Japan, New Zealand and Australia; b) ICAO APAC Office	a) VAAC Backup Procedures for Tokyo/Wellington/Darwin; and b) Appendix (VAAC Backup Test Procedures) in ASIA/PAC Regional SIGMET Guide	November 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/42	Improvement of OPMET Data Availability	That, the ICAO Secretariat, with the assistance of the OPMET/M TF, be invited to: a) continue the efforts to improve the availability (IATA requires at least 95% for AOP and 90% for non-AOP aerodromes listed in the FASID), timeliness and regularity of OPMET data at the RODBs, SADIS and WIFS, through regular monitoring and testing; and b) remind States concerned to ensure not more than one TAF is valid at an aerodrome at any given time (in accordance with Annex 3 – Meteorological Service for International Air Navigation, 6.2.7), and transmitted internationally as per ICAO provisions for services in support of flight planning.	ICAO APAC office	State Letter	September 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/43	Improvement of Timeliness, Regularity and Availability of OPMET	That, ICAO urges the States in the ASIA/PAC Region to: a) note the proposed Amendment 76 Annex 3 provision (intended applicability in November 2013) that will require an aerodrome forecast in the TAF code form to be issued not earlier than one hour prior to the beginning of its validity period; b) note that IATA expressed its requirement for international exchange of aerodrome forecasts to be completed no later than 30 minutes before the commencement of the period of validity *; c) continue efforts for standardized procedures for the issuance of OPMET data; d) consider the details provided in the IATA monitoring for the ASIA/PAC Region; and e) improve the issuance of OPMET data with respect to timeliness, regularity and availability. * ICAO to consider the requirements expressed by IATA and amends the global provisions as necessary.	ICAO APAC office	State Letter	September 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/44	Improvement of OPMET Data Format	That, ICAO remind the States in the Asia Pacific Region of the: a) Standards and Recommended Practices in Annex 3 – Meteorological Service for International Air Navigation concerning provision of operational meteorological information; and b) Annex 3 provisions concerning the quality management of meteorological information to be supplied to users that includes verification and validation procedures to be applied for the exchange of meteorological information for operational purposes, such as OPMET information.	ICAO APAC office	State Letter	September 2012
C 23/45	Implementation of Quality Management Systems for Meteorological Service Provision	That ICAO, in coordination with the World Meteorological Organization (WMO), considers urgent strategies to foster the implementation of quality management systems for meteorological service amongst States in the Asia/Pacific Region in light of the ICAO Annex 3 – Meteorological Service for International Air Navigation requirement applicable 15 November 2012.	ICAO APAC office	Strategy/plan	October 2012

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
D 23/46	Subjects and Task Lists for CNS and MET Sub-groups	That, the list of Subjects/Tasks for CNS Sub-group provided in the Appendix S and list of Subjects/Tasks for MET Sub-group provided in the Appendix T to the Report on agenda item 3.4 be adopted.	ICAO APAC office	CNS and MET SGs notified of the approved Task List	May 2013
C 23/47	Benefits of using ICAO Procurement Services	That, the States/Administrations in the ASIA/PAC Region be encouraged to consider utilizing ICAO's Civil Aviation Purchasing Service in their procurement of civil aviation equipment and services.	ICAO APAC office	State letter	January 2013
D 23/48	Aspect of Space Weather	That, CNS and MET SGs review the impact of space weather in the CNS and MET area and report to APANPIRG.	ICAO APAC office	Working Papers (reviewed by CNS SG/17 & MET SG/17 and delivered to APANPIRG/24)	16 April 2013, for CNS SG/17 & MET/SG 17 and 7 June 2013, for APANPIRG/24
C 23/49	Asia/Pacific Position Statement on ASBU	That, the Asia/Pacific Position Statement containing the response to the Draft Aviation System Block Upgrade (ASBU) Document appended as Appendix 2 to the Report on Agenda Item 3.5 be adopted for States to use as a reference in formulating their position for the 12th Air Navigation Conference .	ICAO APAC office	States notified by SL	

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/50	States' Action Plan on Environment	The States a) continue to consider environmental issues in the planning and implementation of regional air navigation systems; b) bring to the attention of the ICAO specific areas where additional guidance on environmental benefits would be valuable; c) use of IFSET to estimate the fuel savings and corresponding environmental benefits from the implementation of operational improvements, as part of the development of States' action plans; d) note the availability of further assistance by ICAO in the preparation and submission of States' action plans; and e) attend the Assistance for Action – Aviation and Climate Change Seminar in Montreal from 23 to 24 October 2012.	ICAO APAC office	States notified by SL	December 2012

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 APANPIRG/23 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/51	ICAO Public Health Emergency related SARPs	That, States/Administrations: a) should develop, update and test aviation public health emergency (PHE) preparedness plan in collaboration with public health authorities, in compliance with related ICAO SARPs and WHO IHR (2005), and prepare for the ICAO USOAP Continuous Monitoring Approach (CMA) audit which, from 2013, will include protocol questions concerning PHE related ICAO Standards and Recommended Practices; and b) consider become participating members of the ICAO CAPSCA Asia Pacific project, if not yet members, and accept PHE Preparedness Assistance Visits by the ICAO CAPSCA Asia Pacific Project, by sending a letter to the ICAO APAC Regional Office.	ICAO APAC office	States notified by SL	December 2012

ATTACHMENT 3 to the APANPIRG/23 Report
APANPIRG/23 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date
C 23/52	Transition from five regional deficiency databases to single global database	That States and International organization, a) note the approach to transfer five regional air navigation deficiency databases into a single centralized database on iSTARS platform by December 2012; b) test the centralized database on iSTARS platform using the guidance; c) Update the data as necessary in coordination with ICAO APAC Regional Office; and d) provide feedback to ICAO APAC Regional Office on the use of centralized database available in iSTARS, by 30 November 2012.	ICAO APAC office	State letter	October 2012
C 23/53	Update of ATM/AIS/SAR Deficiency List	That, the ATM/AIS/SAR, AOP, CNS and MET Deficiency List be amended as detailed in Attachment A to D to the Report on Agenda Item 4.	ICAO APAC office	Deficiency list updated	December 2012

* **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.