INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF THE FOURTEENTH MEETING OF COMMUNICATIONS, NAVIGATION AND SURVEILLANCE/ METEOROLOGY SUB-GROUP (CNS/MET SG/14) OF APANPIRG

JAKARTA, INDONESIA, 19 – 22 JULY 2010

The views expressed in this Report should be taken as those of the Sub-group and not for the Organization. This Report will be submitted to the APANPIRG/21 Meeting and any formal action taken will be published in due course as a Supplement to the Report of the APANPIRG Meeting.

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1. Introduction

1.1 The Fourteenth Meeting of the Communications, Navigation and Surveillance/Meteorology Sub-group (CNS/MET SG/14) of Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), hosted by the Directorate General of Civil Aviation (DGCA), Indonesia was held at Le Méridien Hotel, Jakarta Indonesia, from 19 to 22 July 2010.

2. Attendance

2.1 The meeting was attended by 103 participants from 24 States/Administrations, IATA, IFALPA and SITA. A list of participants is at **Attachment 1** to the Report.

3. Opening of the Meeting

3.1 The meeting was opened by Ms. Arfiyanti Samad, Secretary of Directorate General on behalf of Mr. Herry Bakti, Director General of DGCA, Indonesia. In her opening remarks, she extended warm welcome to all the participants to Jakarta. She also expressed appreciation to ICAO Regional Director for organizing the meeting in Jakarta. She informed the meeting that Indonesia will be running for the ICAO Council Member and hope to have supports from the States. She emphasized importance of communication, navigation, surveillance and aeronautical meteorological services for safe, efficient and orderly flow of air traffic. She assured commitment of Indonesia to work together in the CNS/MET field with international entities. She informed the meeting that Indonesia has developed new regulations and procedures for communication, navigation and meteorological services to ensure that the services are provided in accordance with ICAO requirements and in compliance with ICAO provisions. She expressed hope that the CNS/MET services in Indonesia can be improved through the use of the existing facilities, procedures and/or through implementation of the CNS/ATM systems. She encouraged fruitful and productive deliberations during the meeting.

3.2 Mr. Li Peng, on behalf of Mr. Mokhtar A. Awan, Regional Director, ICAO Asia and Pacific Office, extended a warm welcome to the participants and conveyed his warm greetings and best wishes to all for a successful and productive meeting. He expressed his gratitude to the Government of the Republic of Indonesia for hosting this important meeting at a short notice and for the warm welcome and the excellent arrangements made for the meeting. He thanked all the participants for making changes to their travel plan from Bangkok to Jakarta as the meeting was initially planned to be held in Bangkok and was relocated to Jakarta due to unrest in Bangkok. He highlighted the main activities of the meeting and achievements made in the CNS and MET fields since last Sub-group meeting. He recalled the main challenges in the CNS/MET fields and emphasized need for cooperation and coordination between States. He also urged States to continue to support ICAO position for next ITU World Radio Communications Conference –WRC 2012. He further stated that this was the second meeting of the Sub-Group ever held away from the Regional Office while the very first meeting was held in Beijing, China in 1997. He expressed the hope that the meeting will be successful and productive.

3.3 In his opening remarks, Mr. Jeffrey Bollard, Chairman of the CNS/MET Sub-group, welcomed the participants and thanked the Directorate General of Civil Aviation for hosting this meeting. He was pleased to note that a large number of participants attended the meeting. He highlighted some of the challenging issues to be addressed at this meeting. He also explained the working methodology of the Sub Group. He encouraged the participants to actively contribute to the deliberations during the meeting.

4. Officers and Secretariat

4.1 Mr. Jeffrey Bollard, Chairman of the Sub-group, presided over the meeting. The newly elected Co-chairmen Dr. Cheng Cho-ming and Mr. Keith Mackersy chaired the MET Working Group meeting. Mr. Lo Weng Kee, Vice Chairman of the Sub-group chaired a CNS ad hoc Working Group meeting.

4.2 Mr, Li Peng and Mr. Sujan Saraswati Regional Officers, CNS and Mr. Christopher F. Keohan, Regional Officer, MET, acted as the Secretaries of the meeting.

5. Organization, Working Arrangement, Language and Documentation

5.1 The working language was English inclusive of all documentation and this report. The Sub-group met as a single body on 19 July 2010 to deal with the subjects of common interest in both CNS and MET fields. On other three days the CNS and MET Working Groups met separately to deal with specific tasks including parallel review of report of CNS and MET parts as it was the first time that the meeting was held for only 4 days.

5.2 A list of Working Papers and Information Papers presented at the meeting is provided in **Attachment 2** to the Report.

6. Terms of Reference of the CNS/MET Sub-Group

1) Ensure the continuing and coherent development of the ASIA/PAC Regional Air Navigation Plan in the CNS/MET fields in accordance with the Global Air Navigation Plan.

2) Review and identify deficiencies that impede the implementation or provision of efficient CNS/MET services in the ASIA/PAC Region.

3) Monitor CNS/MET systems research and development, trial and demonstrations in the fields of CNS/MET and facilitate the transfer of this information and expertise between States.

4) Make specific recommendations and guidance materials aimed at improving CNS/MET services by the use of existing procedures and facilities and/or through the evolutionary implementation of CNS/ATM systems.

5) Review and Identify Inter-regional and intra-regional co-ordination issues in the fields of CNS/MET and recommend actions to address those issues.

(Last updated APANPIRG/20, September 2009)

7. Conclusions and Decisions - Definition

7.1 The Sub-groups of APANPIRG record their actions in the form of Draft Conclusions, Draft Decisions and Decisions with the following significance:

a) Draft Conclusions deal with matters, which, in accordance with the Sub-group's Terms of Reference, require the attention of States or actions by ICAO in accordance with established procedures;

b) Draft Decisions relate solely to matters dealing with the internal working arrangements of APANPIRG and its contributory bodies; and

c) Decisions relate solely to matters dealing with internal working arrangement of the Sub-group only.

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Agenda Item 1: Adoption of agenda

1.1 The agenda adopted by the meeting was as follows:

Agenda Item 1: Adoption of agenda including election of Vice Chair of MET Working Group

Agenda Item 2: Review:

1) follow-up action on reports of the CNS/MET SG/13 and APANPIRG/20 Meetings
2) relevant action items of 46th DGCA Conference
3) outcome of meetings of other related groups of APANPIRG

Agenda Item 3: Aeronautical Fixed Service (AFS):

1) review report of the Fifth Meeting of the ATN Implementation Coordination Group (ATNICG/5)
2) discuss other AFS related issues

Agenda Item 4: Aeronautical Mobile Service (AMS):

1) discuss satellite data-link communication continuity issues
2) discuss satellite voice communication
3) other AMS related issues

Agenda Item 5: Navigation:

1) review reports of the Performance Based Navigation (PBN) Task Force
2) review outcome of activities related to Testing and Calibration of Navigation facilities
3) discuss issues related to implementation of GNSS and review developments that have taken place in the Region
4) review navigation strategy
5) other radio navigation issues

Agenda Item 6: Surveillance:

1) review surveillance related activities
2) review strategy for the surveillance systems
3) discuss other surveillance related issues

Agenda Item 7: Aeronautical electromagnetic spectrum utilization:

1) review ICAO position for WRC-2012
2) review result of various Regional Preparatory Group Meetings

Agenda Item 8: Regional Implementation of World Area Forecast System (WAFS)

1) implementation issues associated with cessation of ISCS-G2
2) progress of trial gridded forecasts and related implementation issues
3) other WAFS (ISCS & SADIS) implementation issues

Agenda Item 9: Regional Implementation of International Airways Volcano Watch (IAVW)

Agenda Item 10: Regional Implementation of International Tropical Cyclone Watch (ITCW)

Agenda Item 11: Implementation of SIGMET and warnings

1) review SIGMET tests
2) SIGMET and warnings implementation issues
3) review METWSG SIGMET advisory
4) update on SIGMET Guide

Agenda Item 12: Implementation of the issuance of observation, TAF and OPMET exchanges

1) review of OPMET/M TF/8 meeting
2) implementation of Amendment 74
3) other OPMET implementation issues
4) update on ROBEX Handbook and ICD

Agenda Item 13: Review of regional procedures contained in the ANP/FASID

Agenda Item 14: Regional MET support to ATM

1) review of MET/ATM TF/1 meeting
2) exchange of information on MET support for operations at aerodromes, terminal areas and en-route

Agenda Item 15: Other MET issues

1) amendment 75 implementation issues
2) implementation of QMS

Agenda Item 16: Review and update Regional Performance Framework Objectives and forms:

1) CNS related Performance Framework Forms
2) MET related Performance Framework Forms
3) review and update CNS/ATM Implementation Planning Matrix

Agenda Item 17: Review of deficiencies in the CNS and MET fields:

1) status of CNS deficiencies (APANPIRG Deficiency List)
2) status of MET deficiencies (APANPIRG Deficiency List)

Agenda Item 18: Future Work Programme

Agenda Item 19: Any other business

Election of Vice Chair of CNS/MET Sub-group of APANPIRG

1.1 After introduction of participants, Chairman invited the Secretariat for a proposal regarding Vice Chair of MET Working Group. Considering heavy tasks and work load being dealt with by MET Working Group and appropriate regional representation, the Secretariat proposed Dr. Cheng Cho-ming , Senior Scientific Officer (Aviation Weather Services) from Hong Kong China and Mr. Keith Mackersy, Meteorological Technical Consultant from Civil Aviation Authority of New Zealand to be the co-chair for the MET Working Group. The proposal was supported by New Zealand, Australia and was further supported by Cambodia, Brunei Darussalam, Malaysia, Bhutan, India, Thailand, Singapore and Indonesia in particular for Dr. Cheng Cho-ming. As result, the meeting elected Dr. Cheng Cho-ming and Mr. Keith Mackersy as co-chair for the MET Working Group of CNS/MET Sub-group of APANPIRG.

1.2 Mr. Shun Chi-ming, Assistant Director of Observatory Hong Kong, China (Forecasting and Warning Services) congratulated Mr. Keith Mackersy and Dr. CM Cheng for co-chairing the MET Working Group, demonstrating the spirit of enhanced cooperation and bringing in expertise from different sub-regions. He indicated that even though he has moved on to other MET disciplines, he will continue to be involved in aeronautical MET as the President of Commission for Aeronautical Meteorology (CAeM), WMO. He is looking forward to working with all colleagues in another context under WMO.

Agenda Item 2: Review:

1) follow-up action on reports of the CNS/MET SG/13 and APANPIRG/20 Meetings
2) relevant action items of 46th DGCA Conference
3) outcome of meetings of other related groups of APANPIRG

Report of the CNS/MET SG/13 and APANPIRG/20 Meetings

2.1 The meeting carried out a review of the actions taken by APANPIRG/20 on Decisions and Conclusions formulated by the Thirteenth Meeting of the CNS/MET Sub-group held in Bangkok from 20 to 24 July 2009. The meeting noted with satisfaction, actions taken and the significant progress achieved by the States and the Secretariat. It was noted that action on 88% of the 50 Conclusions and Decisions of the APANPIRG/20 in the CNS/MET fields were complete. The status of the follow-up action as reviewed by the meeting is provided in **Appendix A** to the Report.

Action taken by Air Navigation Commission

2.2 The meeting also noted the specific actions taken by the Air Navigation Commission (ANC) on the APANPIRG/20 Report with respect to the CNS/MET matters. Regarding *Satellite data link communication capability,* (Conclusion 20/34 refers), the ANC had noted the concerns of APANPIRG for ensuring the availability and sustainability of infrastructure to fulfill operational requirements for satellite data link communication services. The ANC had noted that ICAO would undertake a case study on the ownership and control of the air navigation services infrastructure, including the development of a draft service level agreement for use by air navigation service providers (ANSPs), to ensure that private third party service providers perform in line with recognized safety and performance requirements. Furthermore, it was recognized that usage of two or more autonomous networks by States and international organizations would provide much better availability. With respect to PBN implementation, ANC confirmed the request of APANPIRG in its Conclusions 20/37 for development of additional PBN implementation related guidance material, 20/42 on PBN safety assessment and 20/48 with respect to Flight inspection and validation of flight procedures, the Secretary General was requested to address these PBN implementation related issues through appropriate ANC Panels and Study Groups.

Outstanding Conclusions

2.3 The meeting reviewed the list of Outstanding Conclusions up to APANPIRG/19 (2008), which is provided in **Appendix B** to the Report. The meeting noted that of the 8 outstanding Conclusions, action on 4 Conclusions had either been completed or the item had been closed. The remaining 4 on-going items would require further action, which is expected to be completed by early 2011.

Relevant Action Items of the 46th DGCA Conference

2.4 The 46th Conference of Directors General of Civil Aviation (DGCAs), Asia and Pacific Regions (DGCA/46) was held in Osaka, Japan from 12-16 October 2009. A total of 215 delegates from 34 States/administrations and 5 international organizations attended the Conference. The meeting noted the theme subjects for 46th and 47th DGCA Conference. The Conference developed 12 Action Items which is provided in the **Appendix C** to this Report. Action Items relating to the Work Programme of the CNS/MET Sub-group were highlighted as follows:

- Action Item 46/1 – Seamless Sky - ATM;
- Action Item 46/6 – Implementation of Continuous Descent Operation;
- Action Item 46/7 – Asia-Pacific Flight Procedure Programme;
- Action Item 46/8 – Preparation for WRC2011 (2012); and
- Action Item 46/11 – Technical Cooperation (Training opportunities)

2.5 The meeting noted that Items 46/6, 46/7 and 46/8 were already covered by the work program of the CNS/MET Sub-group and APANPIRG. The meeting encouraged States to make use of the opportunities provided under ICAO Developing Countries Training Programme for training of their national technical staff as and when they are made available.

2.6 With respect to Action Item 46/9 regarding USOAP Compliance Checklists (CC), Australia noted that the CC database used by USOAP has not been updated in time; the checklist still refers to old reference when the SARPs have already been amended. Timely update to the compliance checklist is required. In this regard, the meeting was informed that the on-line database on notification of difference by States based on information provided by the States would be made available shortly by ICAO. The meeting encouraged States to follow up the recommendations of the 46th DGCA Conference.

Review outcome of the ATM/AIS/SAR/SG/20

2.7 The meeting noted following outcome of ATM/AIS/SAR/SG/20 meeting which was held in Singapore from 5 to 9 July 2010. ATM/AIS/SAR SG developed 15 Draft Decisions and Conclusions for consideration by APANPIRG/21. The following Conclusions and subjects of relevance to the CNS/MET/SG were reviewed and noted by the meting.

- Developed a Draft Conclusion recommended APANPIRG to adopt a regional guidance material to assist States for the implementation of changes introduced by Amendment 1 to the 5th Edition of PANS-ATM, Doc 4444;

- Similarly, a Draft Conclusion for APANPIRG to adopt the *Strategy for Implementation of the New Flight Plan Format and Messages* was developed;

- It was agreed that after termination of the service provided by CRA-Japan for South East Asia on 31 March 2011, the responsibility will be taken over by Singapore;

- The meeting noted the update on ASIA/PAC initiatives for the reduction of emission. The meeting urged States to correct the air navigation deficiencies where identified;

- It was informed that a draft consolidated Interface Control Document (ICD) has been prepared to provide a harmonized AIDC for the North Atlantic and Asia/Pacific Regions. The meeting noted that an AIDC Implementation Seminar will be held in Bangkok from 12 to 13 October 2010 and this forum could also be used to seek further comments on the proposed Global AIDC;

- The meeting also identified a need for the development of a harmonized State contingency plans; and

- The meeting adopted the draft Decision formulated by SEA ATS coordination Group to assign task to the MET/ATM Task Force to develop a Sub-regional Volcanic Ash Contingency Plan also requested States to designate a contact person.

2.8 The meeting noted that ATM/AIS/SAR SG/20 endorsed a draft Conclusion regarding transfer the FASID Table ATS-2 – ATS Radiotelephony VOLMET broadcast from ATS to MET part of the ANP/FASID.

2.9 While reviewing a working paper jointly presented by Japan and USA regarding a proposal to organize an Asia/Pacific Seamless ATM Workshop in early 2011, the meeting endorsed the following draft Conclusion formulated by the ATM/AIS/SAR SG/20 inviting ICAO to convene the Workshop for planning the future ATM system .

Draft Conclusion SG 20/09 – ICAO Asia/Pacific Seamless ATM Workshop

That ICAO be invited to organize the Asia and Pacific Seamless ATM Workshop to be held in early 2011 inviting the APANPIRG member States and other parties of interest in order to foster discussion and action for the Asia and Pacific States in the planning of the future air traffic management system, considering the overall vision for the region for seamless ATM.

2.10 Under this agenda item, the meeting also discussed the issue of CNS/MET Sub-group meeting arrangement as tasked by APANPIRG/20 Meeting. It was recalled that New Zealand presented a proposal to reduce time spent for plenary session and extension of daily meeting of CNS/MET Sub-group with the an ultimate objective of bringing down the meeting schedule to four days. The CNS/MET SG/14 meeting was conducted over four days with the daily working hours extended to include four working sessions compared with the three sessions which is the normal practice. The meeting was unable to convene a plenary session to jointly review the future work programme, list of subjects and tasks and the meeting report. The fourth daily session limited the opportunity for the meeting of ad-hoc groups. Ad-hoc groups are a valued component of the work of the Sub-group. Furthermore, some task forces are setup to address implementation issues mainly through correspondence and the only opportunity for the members to meet is during the week of the sub group meeting. Lastly, the trend of increased number of papers submitted requires more meeting time for discussion. The opinion of the meeting is that the four and half day meeting program be retained.

2.11 Chairman also asked the participants to think how the activities of Sub-groups of APANPIRG could be better grouped. In this regard, the meeting was informed that the proposal for setting up AIM/MET Sub-group of APANPIRG was not supported by ATM/AIS/SAR SG/20 meeting. The meeting considered that any restructure of the contributing bodies of APANPIRG should be considered by APANPIRG on the advice of the chairmen of the sub-groups. Any significant change should be programmed to have effect from the 2012 meeting year with the 2011 meetings of the subgroups being used to implement transitional arrangements.

2.12 The MET Working Group opened discussion on the working arrangements later in the week. The group expressed flexibility in future sub-group arrangements and noted that an alignment with ATM and AIM seemed logical given the required MET support for ATM with regard to future systems and services (e.g. NextGen, SESAR and MET Services for the Terminal Area). Another idea posed was to have a separate MET Working Group that floated with another sub-group (CNS, ATM/AIS/SAR) from year to year depending on the overlap issues at that time and would give a chance for other groups to receive exposure to the MET Working Group and vice versa.

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Agenda Item 3: Aeronautical Fixed Service (AFS)

1) Review report of the Fifth Meeting of the ATN Implementation Coordination Group;
2) Discuss other AFS related issues

AMHS Implementation Plan

3.1 Hong Kong China, proposed the procedures required and the phased approach to ensure an orderly testing and implementation of AMHS in the region. AMHS implementation planner to support the States in planning their testing and implementation of AMHS in their administration was also presented to the meeting. To avoid the complexities involved in testing every possible combination of a huge number of MTAs in the region and to save testing time involved in testing all these innumerable number of combinations, it was proposed that comprehensive interoperability test procedures included in Annex C and E of the AMHS Manual should be used only for those pairs of MTAs which are directly connected. For indirectly connected MTA pairs, abridged interoperability test procedure included in the Bilateral Test items (except IT601) stipulated in paragraph 4, Annex E of the AMHS Manual should be sufficient. Four phases of testing with Phase I for AFTN routing at MTA level, Phase II or intermediate phase for MTA direct routing to end BBIS, Phase III or final phase for MTA – to – any – MTA routing within the region and Phase IV for migration to IPS as when IPS is available were explained in detail. In accordance with the phased testing approach explained above, an AMHS Implementation Planner developed to present AMHS testing and implementation was presented. Above proposals were recommended by ATNICG in its Fifth Meeting for adoption.

3.2 The meeting tasked ATNICG to develop similar planner for the implementation of AIDC in the region based on the FASID Table CNS 1E. It was agreed that initial draft on testing requirements and planner will be developed by Hong Kong China.

Clarifications on ATN/IPS guidance (Doc 9896)

3.3 USA brought out the issues related to implementation of ATN, which need to be clarified. It was informed that publication of Edition 2 of ICAO Doc 9896 ATN/IPS Technical Manual was announced for May 2010, but the document has not been published and this has caused a number of States and industry to defer their planning to support IPS environment. Same issues when raised, ATNICG/5 made following recommendations.

a) ICAO Doc 9896, Edition 2 need to be published before implementation issues can be addressed; and

b) Publish Guidance Material of ICAO Doc 9896 to provide guidance to sustain existing service while transitioning to an IPS environment. Regular tracking and verification of referred RFCs need to be performed and reported.

3.4 On the use of VoIP recommended in ICAO 9896, ATNICG made a number of recommendations, which have been discussed in the report on ATNICG/5 meeting. Similarly, on the issue of referring to Request for Comments (RFC), in ATNICG it was expressed that reference to RFC without identifying specific paragraphs would result in different interpretations of requirements. The concern was also expressed that the RFC can be changed or superseded by the industry without any notice. RFCs are developed by the industry and it has happened that some of them have not even been implemented. ATNICG/5 also discussed issues related to IPv4 and IPv6 addressing schemes and developed a consensus which has been included in the presentation on the report of meeting.

3.5 Secretariat clarified that the adoption of external standard was in line with the recommendation of the 36th Session of ICAO assembly. It was also clarified that IPv6 has been adopted, since the address capacity of IPv4 has almost exhausted and IPv6 infrastructure is almost in place to support the implementation. The meeting also noted VoIP related development by Aeronautical Communication Panel.

Asia/Pacific ATN Implementation Strategy

Fifth Meeting of ATNICG

3.6 The fifth meeting of Aeronautical Telecommunication Network Implementation Coordination Group (ATNICG/5), hosted by Department of Civil Aviation, Malaysia was held from 31 May to 4 June 2010 in Kuala Lumpur, Malaysia. The meeting attended by 56 participants from 16 States and an representative from the industry was inaugurated by Mr. Azharuddin Abdul Rahman, Director General of Civil Aviation, Malaysia.

3.7 ATNICG reviewed the Subject/Tasks list assigned for the Group and decided to propose new sub-tasks and remove of some of them on the basis of developments that have taken place. CNS/MET SG Meeting reviewed the updated Subject/Tasks List placed at **Appendix D** to this report and recommended it for adoption by APANPIRG through the following draft Decision:

Draft Decision 14/1 - ATNICG Subject/Tasks List

That, the updated Subject/Tasks List placed at **Appendix D** to this report be adopted as the Asia/Pacific Aeronautical Telecommunication Network Implementation Coordination Group (ATNICG) Subject/Tasks List.

Clarifications on ICAO Doc 9896

3.8 The meeting noted the outcome of Aeronautical Communication Panel (ACP) Working Group of the Whole meeting held from 18 to 22 January 2010 in Montreal as presented to ATNICG. ACP Working Group of the Whole was assured that Edition 2 of Doc 9896, guidance document on ATN using IPS will be delivered in May 2010 but it has not been delivered so far. Differences between Edition 1 and 2 of Doc 9896 were explained and inclusion of Voice over IP (VoIP) in the later edition was informed. The meeting also noted issues related to the on-line and off-line Directory Services and formulated following draft Conclusion bringing out some of the implementation related issues:

Draft Conclusion 14/2 - ICAO Doc 9896 clarifications

That ICAO be invited to provide clarifications on the following issues related to ATN/AMHS implementation

i) VoIP should be limited to ATS ground service since the ICAO approach is to encourage data communication such as CPDLC. Furthermore, the VoIP performance is network dependent and thus performance acceptance is varied.

ii) how the States will come to know about updates on the relevant RFCs; and

iii) IPv6 address structure.

ATNICG Working Group Activities

3.9 Sixth meeting of ATNICG Working Group (ATNICG WG/6) was held in Hua Hin, Thailand from 22 to 25 September 2009 and the Seventh Meeting of the Working Group (ATNICG WG/7) was held on 29 January 2010 in Bangkok. ATNICG WG/7 was held back to back with AMC Training conducted by EUROCONTROL on 25 and 26 January and the AMHS Implementation Workshop organized on 27 and 28 January 2010. All these programmes (the meetings, the training and the workshop) were hosted by Aeronautical Radio of Thailand (AEROTHAI). The meeting was informed about the commissioning of AMHS link between Hong Kong and Macao in December 2009.

Review ATN/AMHS Implementation Status

3.10 Implementation status was also presented by Japan, Indonesia, India, China, Singapore, Republic of Korea, Thailand and USA to the ATNICG Meeting. Compatibility issue between Edition 2 AMHS installed in Japan and Edition 3 in Korea was noted by the meeting. Hong Kong China presented the implementation status in the region through an Excel based Regional AMHS Implementation Planner. It was informed that the implementation status will in future be updated through the Implementation Planner and following draft Decision was formulated for adoption by the APANPIRG:

Draft Decision 14/3 - Regional ATN/AMHS Implementation Planner

That, the Asia/Pacific Regional Implementation Planner Placed at **Appendix E** to this report be adopted to report ATN/AMHS implementation progress in the region.

Review of implementation plan and status from other ICAO regions

3.11 It was informed that MID region had adopted ATN over IPS, which will maintain compatibility with AFTN, CIDIN and ISO/OSI based implementation and also AMHS implementation had been completed or was in very advanced stage of completion in a number of States in the region. MID region currently has four links with Asia and Pacific regions (Bahrain/Singapore, Kuwait/Pakistan, Iran/Pakistan and Oman/India). It was agreed that Singapore, Pakistan and India should take initiative in transiting to AMHS connectivity following the prescribed procedure. Following draft Conclusion was recommended by the meeting for adoption by APANPIRG:

Draft Conclusion 14/4 - AMHS connectivity with ICAO MID region

That, Singapore, Pakistan and India take initiative in transiting to AMHS connectivity with Bahrain, Kuwait, Iran and Oman respectively at the earliest.

In response to a query raised in the meeting, both India and Singapore confirmed their readiness to conduct tests with their reciprocal ends.

3.12 AMHS connectivity between Amman/Jordan and Abu Dhabi/UAE on Virtual Private Network (VPN) and policy adopted in the MID region regarding usage of public internet was also informed to the meeting.

Asia/Pacific Regional ATN/AMHS Implementation Strategy

3.13 Singapore presented the ATN/AMHS Implementation Strategy as updated by ATNICG/5 for review. Changes proposed in the format of the Strategy were noted. The meeting agreed with the stress given to replace the X.25 sub-network with IP sub-network connectivity. The revised Strategy recommends deployment of a backbone network of ATN/OSI and a private network of ATN/IPS comprising of dedicated point-to-point circuits with no connectivity provided with public network. Usage of public network however is limited for connectivity between MTAs and UAs. The meeting, after deliberations decided to recommend following draft Conclusion for the consideration of the APANPIRG:

Draft Conclusion 14/5 - Strategy for Implementation of Aeronautical Telecommunication Network (ATN) in the Asia/Pacific Region

That, the document provided at **Appendix F** be adopted as Strategy for Implementation of Aeronautical Telecommunication Network (ATN) in the Asia/Pacific Region.

ATS Management Centers (AMC) Data

3.14 The meeting was informed about the observation made in ATNICG/5 that AMC data provided by the States was sometimes not correct though the ICAO State Letter on this subject was quite comprehensive. To facilitate recording of correct data, meeting was presented a proposal to circulate a form amongst the States for collecting the correct information. This form includes a filled up sample to provide a better understanding about the requirements of each column. The meeting agreed with the proposal and adopted following draft Conclusion:

Draft Conclusion 14/6 - AMC Information Form

That, States be invited to provide data for AMC in respect of their Administration in the format provided at **Appendix G** to this Report.

Use of Directory Service

3.15 Directory Service concepts are specified in ICAO Doc 9705, Edition 3, Sub-Volume VII and Asia/Pacific Directory Service Guidance document. Based on X.500, Directory Service allows users to collect information describing the users, the applications and other resources in a common directory that is accessible to all authorized users and applications within ATN. It also provides ‘on-line’ administration tool to centrally manage information for the global ATN. For the reasons like synchronizing the data in all the MTAs etc, the service is still not being used on-line. It was informed that ATNICG formulated a Decision to analyze and recommend Directory Service that can be implemented for future use, develop procedures for implementation, identify obstacles on its implementation and develop mitigation proposals for these obstacles.

IP Sub-network Planning

3.16 ATNICG reviewed two Addressing Plans, one based on the IPv6 and the other based on IPv4 as has been adopted in the CAR/SAM region. Based on the IPv4 and IPv6 addressing plans proposed and the meeting considered the following:

i) The coordination required to obtain a global IPv6 address prefix for the region, and the cost in acquiring and maintaining such address prefix;

ii) The desirability of an ICAO global IPv6 addressing scheme, which must be coordinated through the Aeronautical Communication Panel;

iii) The urgent need to migrate from AFTN to the AMHS, and the need for non-backbone States to use the Internet Protocol Suite to reduce their implementation costs; and

iv) That the proposed IPv4 addressing plan is considered sufficient to meet the requirements of ground-ground communication in the Asia/Pacific region in the short-to-medium term.

Based on the considerations mentioned above, meeting endorsed following draft Conclusion developed by ATNICG:

Draft Conclusion 14/7 – Asia/Pacific ATN Interim Addressing Plan

That,

i) The proposed IPv6 and IPv4 addressing schemes be submitted to ICAO and ICAO be requested to consider a global IPv6 addressing scheme for ground-ground communication

ii) The proposed IPv4 address plan placed at **Appendix H** be adopted to enable the Asia/Pacific ATN ground IPS network implementation to proceed using IPv4 in the interim with minimum delay; and

iii) The Asia/Pacific region transition to IPv6 once the above issues have been resolved.

Amendment of Regional Documents

3.17 The meeting was informed that Asia/Pacific ATN IDRP Routing Policy Version 3.1 provides for a common addressing prefix for Asia/Pacific and NAM regions to achieve the ultimate goal of shortest path and hence ATNICG has proposed that the two regions should have common 5-byte NSAP prefix and this requires that Asia/Pacific ATN NSAP addressing plan should be changed to include Hexadecimal Code '91' in the ADM field. The meeting recommended that the mentioned change should be recommended for adoption by APANPIRG.

3.18 ATNICG WG/6 was informed that the current test cases provided in Annex C to Asia/Pacific AMHS Manual are somewhat limited in scope of verifying routing capabilities of ATN routers operating in multiple domains and hence amendment proposed by ATNICG to include additional test cases was recommended for adoption by APANPIRG through a draft Conclusion developed by ATNICG.

3.19 Updated version of guidance document on Management, Operation and Technical Controls on Security was also recommended for adoption.

3.20 The meeting also agreed to recommendation by the ATNICG to revise the test procedures to limit the testing between indirectly connected MTA pairs to abridged procedures provided in paragraph 4, Annex E of the AMHS Manual to save time and efforts required for conducting the comprehensive testing procedure provided in Annex C and Annex E.

3.21 Step-by-step approach for transiting from AFTN Routing to MTA-to-any-MTA developed by ATNICG on the basis of the experience gained by many States was also recommended for adoption by APANPIRG. In view of the foregoing, the meeting endorsed the following draft Conclusion :

Draft Conclusion 14/8 – Amendment/update of Regional ATN/AMHS Guidance Document

That, the following Regional Guidance Documents for ATN/AMSH implementation be adopted and distributed to States:

a) the amended Asia/Pacific ATN Network Service Access Point (NSAP) Addressing Plan for Asia/Pacific Region as provided in the **Appendix I** to this Report;

b) the Test Procedure for ATN Router Connection Test, Annex C to Asia/Pacific AMHS Manual as provided in the **Appendix J** to the Report;

c) “Asia/Pacific ATN Security Guidance Document” to replace the existing Asia/Pacific ATN Security Guidance Document, Draft First Edition as provided in **Appendix K** to the Report; and

d) the phased testing procedure to transit from AFTN routing to MTA-to-any-MTA routing to be incorporated in the AMHS Manual as provided in **Appendix L** to the Report.

3.22 It was informed that ATNICG had considered an Interface Control Document for the IPS routers and agreed to have a common standard to facilitate uniform and harmonized implementation of ATN over IPS. ATNICG felt that there may be a requirement to amend the FASID tables to accommodate the unique requirement of IPS and proposed that an additional sub task be introduced in the Subject/Tasks list for ATNICG.

3.23 The meeting was reminded about the requirement of amending the guidance documents on the basis of Proposed Defect Reports (PDRs) raised in the Aeronautical Communication Panel (ACP) meetings. It was expressed that those States, which were not attending the ACP meetings regularly, were not having an opportunity to raise the PDRs. The meeting was informed that PDR has since been renamed as Amendment Proposals. The meeting therefore formulated following draft Conclusion for providing a facility to such States an opportunity to raise PDR (Amendment Proposal):

Draft Conclusion 14/9 - Points for Proposed Defect Report (PDR) (Amendment Proposal) raised in the region

That, States be invited to present their ATN/AMHS implementation related Points for Proposed Defect Report (PDR) (Amendment Proposal) to the ICAO APAC Office. These points will be presented to the ATNICG/ATNICG Working Group (whichever is scheduled earlier) by the Secretariat for endorsement, so that these points, along with the ATNICG/ATNICG WG recommendations can be forwarded to ACP WG – M Secretariat through ICAO APAC Office.

3.24 Japan presented their proposal for AFTN Routing Change between Japan and Russia in the ATNICG meeting, in view of the developments that have taken place lately. It was agreed that ICAO Regional office should coordinate with Europe Region for updating the AFTN routing directory accordingly the meeting endorsed the following draft Conclusion formulated by ATNICG:

Drat Conclusion 14/10 – 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.

3.25 It was informed that the next Working Group (ATNICG WG/8) meeting has been planned to be held from 28 Sept. - 1 Oct. 2010. In the ATNICG/5 meeting, New Zealand offered to host the Working Group meeting in Christchurch. Republic of Korea offered to host the Sixth Meeting of ATNICG in Seoul tentatively scheduled from 23 to 27 May 2011.

3.26 The meeting appreciated the contributions made by Department of Civil Aviation, Malaysia by hosting the Fifth Meeting of ATNICG and thanked New Zealand and Republic of Korea for their offers to host the next Working Group and ATNICG meetings respectively.

Network Incompatibility Issues

3.27 Regarding issues related to network incompatibilities USA proposed a possible solution based on using Applications to overcome the network incompatibility issues. Usage of Extensible Markup Language (XML) for transmission of OPMET data, usage of public internet for accessing ATS Management Centers (AMC) and the World Area Forecast System (WAFS) Internet File Server, Virtual Private Network (VPN) over public internet etc. are some of the diverse systems which are proposed to be used in the future.

3.28 Asia/Pac Region are phasing out X.25 subnetwork and transiting towards IP subnetwork to support AMHS. It is recommended that the region should move forward to using XML formatted data over AMHS to support OPMET data and other traffic. Trial of XML over AMHS has been planned between Hong Kong China, USA and Singapore. It was also recommended that States should use public internet using IP Security (such as VPN) on a case to case basis to improve network performance. It was informed that table driven protocol like XML can be used for many aeronautical applications. The meeting was of the view that since the proposal included issues related to transmission of OPMET messages, coordination with MET working group should be established.

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Agenda Item 4: Aeronautical Mobile Service (AMS):

1) discuss satellite data-link communication continuity issues
2) dicusss satellite voice communication
3) other AMS related issues

Outcome of First Satellite Operational Continuity Meeting (SOCM/1)

4.1 While reviewing the outcome of the SOCM/1 which was held from 26 to 28 August in Bangkok to meet the requirements of APANPIRG Conclusion 19/24 and consequential actions taken by APANPIRG and Air Navigation Commission, the meeting discussed the current satellite data link communication status and related issues.

4.1.1 The meeting noted that the end to end serviceability performance has been improved to some extent since late 2009. The meeting noted that service provider stockholders have been putting efforts into incentivising the Release 15 upgrades to all four GESs – which are now nearing completion. It was also informed that additional 60 aircraft from 4 airlines started using MTSAT through SITA AIRCOM service.

4.1.2 It is noted that although improvement for end to end communication performance is still required, the requirement for RNP 4 based separation in the South Pacific could be marginally achieved. The meeting appreciated ICAO Regional Office for taking the lead role in organizing the SOCM/1 Meeting.

4.1.3 The meeting noted the chain of SATCOM datalink service involves several segments from different service providers and stakeholders including end users. Therefore improvements for the SATCOM datalink service require coordinated and collaborated efforts among all the stockholders and strategic planning. The meeting considered it as a global issue which need to be addressed at global level.

4.1.4 In this connection, the meeting further discussed possible dates for SOCM/2 Meeting which is scheduled for end of 2010. It was agreed that the second meeting of SOCM should be organized after receiving input from the reconvened FANS SATCOM Improvement Team (FSIT). The meeting noted the recommendation by ICAO that the Air Navigation Service Providers and the Airline Operators should consider to use two or more redundant SATCOM systems through service providers to achieve improved performance. The meeting expressed concerns about the availability of data link services after the life of some of current INMARSAT and MTSAT satellites expire in 2016. Therefore, strategic system planning for future system and requirements for the correspondent and/or updated avionics are required.

4.1.5 It was noted that SOCM/2 meeting may be postponed due to the reason that FANS SATCOM Improvement Team Meeting (FSIT) had not been reconvened as planned. However, if the FSIT meeting is not conducted in the a reasonable period, the SOCM/2 meeting should be conducted. The meeting discussed objective of the meeting and identified following items that may be included in the agenda for the next SOCM/2 meeting.

- Review the status of Satellite datalink communication status;

- Implementation of improvement plan by stakeholders to develop a common outage/maintenance reporting template and process by CSPs which is useful for States/ANSPs/CRAs;

- Develop common service level agreement between CSPs and State/ANSPs based on requirements in the GOLD;

- Satellite Communication Voice for routine ATS; and

- Mid and long term strategy for Satellite communication i.e. beyond 2016 including requirements for modification to SATCOM satellite data unit (SDU) to enhance capability to access multi satellite service provider and whole I3 and I4 network.

4.1.6 In this connection, attention of the meeting was also drawn to the '*Guidance Material for the Asia/Pacific Region for ADS/CPDLC/AIDC Ground Systems Procurement and Implementation*' provided on the ICAO Asia/Pacific Regional website through the link APAC e-documents for guidance in the matters of procurement and implementation of datalink systems.

Global Operational Data Link Document (GOLD)

4.2 The meeting noted information presented by the USA on the development process of GOLD to replace FANS Operational Manual (FOM) for Asia/Pacific, South American and African/Indian Ocean Regions. The meeting noted that the Ad-Hoc GOLD Working Group has completed the First Edition, which was published on 14 June 2010 which can be accessed on the following websites.

a) FAA:

http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/

b) ISPACG CRA website: http://www.ispacg-cra.com/gold.asp; and

c) ICAO Asia and Pacific Office: http://www.bangkok.icao.int/edocs/index.html

4.2.1 In this regard, the meeting recalled that APANPIRG had approved GOLD as Asia/Pacific regional guidance material at its 20th meeting for use by States and airspace users (Conclusion 20/73 refers) to replace FOM in the Asia and Pacific Region upon release of the GOLD by the Ad-Hoc GOLD Working Group. A State Letter was issued on 28th June 2010 to notify States and International Organizations that GOLD has become applicable since June 2010.

Review outcome of NAT SPG/46 Meeting

4.3 The meeting was informed that the Forty-Sixth Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in the European and North Atlantic (EUR/NAT) Office of ICAO from 22 to 25 June 2010. It was required to coordinate with APAC Region and with the APANPIRG groups for some conclusions adopted by NAT SPG/46. The Secretariat was also requested to provide the issues identified to the meetings of APANPIRG Sub-groups for review.

4.4 It was noted that NAT SPG/46 has adopted a conclusion for an amendment proposal to the NAT SUPPs (Doc 7030) with respect to the FANS 1/A mandatory equipment carriage requirement (NAT SPG Conclusion 46/2 refers).

4.5 The meeting also noted that NAT SPG/46 has reviewed the status of implementation of the NAT Data Link Monitoring Agency (NAT DLMA) and urged the NAT States, service providers and industry to complete some remaining actions (NAT SPG Conclusion 46/3 refers) ;

4.6 The meeting also noted NAT SPG Conclusion 46/4 on a revised version of the NAT Proposal for Amendment to Doc 7030 on SATCOM Voice. In this connection, the meeting also considered a paper presented by Australia. The meeting supported the continued development of ICAO global AMS(R)S Voice avionics standards and procedures. The meeting recommended to endorse the Terms of Reference for the future work of the inter-regional Satellite Voice Communication (SATCOM) Task Force as approved by NAT SPG/46 and provided at **Appendix M** to this Report. (NAT SPG Conclusion 46/5 refers). Accordingly the meeting formulated the following draft Conclusion:

Draft Conclusion 14/11 – Inter-regional ad hoc SATCOM Task Force

That,

a) the Terms of Reference of the inter-regional ad hoc Satellite Voice Communication (SATCOM) Task Force adopted by NAT System Planning Group as provided at **Appendix M** be endorsed;

b) the outcome of the task force should be coordinated with the CNS/MET Sub-group of APANPIRG).

4.7 The meeting noted that Global Operational Data link Document (GOLD) Version 1.0 has been also adopted by the NAT SPG and proposal for ICAO to establish a global document configuration management process. It was noted that the amendment procedure included in the GOLD was quite different from the conventional ones being used.

Pan-regional ICD for AIDC

4.8 The meeting noticed that NAT SPG has agreed to the development of Pan-regional ICAO guidance material for oceanic AIDC ICD based on the current AIDC ICD (version 3) adopted by APANPIRG and the latest AIDC ICD used in the NAT Region. The NAT SPG further agreed that the task of harmonising the NAT and APAC AIDC ICDs should be advanced in accordance with the following principles:

a) The United States should continue the effort by drafting a consolidated ICD with thorough bi-directional tracking of content;

b) Since the ICD would apply to oceanic regions only a title of the future document should be "Pan-regional ICD for Oceanic AIDC";

c) The content of the initial consolidated ICD should be confined to the existing substance of the NAT and APAC ICDs. Otherwise review would be unnecessarily complicated;

d) The above should be accomplished as quickly as practicable, and the NAT and APAC ICDs should be frozen in the interim; and

e) Once the NAT and APAC PIRGs had endorsed the resulting ICD, a new round of drafting and review could begin to incorporate any desired new substance, as part of the ongoing inter-regional maintenance of the document.

4.9 The NAT SPG also agreed that this work would be progressed in the framework of the NAT IMG and that a group of experts would be identified to review the draft consolidated NAT/APAC AIDC ICD. The Rapporteur of the NAT CNSG would coordinate this activity with the APAC Region. The work would be conducted via electronic means of communication as far as possible. A progress report would be provided to the next meeting of the NAT IMG where a decision would be taken regarding further steps.

4.10 Within the Asia Pacific Region, the APAC AIDC ICD applies to ATS units and ATM systems serving oceanic, continental and regional airspace. Therefore the assumption that the ICD would only apply to oceanic regions is at complete variance with the implementation and use of the APAC AIDC ICD. Accordingly, the meeting formulated following draft Conclusion:

Draft Conclusion 14/12 – Pan-Regional ICD for AIDC

That, ICAO Regional Office inform the NATSPG that the proposed title "Pan-regional ICD for Oceanic AIDC" is unacceptable as the ICD for AIDC is applicable for use by all ATS and ATM facilities in both oceanic, and continental areas within the Asia Pacific Region; and that the document should be titled as "Pan-Regional ICD for AIDC.

Update on use of Satellite Voice Communication (SCV) for ATC purpose

4.11 The meeting discussed a paper presented by Australia which summarizes work undertaken by ICAO in the field of Satellite Voice Communication (SCV) for use for ATS purpose. The concerns and limitation raised by States and industry with using SCV for ATS are as follows:

a) The Annex 10 requirements for Aeronautical Mobile Satellite (Route) Service (AMS(R)S voice avionics and the supporting ground system requirements and performance standards are not sufficiently robust to support the desired use as a substitute to HF as a long range communication system,

b) Many ANSPs do not have the supporting infrastructure nor ATC procedures to use SCV as an alternative to HF,

c) Pilot and ATC procedures are not fully developed ,

d) SCV, unlike HF, would not be globally available, and

e) The lack of guidance on the separations standards for which SCV is intended to be used.

4.12 In addition, Japan indicated that using SCV would increase workload of air traffic controller. While supporting the continued development of relevant ICAO standards and procedures for using SCV for ATS, the meeting recommended to retain SCV use to emergency and non-routine purposes as stated in APANPIRG Conclusion 14/17 adopted in 2003.

Policy on harmonizing data communication

4.13 USA informed the meeting of the FAA's policy on harmonizing its data communication programs within the National Airspace System (NAS) and the international airspace it serves. After introduction of history of datalink communication related activities and background information on standard development for CPDCL and ADS-C applications, it was stated that the FAA will promote the use of RTCA, EUROCAE, and ICAO to internationally standardize the operational and technical definition for next generation data communication services that meet the operational needs in its domestic and international airspace. The FAA envisions that operators will only need one upgrade cycle to equip their aircraft to benefit from the next generation data communication capabilities planned for 2015-2025 in international and domestic airspace. RTCA SC-214 and EUROCAE WG-78 are working jointly to develop standards for next generation data communication services. The reason for the Policy is to promote all regions to follow on convergence of services using 214/78 in their FANS systems.

ADS/CPDLC operational trial in the Ujung Pandang FIR

4.14 Indonesia informed the meeting that taking into account the progress CNS/ATM implementation in the Region, Indonesia has conducted the ADS/CPDLC operational trial on particular oceanic ATS routes of A461, B583, B584, B472, B473, B462, R340/R590 in the Ujung Pandang FIR for all aircraft equipped with FANS-1/A. Starting time of the trial was from 3 July 2008 with duration of three months. This ADS-C/CPDLC trial will finish in September 2010. The result of the trial was optimistic and met the operational requirement. Indonesia has proposed transition from the trial to operational implementation.

DATA-LINK Performance Monitoring Results by New Zealand

4.15 The meeting reviewed some encouraging results of data-link performance monitoring within the Auckland Oceanic FIR presented by New Zealand. The meeting noted that the Central Reporting Agencies (CRA) of the Informal South Pacific ATS Coordinating Group i. e the ISPACG CRA, has for some time published a collection of data-link monitoring data on its website at: http://www.ispacg-cra.com/performance.asp.

4.16 The statistics data collected since December 2008 indicates that while the safety targets for network availability are being achieved at present, it is clear that considerable improvement is necessary for the efficiency target to be met. The efficiency target supports operational efficiency and orderly flow of air traffic. It was demonstrated that the nominal times for CPDLC and ADS-C continuity are being achieved. The availability should improve significantly when the figures to 1 July 2010 are available,

Regional HF Management Guidance Material

4.17 The HF management guidance material covering SP6 area, provided by the Chair of the South Pacific HF Working Group was presented to the meeting by the Secretariat. The guidance material integrated regulatory materials relating to South Pacific States (Doc. 7030), FASID, radio regulations and current NOTAM's etc.

4.18 The purpose of the document is to provide a guidance methodology for the utilization of the Families and Frequencies employed by the Aeronautical Communication Stations in the South Pacific, to support a better management plan of the available families, frequencies and human resources, in order to increase the efficiency and capacity of the Communications Network. The document focuses on the propagation, technical and characteristics of the HF network while detailing specific information on ground facilities within the south pacific SP6 region. It will also include other relevant information about HF frequencies for air-ground communications. In addition, it also includes contact information for Aeronautical Stations. Its intent was to make information freely available from one source document.

4.19 While the document is primarily aimed at the South Pacific, a lot of the information has been used from the NAT document 003. Consequently there is no reason why it could not be rolled into the current NAT document as a step towards a global HF guidance document, much like the datalink document "GOLD" which was born out of the SPOM, FOM etc.

4.20 After reviewing the structure and contents of the document, the meeting considered it a very useful document for operators and ANSPs in the South Pacific Region. Therefore, the meeting developed the following draft Conclusion for consideration by APANPIRG

Draft Conclusion 14/13 – Regional HF Management Guidance Material

That, the HF Management Guidance Material for the South Pacific as provided in the **Appendix N** to the Report be adopted as Part One of Asia/Pacific Regional Guidance Material for HF Management.

4.21 The meeting also encouraged States in North Pacific Sub-region, Bay of Bengal and Indian Ocean sub-regions coordinate each other to develop a similar document for use by the Operators and Air Navigation Service Providers. These documents will become part of the Regional HF management guidance material for adoption by APANPIRG through CNS/MET Sub-group.

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Agenda Item 5: Navigation:

1) review reports of the Performance Based Navigation (PBN) Task Force
2) review outcome of activities related to Testing and Calibration of Navigation facilities
3) discuss issues related to implementation of GNSS and review developments that have taken place in the Region
4) review navigation strategy
5) other radio navigation issues

Review reports of the Performance Based Navigation (PBN) Task Force

5.1 The meeting noted that the seventh meeting of the PBN TF has been delay and will be held just before APANPIRG/21 because of unavoidable circumstances. Due to the rescheduling of the seventh meeting, the ATM/AIS/SAR SG and the CNS/MET SG. were not be able to review report of the PBN TF/7 meeting. The meeting reviewed the report of the sixth meeting of the PBN TF which took place in Hong Kong, China from 3 to 5 February 2010. PBN TF/6 was preceded by an Implementation Seminar also held in Hong Kong.

5.2 The meeting was informed that PBN TF had recommended integration of the Implementation Tasks List and action items into the PBN Task Force Tasks List. The meeting reviewed the integrated Tasks List proposed by the PBN TF and agreed to endorse the following Draft Decision:

Draft Decision 14/14 – PBN Task Force Tasks List

That, the PBN Task Force Tasks List provided at **Appendix O** to this report be adopted.

Global PBN Implementation – Update

5.3 The meeting was informed about the significant global PBN initiatives and completion of the initial draft of PBN Operational Approval Manual and Continuous Descent Operations (CDO) Manual. The meeting also noted directions adopted by the PBN Study Group in September 2009 to harmonize the global PBN implementation efforts. Regarding the activities of APAC Flight Procedure Program, the Chairman PBN TF informed meeting that the contribution by each active participating States is around US$16,000 and in addition, non monetary contributions have also been assured by FAA, French DGCA/ENAC, Airbus Industries, Hong Kong China, and Jeppesen.

APAC Region PBN Implementation

5.4 States, which had not developed their State PBN Plan, were once again reminded about the requirement and an action item was adopted encouraging the States to consider implementation of CDO. State were also encouraged to attend various PBN related training and other programme. Meeting was briefed about various issues related to PBN implementation in the region and about various action items adopted by the Task Force.

PBN Implementation Plan

5.5 States were urged to review the draft PBN Operational Approval Handbook and provide feedback to the next PBN TF scheduled for September 2010. The meeting was briefed about the limitations of earlier generation FMS and it was recommended that this issue should be taken up with Instrument Flight Procedure Panel (IFPP). Accordingly, the following draft Conclusion developed by PBN TF was endorsed by the meeting.

Draft Conclusion 14/15 – FMS (older generation) – limitations

That, ICAO (IFPP, PBNSG) be invited to note the limitation of older generation FMS in putting procedure identification within 6-digit alpha-numeric. This limitation occurs when pilot attempts to select a specific approach for an airport that has multiple runways and each of the runways has multiple procedures for the same type of navigation system. ICAO is also requested to provide guidance and standardize solution on the issue.

State/Industry Contribution

5.6 The meeting was informed about the status of PBN implementation in various States, as presented to the PBN Task Force meeting. States, while informing the PBN TF about the status of implementation in their administration also described various benefits these implementations have provided. Based on the review of the status of implementation in various States, PBN TF revised APAC Regional PBN Implementation Plan. The meeting reviewed the revised plan developed by the PBN TF and decided to formulate following draft Conclusion for adoption by APANPIRG:

Draft Conclusion 14/16 – Revised APAC Regional PBN Implementation Plan

That, the revised APAC Regional PBN Implementation Plan Version 2.0 provided in **Appendix P** be adopted.

State PBN Implementation Plan

5.7 PBN Task Force urged the States to plan their PBN implementation efforts to ensure harmonized transition and implementation. The meeting also discussed State implementation plans and decided to endorse following draft Conclusion formulated by the Task Force:

Draft Conclusion 14/17 – Develop State PBN Implementation Plan

That, the States, which have not developed their State PBN Implementation Plans so far, be urged to develop the plan in accordance with the Asia/Pacific Regional PBN Implementation Plan at the earliest.

5.8 The CNS/MET SG was also informed about the discussions that took place in PBN TF regarding the display limitations related to the RNP operations to levels below 0.3. Based on the experience gained by some of the States, PBN TF recommended an alternate means of compliance and developed following draft Conclusion. The meeting after reviewing the recommendation endorsed the draft Conclusion:

Draft Conclusion 14/18 – Aircraft Equipage Requirements

That, ICAO provide guidance on aircraft that do not have a lateral and vertical readout on the navigation display, but do display the lateral and vertical profile on the navigation equipment, which could be considered an alternate means of compliance if supplemented by appropriate flight crew training for RNP value of 0.3 RNP or greater.

PBN Implementation Progress Report

5.9 The meeting was informed about the discussion that took place in PBN TF meeting regarding the measurements proposed for assessing the benefits of PBN implementation. It was informed that PBN TF was of the view that PBN Progress Report Template should include the impact on safety, gains in efficiency, environmental savings and infrastructure cost reduction to synchronize them with the performance based measurements concept. After review of the PBN TF recommendation, meeting endorsed following draft Decision:

Draft Decision 14/19 – PBN Performance Metrics

That, CNS/MET SG and ATM/AIS/SAR SG be tasked to review and consider amending the APAC Performance Monitoring and Measurement Metrics 2 and 3 for PBN to include specific measurements that capture operational benefits in terms of PBN's ability to help fulfill strategic objectives: safety, efficiency, capacity, access and the environment.

Feasibility of Establishing a Regional RAIM Prediction System

5.10 It was informed that PBN Manual requires the States and ANSPs to provide timely warning of GNSS RAIM outages to the users of the services like the pilots, flight dispatchers, Air Traffic Controllers and Airspace Planners. The meeting was briefed about the advantages that can accrue from generating harmonized regional RAIM prediction information. It was informed that AEROTHAI has been requested to develop more detailed technical architecture, operational concepts and administrative arrangements and an action item was developed by the PBN TF.

PBN Flight Planning Issues

5.11 The meeting was briefed about the PBN issues related to the Flight Plan Amendment, which becomes applicable in November 2012. PBN TF had developed action items to address these issues. The meeting appreciated the support provided by Hong Kong, China in hosting the meeting and conveyed its thanks to the Civil Aviation Department of Hong Kong, China for this help.

5.12 States and International Organizations appreciated the work done by the Task Force and expressed that the Tasks assigned to the Task Force will grow in future. The meeting also expressed that though GNSS has been there since past sixteen to seventeen years, yet there is some resistance in its adoption by some States. It was agreed that the concerted efforts are needed to develop a global acceptance of GNSS to support PBN implementation.

PBN Task Force Work Programme

5.13 Chairman, PBN Task Force, presented a comprehensive report on the PBN Task Force activities. It was informed that PBN Task Force had planned two meetings 2010, but has been able to organize only one so far, the second meeting is scheduled in September 2010. He informed the meeting about various global and regional developments that have taken place in the implementation scenario. The meeting was also briefed about the future work program of the PBN Task Force and was informed that the 37th Session of ICAO Assembly will be presented a report and will be informed about the future programme on this subject. The meeting recognized the work accomplished by the PBN Task Force and the need for ongoing ICAO regional support to continue the PBN and APV tasks. The meeting was also urged to develop a recommendation that the Task Force be continued in the manner suggested above. Essentiality of continuing PBN Task Force for a longer duration was generally agreed to by the meeting. It was expressed that PBN implementation is still going on and hence PBN TF has to be there to support this implementation.

5.14 The meeting considered the terms of reference of the PBN TF and the continuing contribution the TF can make to the implementation of PBN in the Asia/Pacific Region. The meeting considered the existing terms of reference were appropriate to allow the PBN TF to focus on implementation and to move on from the planning phase of PBN implementation. The meeting also observed that the TF should pass routine and repetitious task to other bodies more appropriate to undertake these activities such as education and training which can be transferred to aviation academies. The meeting was of the opinion that the PBN TF should be extended with a life of 3 to 5 years and developed the following Draft Decision:

Draft Decision 14/20 - PBN Task Force continuation

That, the PBN Task Force be continued for a period of 3 to 5 years with the existing Terms of Reference and the focus of the Task Force be on implementation support with routine and repetitious tasks being passed to other groups.

PBN State Plan Harmonization

5.15 IATA, on behalf of Australia, Hong Kong China, New Zealand and Thailand presented a report on the PBN State Plan harmonization in the region. Highlighting the slow progress of PBN implementation in the region, it was informed that approximately half of the Asia Pacific States had not submitted their PBN Implementation Plan by the end of 2009 (as required by ICAO Assembly Resolution). Out of the plans submitted, only one third demonstrated a path towards timely and successful implementation. The paper also predicts that APAC Region will not be able to meet implementation targets and stands at the risk of not meeting ICAO Resolution A36-23 requirements. It further described the review criteria and review methodology adopted in the assessment of State PBN Implementation Plans and provides an outcome of their assessment. In conclusion, the plans received were identified in three categories based on their quality:

i) Robust – when 8 to 10 basic plan elements (BPE) are satisfied
ii) Marginal – when 5 to 7 BPE are satisfied
iii) Incomplete – when 4 or less BPE are satisfied

5.16 Out of the 21 plans assessed, 7 were rated as robust, 5 were rated as marginal and 9 were rated incomplete. It was informed that individual plan assessment letters will be issued through ICAO to each State, providing confidential feedback and suggesting improvements.

5.17 Tool used for the assessment of the State Implementation Plans was appreciated by the meeting and it was hoped that the States will benefit tremendously from the feedback and suggestions. It was also hoped that this assessment feedback will not be taken as criticism by the States. In response to a query, the meeting was informed that the assessment criteria was developed from PBN Manual and it was proposed that this tool should be passed on to ICAO Headquarters for its global usage. The meeting was of the view that those States, which have acquired implementation experience and which have the skills available on the subject should support the States, which are not that well informed in the implementation. Some participants were of the view that non-submission of the Implementation Plan should not be taken as deficiency, but efforts should be made to find out as to why these States have not submitted their plans in time and whether they need assistance to complete the plans. It was also suggested that the issue of non submission of plan should be taken up in APANPIRG and DGCA meetings.

Regional Support Strategy for PBN Implementation

5.18 IATA proposed a strategy in providing support to the States to achieve acceleration in the implementation. It was observed that the State progress on implementation of PBN is slow, though the Regional Plan providing guidance on PBN implementation has been delivered and a number of training programmes and seminars have been conducted on the subject. The strategy proposed includes but is not limited to:

- Establishing a PBN Regional Development and Implementation (REDI) Team to identify implementation needs and organize resources for that;

- Formulation of cooperative arrangements with volunteering States that are advanced in PBN;

- Develop additional support mechanism that creates skills and capabilities within States to implement and sustain PBN operations; and

- Promote PBN to decision makers.

Revision of the GNSS Manual Doc 9849

5.19 The meeting was informed that ICAO through the Navigation Systems Panel (NSP) has commenced the revision of the GNSS Manual Doc 9849 with the target of presenting the revised manual to the November 2010 meeting of the NSP for consideration. The Secretary of the NSP has sought the input of regional group to identify hurdles to the implementation of GNSS applications. The meeting was provided with examples of implementation hurdles already identified. The meeting discussed a range of hurdles and considered many of the institutional issues could be addressed by authoritative information provided in the revised GNSS Manual.

Implementation of GNSS

5.20 While discussing updating of the GNSS Manual Rev 1 (2005), the Meeting noted the slow progress of aviation in implementing GNSS applications in some new ATM initiatives such as PBN, RNP approaches, etc where GNSS is a core technology. While the meeting recognized much progress had been achieved in the PBN initiative such as use of GNSS in the oceanic phase but it felt more could be achieved in the terminal and approach phases. Also the meeting noted there is a lack of formal adoption of GNSS in most States. The meeting brainstormed ways for greater implementation of GNSS in the aviation field, including overcoming of existing hurdles. The meeting agreed that this slow implementation of GNSS applications in some aviation fields should be brought to the attention of the coming DGCA Conference in Macao, China as well as the 37th Session of the ICAO Assembly.

5.21 The meeting noted that a number of hurdles had been identified by the Navigation Systems Panel (**Appendix Q).** Rev. 2 of the GNSS Manual, expected to be out by end 2010, would provide guidance on how to deal with these hurdles and would become a more useful reference document in guiding States in GNSS implementation. ICAO HQ is soliciting feedback from Regional Offices regarding this list of hurdles. In order to make Rev. 2 of the GNSS Manual a useful reference document and as Asia/Pac's contribution to the updated Manual, the meeting formulated the following Decision.

Decision 14/21 – Solicitation of Feedback on Hurdles Experienced in GNSS Implementation

That, Secretariat circulates **Appendix Q** to members of the CNS/MET SG and points-of-contact of the PBN Task Force to solicit feedback of additional hurdles encountered in the implementation of GNSS.

5.22 The meeting was briefed that Rev 1 of the GNSS Manual contains substantial information about GNSS implementation. From feedback received and queries from States, States may not be aware of the GNSS Manual. The meeting suggested a need to raise awareness of the existence of GNSS Manual among the aviation community such as to present a copy of the Rev 1 GNSS Manual to each DG at the coming DGCA Conference.

5.23 The meeting also brainstormed the possibility of forming Regional Development and Implementation (REDI) team to assist States in their PBN implementation as well as to facilitate Regional support. The mechanism of forming such a REDI team could be along the line of the set-up of the Beijing Flight Procedure Programme Office. The meeting discussed the tentative terms of reference and scope of the REDI team which is provided in Appendix **R** to this report.

5.24 In view of the above brainstorming exercise, the meeting developed the following draft Conclusion for promotion of greater implementation of GNSS applications in the aviation field.

Draft Conclusion 14/22 – Progress of GNSS Implementation & Awareness of GNSS Manual

That, ICAO

a) highlight the slow progress of GNSS implementation in the aviation field at forums such as the coming 47th DGCA Conference in October in Macao, China and the 37th Session of ICAO General Assembly in September 2010; and

b) raise the awareness of existence of the GNSS Manual among the aviation community

Ionospheric Data Collection

5.25 In the CNS/MET SG/13 and APANPIRG/20 meetings, it was agreed to develop a cooperative effort in developing a standard ionospheric model for the region to facilitate implementation of GNSS. As a first step, it was decided that Focal Contact Points in the States should be identified, who will coordinate in the matters of ionospheric data collection. The second step was to be discussed in this meeting. The progress was reported that has taken place in the identification of Focal Contact Points and invited the meeting to discuss the second step in the direction of developing the model.

5.26 Japan provided a comprehensive paper describing activities in monitoring and possible mitigations of ionosphere characteristics in the low latitudes. The paper noted that the Electronic Navigation Research Institute (ENRI) has successfully developed a prototype GBAS that Cat I performance in the Japanese ionosphere environment. The paper promoted the cooperative collection and sharing of ionospheric data particularly in the period leading to and during the next solar maximum which is expected to occur in 2013. Japan also suggested that workshop be conducted by voluntary group to enhance the understanding of ionosphere issues.

5.27 Australia presented the findings of a historic review of ionospheric characteristics observed in the Australian mid latitude. The review found from the observed data that ionospheric excursions were well contained with the threat space developed for the contiguous United States. The methodology used in the Australian study is proposed as an evaluation tool for other States.

5.28 Hong Kong China informed the meeting on the installation of GNSS monitoring system and the commencement of ionospheric data collection by late 2010. Other States are invited to exchange data and jointly develop the regional ionosphere model with Hong Kong China.

5.29 The meeting agreed the worth of a coordinated ionospheric review and measurement campaign. Japan was invited to provide technical leadership with the ICAO providing support for development of a measurement campaign coordinated through the points of contacts nominated by States. The coordination is initially to be undertaken by correspondence and with option of a meeting further progress the program.

Navigation Strategy

5.30 The Navigation Strategy for the Asia/Pacific Region was reviewed and was found to be appropriate without revision.

The Ninth Edition of the Flight Inspection Catalogue

5.31 The meeting noted that the twentieth meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/20) held in September 2009 urged States to update the information in the Flight Inspection Catalogue and encouraged ICAO to publish the new

edition of the Catalogue by end of October 2009. The Updated *Catalogue of Flight Inspection Units Asia and Pacific Regions* was published in October 2009 as the Ninth Edition which is available on the following ICAO webpage: http://www.bangkok.icao.int/edocs/cns/cfiu_ver9.pdf
The Catalogue of Flight Calibration Units in the Asia and Pacific Regions can be used to facilitate those States, which do not have the Flight Calibration Units of their own and are desirous of utilizing the services of some other State in meeting ICAO requirement of periodical calibration of their Navigation Facilities.

Sixteenth International Flight Inspection Symposium (IFIS)

5.32 The meeting was informed that the 16th International Flight Inspection Symposium, organized by the Flight Inspection Center of CAAC and the International Committee for Airspace Standards and Calibration (ICASC) was held in Beijing, China from 21 to 25 June 2010. The Symposium was attended by 202 participants from the flight inspection/validation organisations, industry partners of 36 States/ Administrations including 10 Administrations in APAC Region with additional local participants from various places in China. This was the first time that such Symposium was held in the APAC Region. The objective of the Symposium was to exchange technical information and experiences gained in flight inspection and validation and promote development of new technology. The outcome of the regional seminar on Testing of Navigation and Surveillance Facilities and Validation of Flight Procedures and its follow-up actions taken by Navigation System Panel was provided to the Symposium.

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Agenda Item 6: Surveillance

1) review Surveillance Activities
2) review strategy for the surveillance systems
3) discuss other surveillance related issues

Outcome of SEA ADS-B WG/5 Meeting

6.1 The meeting noted that the Fifth Meeting of the South East Asia Sub-Regional ADS-B implementation Working Group hosted by Directorate General of Civil Aviation (DGCA), Indonesia was held from 21 to 22 January 2010 at the Mandarin Oriental Hotel, Jakarta, Indonesia.

6.2 The meeting was attended by 57 participants from Australia, Cambodia, Hong Kong China, Indonesia, Malaysia, and Singapore, CANSO, IATA and representatives from industries.

6.3 With regard to the requirement to identify optimum coverage of ADS-B ground stations and associated VHF radio voice communication in the sub-regional FIR boundary area, the meeting updated a coverage chart based on the available information presented to the meeting.

Activities updates at SEA ADS-B WG meeting and Issues on Regional Trials

Indonesia

6.4 Indonesia informed the meeting that 27 ADS-B Ground stations with dual system had been installed at Makassar, Sorong, Natuna, Kupang, Merauke, Banda Aceh, Matak, Cilacap, Soekarno Hatta Airport-Jakarta, Tarakan, Pangkalan Bun, Palu, Kintamani - Bali, Waingapu, Alor, Galela, Ambon, Saumlaki, Medan, Pakanbaru, Palembang, Pontianak, Timika, Biak, Kendari, Manado, and Surabaya. Amongst which, 18 Stations in the Eastern part of Indonesia are connected to Makkasar Air Traffic Service (MAATS) ATM system and 9 ADS-B Ground Station in the Western part of Indonesia are linked to the Remote Control Monitor System (RCMS) in JAATS-Jakarta. The Test-Bed system at DGCA Headquarters is able to monitor and control the ADS-B Data from these 27 ADS-B Ground Stations.

6.5 MAATS-Makassar has been upgraded from Eurocat-X version 2.4 to version 3.15 integrating with ADS-B capabilities and was commissioned in December 2009. DGCA will establish Implementation Team for ADS-B implementation. Required regulations such as Operational Concept, Safety Assessment, ADS-B Procedure will be developed and introduced into CASR. For Near Term, DGCA has a plan to use ADS-B for Situational Awareness in MAATS Center. Cross FIR boundary operational data sharing has been identified as the initial application of ADS-B Services. Based on experience gained in using ADS-B for situational awareness, Indonesia will provide separation services using ADS-B.

6.6 The meeting congratulated Indonesia for the work completed and for the significant milestone achieved. In response to a query, it was clarified that ADS-B based separation service is expected to be provided in 2013. The meeting also supported the intension of Indonesia for ADS-B data sharing from which huge benefits could be derived.

Singapore

6.7 Singapore informed the meeting that the Civil Aviation Authority of Singapore (CAAS) installed an ADS-B station and an ADS-B data processor in Singapore on 7 December 2009. The installation will:

a) complement the existing surveillance coverage by the Long Range Radar;
b) allow Singapore to perform operational trial using ADS-B data; and
c) complement the coverage of Indonesia and Vietnam through data sharing.

6.8 The ground station supplied by Comsoft GmbH supports ASTERIX Cat 21 versions 0.23, 0.26 and 1.3 with coverage of about 290 NM based on targets of opportunity. The ADS-B data processor can also process versions 0.23, 0.26 and 1.3 of ASTERIX Cat 21. The processing system is able to fuse ADS-B data from various sources and customized filtered dataset for each user.

6.9 It was also informed that the ADS-B data is currently used mainly for technical evaluation and familiarization. CAAS considers purchasing a stand-alone controller position to conduct operational trials, before the commissioning of the new ATM automation system in early 2012. Singapore is ready to share ADS-B data with other States.

Malaysia

6.10 Malaysia provided following updates:

- DCA Malaysia had a discussion with DGCA Indonesia at Special Coordination Meeting which was held in June 2009 regarding ADS-B data sharing from Banda Acheh for ATC surveillance in Bay of Bengal. The discussion is still on-going;

- Malaysia had started upgrading the ATM System which will be able to integrate all the surveillance data inclusive of ADS-B. The project is scheduled to be completed in April 2011;

- Malaysian airspace is covered by radar except for a small portion in the Bay of Bengal which at the moment is covered by ADS-C. Nevertheless DCA Malaysia has submitted in 10th Malaysia Plan to install ADS-B station and also upgrade and refurbish the present radars;

- DCA Malaysia expects the timeline for ADS-B mandatory equipage in Kuala Lumpur and Kota Kinabalu FIRs to be before 2020.

6.11 Malaysia was encouraged to advance planning for providing ADS-B based surveillance service for its air space in the Bay of Bengal area.

Hong Kong, China

6.12 Hong Kong China reconfirmed its plan for:

- mandate ADS-B carriage, by end 2013 for aircraft flying over ATS routes L642/M771;

- mandate ADS-B carriage, by end 2014, for aircraft flying within Hong Kong FIR; and

- mandate ADS-B carriage, after 2015 to be confirmed, for low flying aircraft including general aviation aircraft and helicopters.

Cambodia

6.13 The meeting was informed that airspace of Phnom Penh FIR is covered by radar. Cambodia has no immediate plan for the implementation of ADS-B. With assistance provided by JICA, Cambodia has developed a master plan for CNS/ATM systems implementation including ADS-B. Cambodia has coordinated the implementation plan with neighboring States – Laos and Viet Nam. Cambodia has also initiated coordination with Thailand.

Review of sub-regional implementation plan

6.14 Singapore and Indonesia agreed to prepare a paper on further updates to the data sharing template based on experience gained in using the template for next ADS-B SITF meeting.

Updates on ADS-B Data Sharing in South China Sea area

6.15 Singapore updated the implementation plan in the South China Sea area. Indonesia, Singapore and Vietnam have been jointly working on the installation of ADS-B ground stations and VHF radios. Discussions were also held between the parties concerned on the ADS-B data sharing and the use of the VHF radio facilities at other party's premises. It was explained that confirmation to the final version of the paper was not received from Viet Nam.

6.16 ADS-B will be implemented in the Singapore FIR in 2 phases. In Phase I, ADS-B operations will apply to ATS routes **L642 and M771** while other ATS routes in the Singapore FIR could be covered in Phase II. ADS-B operations will be exclusive and applicable between FL310 and FL410. Aircraft intending to operate in ADS-B airspace will need to be ADS-B equipped and certified accordingly. The task list and proposed milestones will be presented to ADS-B SITF/9 for review.

6.17 CANSO congratulated Indonesia, Viet Nam and Singapore for the project and for coming up with the project timeline and milestone so that all parties could work towards timely completion of the project. It was further stated that this was an excellent example of regional collaboration involving multiple ANSPs which would pave the way for the wider implementation of ADS-B in the ASIA/PAC Region.

6.18 IATA supported efforts made by the three States to enable ADS-B data and DCPC capability sharing. IATA totally endorsed the proposed steps and emphasized the very important role of the project with clear timelines. It was emphasized important of regulator's ADS-B equipment seminar to be held next month. States should finalize their equipment requirement to allow the air space users to have 4-5 years time for equipage of the equipment. Member Airlines are expecting to receive early benefits as best equipage should be able to receive best service.

6.19 USA made a presentation providing a brief introduction of the Federal Aviation Administration's ADS-B Program, including the following components:

a) Overview of FAA's NextGen
b) Program Strategy
c) Description of Essential Services
d) Description of Critical Services
e) Description of Airborne Applications
f) Existing and Proposed Gulf of Mexico Route Structure;
g) Domestic and International Agreements

6.20 An essential component of the FAA's Next Generation Air Transportation System (NextGen), is the ADS-B Program. This program will increase safety, capacity and efficiency of air travel and provides critical flight information simultaneously to pilots and air traffic controllers. In response to a query, it was clarified that USA issued the final rule in end of May for DO260B mandate from 2020. It was further explained the mandate does not include ADS-B IN nor include TIB-B and FIS-B. The further information regarding ADS-B project is available on the following FAA's webpage: www.adsb.gov

Australia-Indonesia Data Sharing Project

6.21 Australia and Indonesia provided an update on their data sharing project. Airservices Australia has approved Phase 1A. Indonesia's DGCA has also approved Phase 1A and an ADS-B Filter has been installed in MAATS, Makassar. The ADS-B Filter has been tested and integrated into the ATC System in MAATS (Eurocat-X). The tests were conducted between two States and the result of the test was successful.

6.22 The meeting noted that four ADS-B ground stations at Saumlaki, Merauke, Thursday Island and Gove have been installed and are operating. A draft agreement is in the final stage of co-ordination for signature by the two States. The draft is based on large part of the sample agreement developed by SEA ADS-B WG. The meeting noted the planned schedule of the projects and target dates of some specified milestone. Recognising that the agreement needs approval from Foreign and Defence Ministries of Indonesia, the meeting encouraged DGCA to make every effort to get it approved by the authorities as early as possible.

6.23 It was considered essential to clarify that no issue of sovereignty is involved as the data derived from aircraft has been shared in ADS-C applications for years. The difference between ADS-C and ADS-B is updating rates. It is not like radar data which may involve liability concerns. Testing activities were undertaken in May 2010. A satellite datalink has been established to exchange the ADS-B data using multicast and using Asterix Category 21 Version 0.23. The testing of this link (Indosat 64Kb) is now complete. The target date of using ADS-B data for situational awareness and safety nets by ATC is set for 2010 for Australia and 2011 for Indonesia. The expected outcome and benefits of the project Phase 1A are as follows:

– reduced numbers of safety incidents at the FIR boundary;

– earlier detection of ATC and pilot errors (co-ordination errors, incorrect Flight level etc);

– increased support and confidence in data sharing to allow introduction of radar-like separation at the FIR boundary in a future phase; and

– technical & operational analysis of data in preparation for future application of radar like separation services.

6.24 Operational ADS-B data from Indonesia was successfully displayed in Australia on the Remote Control & Monitoring System (RCMS). However, the surveillance data will not be displayed for use by air traffic controllers until the Deed of Agreement between the two countries is signed and the formal commissioning activities associated with the link and Filter are completed. Both Indonesia and Australia have developed and have tested ADS-B filters to control and manage data flow under the data sharing agreement. These filters are now installed in the respective ATC centres. A draft Deed of Agreement to support ADS-B data sharing has been developed and is in the final stages of co-ordination before signature by Australia and Indonesia. The agreement is based in large part on the sample agreement developed by SEA ADS-B Working Group.

6.25 The project is expected to extend to Phase 1B and possibly Phase 2. The Phase 1A shall be operational before requesting approval to commence phase 1B which would comprise following additional sites:

Australia: Broome, Doongan TBD **(alternate location to Darwin is considered)
Indonesia: Waingapu, Kintamani, Kupang
(All these stations are already operational)

	Milestone	Planned date
1.	Signature of Data sharing agreement	TBD
2.	Complete Inter FIR datalink installed for testing	Completed April 2010

3.	Completion of data link testing:	Completed May 2010
4.	Use of foreign ADS-B data for situational awareness by ATC	August 2010 for Australia
5.	Use of ADS-B data for monitoring by ATC	June 2010 for Indonesia
6.	Use of ADS-B data for situational awareness by ATC	2011 for Indonesia

6.26 Phase 2 - This phase, if approved, could transition to full radar-like separation when both parties have in place suitable ATC infrastructure such as:

- duplicated data communication capability;
- Direct Controller Pilot Communication (DCPC) for both parties at the boundary;
- revised boundary separation standards and Memorandums of Cooperation; and
- Policies, regulations and extensive training

6.27 USA commended for the cooperation amongst parties and congratulated for the good work done by the region. IATA indicated strong support for the project and noted still a lot of work need be done and look for the agreement to be signed.

R&D activities on ADS-B, GBAS system technologies in the Republic of Korea (ROK)

6.28 The meeting noted the R&D activities related to ADS-B and Ground Based Augmentation System (GBAS) technologies undertaken in the Republic of Korea.

6.29 Based on the CNS/ATM R&D road map for 2005~2020 in the Republic of Korea(ROK), the Korean government will undertake 19 research programs on next generation aviation safety facilities step by step. Among them GBAS and ADS-B technologies are being developed during 2010~2014 in the ROK which are in accordance with the ICAO standards, particularly focusing on the certification and operation technologies. These systems will be implemented in Korean territory after the successful development of GBAS and ADS-B test-bed system.

Schedule of ADS-B R&D:

a) Phase 1 (2010-2011): Development of ADS-B system, Implementation of Test and Evaluation environments;

b) Phase 2 (2012-2013): Performance Improvement of air and ground surveillance; and

c) Phase 3 (after 2014): Acquiring key technologies, deployment in the domestic

d) area and regulation for installation of ADS-B airborne system;

The Development of the GBAS CAT-I operation technology

A. 1st Phase (2010-2011): Certification system development, build a test-bed facility and select a test airport

B. 2nd Phase (2012-2013): Ground and flight test, establish operation procedures and certification system

C. 3rd phase (2014~): Basic research on equipment and service for GBAS CAT-II/III system

Surveillance Strategy

6.30 The meeting reviewed the regional Surveillance Strategy for Asia/Pacific Regions which was updated by the CNS/MET SG/12 and adopted by APANPIRG/19 in 2008 under Conclusion 19/39.

6.31 It was suggested to insert additional word “cooperation” at last bullet paragraph as follows:

(12. Ensure civil-military ***cooperation and*** interoperability)

6.32 It was also suggested to include additional information into the consideration part regarding newly developed standard DO260B (Version 2 ES being developed by ICAO).

6.33 Considering the surveillance strategy to be reviewed the ADS-B Study and Implementation Task Force meeting next month, the meeting decide to ask the Secretariat to refer the above comments for consideration by the ADS-B Task Force

Update on the Surveillance and Collision Avoidance Related Works carried out by ICAO Panels

6.34 The meeting noted the developments that have taken up in the global Aeronautical Surveillance environment and the future direction which the developments are going to take including the changes that have been incorporated through Amendment 85 to Annex 10, outcome of some Aeronautical Surveillance Panel and work programme of SAS Panel and OPLINK Panel.

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Agenda Item7: Regional Preparations for ITU WRC 2012

1) review ICAO position for WRC-2012
2) review result of various Regional Preparatory Group Meetings

7. 1 Radio Frequency Spectrum is a scarce resource with finite capacity for which demand is continuously increasing because of requirements being generated by new technological applications and periodical expansion of existing services. Continuation of existing aeronautical services and development of new aeronautical applications are dependents on the availability of adequate spectrum. Process of international competition between expanding aeronautical and non-aeronautical radio services takes place in ITU World Radiocommunication Conference (WRC) held every four (approximately) years. Next WRC is scheduled to be held from 23 January to 17 February 2012. To protect the interests of global aeronautical community, ICAO has circulated its position on WRC2012 Agenda Items of critical interest to Civil Aviation through a State Letter dated 30 June 2009. The Secretariat provided information on the regional activities aimed at ensuring inclusion of ICAO position on WRC–2012 Agenda Items of critical interest to civil aviation in the regional/national position.

First Meeting of the Regional Preparatory Group (RPG) for WRC- 2012

7. 2 States have identified focal contact points in their administration who will project ICAO position in the national/regional level forums in order to ensure that this position be included in the national/regional position. To provide a forum for these contact focal points to be thoroughly familiar with ICAO position and to assist them to effectively participate in the national/regional level forums, the first meeting of the Regional Preparatory Group (RPG/1) was organized on 8 and 9 December 2009 in Bangkok. Meeting addressed following agenda items:

i) Introduction to ITU and WRC Processes;
ii) Aviation Issues at WRC – 2012; and
iii) Role of aviation sector in the prepareation for WRC – 2012.

7.2.1 Discussion during RPG/1 led to the formulation of the following draft Conclusion, which was endorsed by the CNS/MET SG/14 as follows:

Draft Conclusion 14/23 – Preparation for WRC – 2012

That,

a) States be urged to have the designated contact person closely involved in the preparatory work for WRC – 2012 at the national level in close coordination with the contact points designated by respective telecommunication regulators;

b) Make necessary arrangements for the designated contact persons to attend the APT APG meetings and WRC – 2012 Conference to protect aviation interests; and

c) Reference to APANPIRG Conclusions 19/41, 20/58 and DGCA Conference Action Item 46/8 may be used to support these efforts.

7. 3 The RPG/1 meeting was informed that the States can get the latest information regarding ICAO position from ICAO Aeronautical Communication Panel (ACP) website http://www.icao.int/anb/panels/acp/index.cfm. Some participants were of the view that better visibility should be provided to ICAO Position on WRC-2012 Agenda Items of interest to civil aviation and developed a draft Conclusion to this effect. The meeting endorsed following draft Conclusion formulated by RPG/1 for adoption by APANPIRG:

Draft Conclusion 14/24 – Visibility of ICAO Position on WRC – 2012 Agenda Items

That, ICAO be urged to provide better visibility to ICAO Position on WRC-2012 Agenda Items of critical interest to civil aviation on the ICAO website.

Third Meeting of APT Conference Preparatory Group (APG/3) for WRC-2012

7. 4 The APG2012-3 was held in Bangkok from 8 to 12 March 2010. The meeting was attended by 306 participants representing 27 States, industrial bodies and international organizations. ICAO participated in the meeting as observer and presented two Information Papers reflecting ICAO Position on WRC2012 agenda items of critical interest to Civil Aviation and ICAO contribution to the ITU-R Working Party activities. The secretariat presented to the meeting, in detail the outcome of APG2012-3 on Agenda Items of critical interest to civil aviation. The meeting stressed on the importance of ensuring retention of the existing spectrum and acquisition of additional spectrum for new applications and urged the States to ensure that their delegations to the national/regional forums effectively project ICAO position and to the extent possible ensure its inclusion in the national/regional position. It was commented that if aviation looses spectrum it will lose capacity also.

7. 5 With respect to Agenda Item 1.7 of WRC-2012 on long term spectrum availability and access to meet the requirements of aeronautical mobile-satellite (R) service which was specifically highlighted during the meeting and States were urged to support Method B specified in the proposal. Different positions taken by national administrations were discussed in the meeting.

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Agenda Item 8: Regional Implementation of World Area Forecast System (WAFS):

1) Implementation issues associated with cessation of ISCS-G2
2) Progress on trial gridded forecasts and related implementation issues
3) Other WAFS (SADIS & ISCS) implementation issues

8 Regional Implementation of World Area Forecast System (WAFS)

8.0 The meeting noted reference to global MET study groups as they contain progress on action items and conclusions that may relate to implementation issues in the ASIA/PAC Region. The meeting agreed that when necessary, discussions can reference this material to note progress of the various global groups regarding how they relate to implementation of current and future standards in the region. Relevant to the World Area Forecast System (WAFS) are the Satellite Distribution System Operations Group (SADISOPSG) and World Area Forecast System Operations Group (WAFSOPSG) developments that can be accessed at the following website: http://www2.icao.int/en/anb/met-aim/met/Pages/OperationsandStudyGroups.aspx.

8.1 Implementation issues associated with cessation of ISCS-G2

8.1.1 The meeting was informed of the implementation of the WAFS Internet File Service (WIFS) in March 2010 for trial operations and May 2010 for operations. The meeting was also informed of the plan to terminate the ISCS satellite broadcast on 30 June 2012. From this date, the data currently provided by ISCS satellite service will only be available via the WIFS. In light of the above, ISCS user States are requested to implement WIFS to obtain OPMET data and WAFS forecasts no later than March 2012. The meeting also recalled that for those States under the SADIS footprint, WIFS can serve as a backup. Likewise, for those States who have the WIFS as primary service, SADIS FTP can serve as a backup. The meeting noted that the WIFS and SADIS FTP do not use the same protocol, but workstation vendors allow for the different protocols. Valid concerns on how the switch from one system to the other for backup purposes were brought to the attention of the WAFS Providers. For those who have SADIS/WIFS as primary service, a contingency WIFS backup is possible through application to the respective backup provider for direct data link. It was noted that a backup service would be provided only for the purpose of backup and not for the dual reception of WAFS products with regard to SADIS. WIFS backup policy will be determined by WIFS Provider State and both Provider States will coordinate with SCRAG, SADISOPSG and WAFSOPSG. In order to facilitate implementation of WIFS, the meeting was encouraged to update the list of ISCS focal points.

8.1.2 The meeting recalled that a State letter sent by the ICAO Asia and Pacific Regional Office, dated 10 May 2010, provided States with contact information necessary for the implementation of WIFS. Full details of WIFS are contained in the WIFS User Guide, available at http://aviationweather.gov/wifs. The meeting was also advised of a change to the WIFS registration process. WP/36 stated that the approval process for a user to obtain a user identifier and password (required to access WIFS) was by using a PDF form available on the WIFS website and in the WIFS User Guide. It was noted that the use of the pdf form has now been superseded by an online registration page available on the WIFS website.

8.1.3 The meeting desired discussion on the results of a survey concerning the cessation of ISCS-G2. It was noted that Working Papers 14 and 15 of the OPMET/M TF/8 meeting responded to two of the concerns expressed by States in the Region. That is, Internet security and quality of service issues. In addition, several States raised concerns about backup for accessing WAFS products in situations such as prolonged loss of Internet connectivity arising from disasters (e.g. earthquake damage to undersea cables). It was noted that the ISCS Provider State provides internal backup service by utilizing multiple server farms and that for some locations States would have access to SADIS as a backup if the WIFS failed. Whilst not part of WIFS, WP/14 of the OPMET/M TF/8 meeting section 5.2 does provide a set of alternative mechanisms that maybe considered by member States.

8.1.4 Further discussion noted that ICAO enabled the use of the Internet (APANPIRG D20/59, WAFSOPSG D5/9 and Amendment 75 to ICAO Annex 3) for obtaining non-time critical MET data such as WAFS forecasts. With regard to time critical elements (e.g. SIGMET) the meeting noted that AFTN is the method of communication prescribed in Annex 3. It was noted that a number of States in the South Pacific currently obtain WAFS products via the Internet rather than through ISCS. However, the meeting was advised that the cost of the Internet service in at least one State in the South Pacific was quite high.

8.1.5 The meeting discussed the concept of WAFS as it has evolved since the inception of WAFCs development in 1982. Concerns with the cessation of ISCS-G2 June 2012 and an investigation of the need for SADIS satellite broadcast beyond 2015 by the SADISOPSG has raised the need for this matter to be considered at the next Conjoint ICAO MET/AIM Divisional Meeting / WMO CAeM-XV session tentatively scheduled to be held in 2014. The meeting acknowledged that global policies were outside the terms of reference for the meeting. As the discussion did not provide a timely consensus, the co-chairs proposed that an ad-hoc group should be convened to discuss this matter. The ad hoc group consisting of the ISCS Provider State, Australia, Hong Kong China, New Caledonia, New Zealand, Singapore and IATA. The ad-hoc group met and developed the following draft Conclusion.

Draft Conclusion 14/25 – Transition to WAFS Internet File Service (WIFS) from ISCS-G2

That,

a) The ISCS Provider State will work with States, in cooperation with the Secretariat and Asia and Pacific office, to assist States with the implementation of WIFS by March 2012;

b) States to update Points of Contact in **Appendix S** to the Report and submit the WIFS registration form; and

c) ICAO Asia and Pacific Regional Office to request States to advise on the status of their implementation of WIFS by March 2011.

Note 1: The data currently being provided by ISCS satellite service will only be available via the WAFS Internet File Service (WIFS) after June 30 2012.

Note 2: WIFS commenced operation in May 2010.

8.2 Progress of trial gridded forecasts and related implementation issues

8.2.1 The meeting was presented with an analysis of the WAFS trial gridded forecasts of icing, turbulence and cumulonimbus clouds conducted by Hong Kong, China. Evaluation of the five gridded forecasts (maximum CAT potential, mean in-cloud turbulence potential, ICAO height at CB top, CB horizontal extent, and maximum icing potential) by aviation users is made possible at the following website http://wafs-grid-fc.weather.gov.hk/. Since the CNS/MET SG/13 meeting, the following conclusions deduced from maps showing absolute difference in the forecasts of the two WAFCs for the same parameter at the same valid time since May 2009 was presented:

- Maximum CAT potential – mean absolute difference has decreased since December 2009 while relatively large differences are noted near certain mountainous regions (e.g. Andes);

- Mean in-cloud turbulence potential – mean absolute difference at high latitudes in Northern Hemisphere has decreased since December 2009;

- ICAO height at CB top – no change (differences noted);

- CB horizontal extent – no change (differences noted); and
- Maximum icing potential – no change (differences noted)

8.2.2 Improvements in harmonization for the first two forecasts mentioned were due to model changes by WAFS. The WAFS Providers noted that WAFS changes are placed on the bulletin notice board available on the WAFSOPSG website. However, further clarity on model changes and implementation dates were determined by the meeting as necessary to inform the users of these trial product changes. In addition, this is necessary information for proper analysis and subsequent reporting of results. The meeting requested the WAFCs to inform users of forthcoming changes to the contents of the WAFS forecasts in more detail than what is provided, which is addressed in the below draft Conclusion section a.

8.2.3 With regard to further harmonization of the gridded trial forecasts the meeting acknowledged further harmonization is necessary based on the differences noted above, the greatest differences observed with CB forecasts. The meeting also acknowledged that this effort is in progress and covered by WAFSOPSG Conclusions 4/17 and 5/10.

8.2.4 The meeting noted that compressed GRIB2 WAFS forecast data are approximately 17 MB per model run whereas uncompressed GRIB2 forecast data amount to 50 MB per model run. To efficiently manage bandwidth of obtaining these files (one file represents a forecast run for all forecast elements), the meeting was presented with a solution to streamline data transmission that would consist of required forecasts (upper wind, upper-air temperature, and SIGWX phenomena) in flight documentation (Annex 3, 9.3.1 refers) in the first file of two for each forecast hour. The second would comprise forecasts (upper-air humidity, geopotential altitude of flight levels, flight level and temperature of tropopause, and direction, speed and flight level of maximum wind) that are supplied to operators and flight crew members as established by meteorological authority in consultation with operators concerned. The size of the required forecasts mentioned above is about 11 MB, comparable to that of GRIB1 forecasts. This concept would reduce the reception time of required forecasts for timely preparation of flight documentation. IATA expressed concerns of this suggested solution since forecasts in both categories are used in their ingest systems as the forecasts become available. The meeting agreed that a study note be submitted to the WAFSOPSG with regard to user requirement changes such as splitting files as outlined above.

8.2.5 The meeting discussed limitations of WAFS administrative messages for which guidance material (*Guidance for Users Regarding WAFC Administrative Messages Issued in Events of Errors Identified in WAFS SIGWX Forecast (in BUFR Code and/or PNG Chart Form)*) was provided in response to APANPIRG Conclusion 19/44 and WAFSOPSG/5. Special attention was placed on the following text of this guidance material in connection with errors identified in WAFS SIGWX forecast:

> *The content of such administrative messages shall be brought to the attention of users of the WAFS SIGWX forecast at the pre-flight planning stage. Where relevant to a particular flight, such correction information may be forwarded to aircraft in flight, but is not mandatory.*

In this context, MET Services may find difficulty in determining whether or not a flight is in pre-flight stage or in-flight. Further guidance was requested with regards to what the MET Service and relevant end users should do with the administrative messages. For example, ignore the part of the forecast with error or correct it manually? The meeting agreed that the WAFSOPSG consider further guidance on administrative messages and reflected in part c of the below draft Conclusion.

8.2.6 Given the aforementioned topics in 8.2.1 and 8.2.4, the meeting formulated the following draft Conclusion.

Draft Conclusion 14/26 – Improvements to WAFS Implementation

That, the WAFSOPSG is invited to discuss and consider the following improvement measures in WAFS implementation:

a) the WAFC Provider States inform users in advance about forthcoming changes to the contents of the WAFS forecasts; and

b) further guidance be provided regarding the specific actions to be taken by the MET service providers and all relevant end users of WAFS upon receiving the administrative message.

Note: Guidance should also include any requirement for a user State to generate their own administration message for a product affected by a received administration message.

8.3 Other WAFS (SADIS & ISCS) implementation issues

8.3.1 The meeting was informed of SADIS developments since the CNS/MET SG/13 meeting, which include the following: upgraded uplink ground segment infrastructure of the SADIS 2G service, progress in eliminating cause of transmission data losses on SADIS 2G, update to the 4th edition of the SADIS User Guide, development of secure SADIS FTP service, and reasoning for not changing the future SADIS 2G bandwidth. More information can be found in **Appendix T** to the Report.

8.3.2 The meeting was appraised of developments common to both WAFS (SADIS and ISCS) such as continued development and implementation of WAFS upper-air forecasts in GRIB2 code that includes CB, icing, and turbulence (undergoing harmonization), implemented provision of WAFS Aviation GRIB 2 data in compressed form on server based system SADIS FTP and WIFS on 2 March 2010 (CB, icing, turbulence available as trial forecast products for evaluation only), alignment of SIGWX issue times on 15 June 2010, WAFC backup tests, corrections to WAFS SIGWX forecasts, implementation of additional WAFS output performance indicators at WAFC London, update to the legend text of WAFS forecasts that indicates provider of data and issuer source of data, WAFCs and TCACs coordination for harmonization between tropical cyclone advisories and SIGWX, development of guidance on use and visualization of new gridded WAFS forecasts underway for possible endorsement at WAFSOPSG/6, and development of web-based training for States and WAFS users and associated costs for possible endorsement at WAFSOPSG/6.

8.3.3 The meeting acknowledged the availability of CB, icing and turbulence forecasts only on SADIS FTP and WIFS beginning 2 March 2010, but these forecasts are not on satellite broadcast. These products will not be transmitted on satellite broadcast in GRIB 2 form until WAFSOPSG endorsement. Another point the meeting acknowledged were the outcomes of the Workshop on gridded WAFS forecasts for icing, turbulence and CB cloud held in Paris from 14-15 September 2009. In particular, the preference for WAFS forecasts to be provided in its current form in that WAFS SIGWX BUFR should be visualized by workstation software. Therefore, the development of WAFS web-based server forecasts has been temporarily suspended. Further harmonization of forecasts was deemed necessary as well as guidance on the use of products. **Appendix T** provides more details on WAFS developments.

8.3.4 The meeting reviewed the draft SADIS Strategic Assessment Tables for Asia, 2010-2014 prepared by the SADIS Strategic Assessment Team which are used to help guide the SADIS Provider State in future developments necessary for SADIS. The process of formulating the regional SADIS Strategic Assessment Tables was addressed in SADISOPSG Conclusion 15/10 calling for the SADIS Provider State to take note of the completed SADIS Strategic Assessment Tables to form the basis for the future development of the SADIS and to forward the SADIS Strategic Assessment Tables to the MET sub-groups of the PIRGs concerned for update in respect of future requirements. The meeting agreed with the SADIS Provider State proposals for 2014, except for the category of FC.

As pointed out, FC is no longer required in the Region and though some FC have been exchanged in the Region as recorded by SADIS, the meeting agreed to reflect requirements and use zero for all entries for FC for the period 2010 to 2014. It was also noted that XML code in the exchange of TAF, METAR and SIGMET will impact these tables in the future, but for the period of concern the tables were not expected to change considerably because bilateral use of XML will be enabled beginning the end of 2013. Given the aforementioned, the meeting adopted the following Decision.

Decision 14/27– SADIS Strategic Assessment Tables

That, the Asia region SADIS strategic assessment tables, as given in **Appendix U** to the Report, be adopted and forwarded to the SADISOPSG for planning the future SADIS bandwidth requirements.

8.3.5 The meeting reviewed the WAFS Implementation Plan and Procedures and WAFS Implementation Task Force work programme and composition and took note of the points mentioned above and that Item 16 (implementation of WIFS) and 17 (workshop on gridded forecasts of icing, turbulence and convective clouds) of the WAFS Implementation Plan and Procedures in **Appendix V** were completed.

8.3.6 With regard to Item 18 (WAFCs beginning parallel broadcast of WAFS forecasts in the GRIB2 code form), GRIB2 has been made available via SADIS FTP and WIFS (not via satellite broadcast). With regard to Item 20, regional training on the use of gridded forecasts in 2011 and the provision of computer-based training products and web-based training package will be considered by the WAFSOPSG/6 meeting. Also, the task on cessation of the WAFS SIGWX forecasts in BURF code form and PNG chart form has been removed from the WAFS long-term plan (2009-2013) based on user needs expressed at WAFSOPSG/5 for a need of a similar product to SIGWX that would utilize gridded forecast data. (to add results of meeting of WAFS/I TF). Furthermore, implementation of WIFS by 2012 was reflected in the task force documents. In the light of the above discussions, the meeting formulated the following Decision.

Decision 14/28 – ASIA/PAC WAFS Implementation Plan and WAFS Implementation Task Force

That,

a) the ASIA/PAC WAFS Implementation Plan and Procedures be amended as shown in **Appendix V** to this report;

b) the work programme and composition of the WAFS Implementation Task Force be amended as given in **Appendix W** to this the report.

8.3.7 One State expressed interest in obtaining WAFS forecasts in TIFF format for data verification reasons. It was noted that user requirements be considered at the global forums (SADISOPSG and WAFSOPSG) and if not a member of these groups that consultation with a member in the Region could facilitate information being provided to the global forums. With regard to the WAFC administration messages identifying corrections to SIGWX forecasts it was requested that the content be made more user friendly – by including chart area identification for instance. The WAFCs believe this request could be accommodated and to work to that end. In terms of operational use of trial gridded forecasts, clarification was sought by ICAO as to whether or not they can be used operationally. As noted in Amendment 75 to Annex 3 section 3.2.1, gridded global forecasts of cumulonimbus clouds, icing and turbulence are currently of an experimental nature, labeled as “trial forecasts” and only distributed through the Internet-based FTP services. IATA will be providing thresholds of the new trial products that relate to user impacts based on airframe and aircraft type which will facilitate the evaluation of these trial products.

8.3.8 The meeting was appraised of developments with regard to the international flight folder documentation programme (IFFDP) in that the flight documentation programme currently available by facsimile and the Internet for dispatch and preflight planning and flight crews en-route will be completely web-based utilizing virtual flight folders. The flight folder information provided in IP/22 relevant to the route of flight and altitude will be available utilizing WebIFFDP system beginning in late 2010. Users may log in to their custom web page and view and print charts in their Virtual Flight Folders. Other delivery mechanisms such as email, chat-rooms, and client-side software are also being investigated.

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Agenda Item 9: Regional Implementation of International Airways Volcano Watch (IAVW)

Provision of graphical advisories

9. 1 The meeting discussed the difficulty in identifying information associated with volcanic ash cloud from the header of graphical Volcanic Ash (VA) advisories, noting the requirement in Amendment 75 to ICAO Annex 3 to provide such advisory information relevant to the whole route to operators and flight crew members. The difficulty arises from the fact that the header code "X" for area designator indicates global region and there is no direct match with the corresponding textual advisory for the same volcano. This makes automatic extraction of volcanic information relevant to the flight route difficult. Of parallel interest, Tropical Cyclone (TC) advisories in graphical form will be available to operators and flight crew beginning November 2010. It was suggested that Volcanic Ash Advisory Centres (VAACs) and Tropical Cyclone Advisory Centres (TCACs) include the file name of the graphical advisories under remarks (RMK) of the corresponding VA/TC text advisories so that appropriate graphical advisory could be identified and included in flight documentation. In light of the above, the meeting formulated the following draft Conclusion.

Draft Conclusion 14/29 – 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.

Distribution of radioactive cloud information

9. 2 The meeting discussed regional developments associated with IAVW, in particular, obtaining 8 character AFTN addresses for Area Control Centres (ACCs) in the ASIA/PAC Region to support the IAVW Operations Study Group (IAVWOPSG) Secretariat that will provide a global list of ACC AFTN addresses to VAAC London for the distribution of radioactive cloud information beginning 18 November 2010 (Amendment 75 to Annex 3). The meeting noted that 80% of the addresses have been obtained, but would strive to achieve 100% completion before November 2010 for proper implementation of this critical information that would be provided by VAAC London. The meeting was invited to complete their respective ACC AFTN addresses as indicated in **Appendix X** to the Report in the near future. The meeting also noted that some States were in the process of determining what to do with the information received on radioactive cloud. It was noted that global guidance is being developed and will be considered at the IAVWOPSG/6 meeting and that the METWARN/I TF monitor the progress for reporting to States. Japan noted that the ACC AFTN addresses would be provided by 1 September 2010 as requested.

Volcanic ash agreement

9. 3 The meeting noted an agreement is being considered between the Ministry of Transport of the Kingdom of Tonga (MTKT) and the Ministry of Lands, Survey and Natural Resources of the Kingdom of Tonga (MLSNRKT) on the dissemination of volcanic ash information from MLSNRKT to MTKT for distribution to ACCs, Meteorological Watch Offices (MWO)s and VAACs.

Volcanic Activity Reports (VAR)

9. 4 The meeting noted the need for improving the collection and dissemination of VAR, special air reports containing information on volcanic activity. In particular, noting that of 80 written pilot reports related to a series of serious high level eruptions in Papua New Guinea, very few were transmitted in real-time and less than 5% reached the VAAC. As specified in ICAO *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM), VAR are required to be forwarded to air traffic services and then to MWOs and VAACs. The need for disseminating VAR has been raised at ICAO and WMO global forums and as per IAVWOPSG/4 Conclusion 4/22, the VAAC

Darwin was to collected VAR globally on a trial basis, however it was determined that the relevant Aeronautical Information Service (AIS) and Regional OPMET Data Bank (RODB) would be most suited for central collection and distribution.

Global and regional developments in response to the Icelandic Volcano

9. 5 In light of the Eyjafefjallajökull Volcano eruption on 14 April 2010 that significantly disrupted air travel and commerce, the meeting noted the developments of the new ICAO International Volcanic Ash Task Force (IVATF). Goals of the IVATF were noted, in particular the agenda items of the first IVATF meeting to be held in Montréal from 27 to 30 July 2010. That is, results of the European and North Atlantic Volcanic Ash Task Force (EUR/NAT VATF) meetings, review of operational response to volcanic ash aircraft encounter and notification and warning for VA (ATM sub-group), development of ash concentration thresholds (AIR sub-group), improvement of ash detection/avoidance systems (Science sub-group), and improvement and harmonization of dispersion models and their visual presentation (IAVW Coordination Group). The VAACs in the ASIA/PAC Region (Darwin, Tokyo, and Wellington) have been invited to the IVATF/1 meeting. New Zealand objectives for the IVATF/1 meeting were detailed in IP/17. The ICAO IVATF website is located at http://www2.icao.int/en/anb/met-aim/met/ivatf/default.aspx?PageView=Shared.

9. 6 The meeting noted the developments of the EUR/NAT VATF in that the second meeting of the EUR/NAT TF held in Paris from 8 to 10 June 2010 recommended the NAT and EUR volcanic ash contingency plans (EUR Doc 019 and NAT Doc 006, Part II) be combined and updated and referenced in Appendix C to Attachment 2 of WP/12. The consolidated volcanic ash contingency plan has been endorsed by the States members of the European Air Navigation Planning Group (EANPG) and the North Atlantic Systems Planning Group (NAT SPG) on 9 July 2010 with immediate applicability within the two ICAO Air Navigation Regions.

9. 7 The updated, combined contingency plan provides contamination levels (low, moderate and high) based on volcanic ash concentrations. That is, low contamination is defined as volcanic ash concentration of less than $2x10^{-3}$ g/m^3; medium contamination is defined as volcanic ash concentration greater than $2x10^{-3}$ g/m^3 but less than $4x10^{-3}$ g/m^3 and high contamination is defined as volcanic ash concentration greater than $4x10^{-3}$ g/m^3. The meeting noted that these volcanic ash concentration thresholds and associated contamination levels are not yet a global standard and that the formal procedures of developing this type of standard would be conducted through the established ICAO procedures. Nevertheless, this contingency plan provides these volcanic ash concentration levels for operators to use in their risk assessment in determining how and where to conduct operations. Nomenclature such as danger area was also used to be consistent with current ICAO documents. Danger areas as defined in Annex 2, *an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times*, may be determined by the State using the volcanic ash concentration levels. However, no international standard currently exists in making that determination and therefore operators are made aware that differences in State policy in declaring a danger area may affect transitioning from one FIR to another. This issue is expected to be addressed by the IVATF.

ASIA/PAC Volcanic Ash Contingency Plan

9. 8 The ASIA/PAC Region does not have a volcanic ash contingency plan, which was raised at the Twentieth Meeting of APANPIRG Air Traffic Management/Aeronautical Information Services/Search and Rescue Sub-Group (ATM/AIS/SAR/SG/20) held in Singapore from 5-9 July 2010. Specifically, ATM/AIS/SAR/SG/20 draft Decision SG 20/12 invited the CNS/MET SG to develop sub-regional volcanic ash contingency plans in the Asia/Pacific Region and urges States to establish/maintain appropriate contact points in the interim period until these contingency plans become available.

9. 9 The meeting expressed concerns about current capabilities with regard to providing volcanic ash information utilizing volcanic ash thresholds and verification of ash concentrations based on aerosol sonde, lidar, radar and aircraft measurements. Furthermore, the meeting agreed that the

task of volcanic ash contingency plans involves many disciplines such as ATM, air worthiness, scientific community, and MET as detailed in the composition of the IVATF. The uniqueness of the ASIA/PAC region dotted with volcanic activity, multiple FIRs, lack of central flow control unit, and current monitoring capabilities added more concern to the group in providing the most sensible pragmatic approach for the region to consider. In addition, some States were noted to have sophisticated contingency plans for volcanic ash. As a result, an ad-hoc group was formed consisting VAAC Wellington, Darwin and Tokyo as well as IATA and Hong Kong China to consider the development of a regional volcanic ash contingency plan.

9. 10 The ad-hoc group reported to the meeting that the TC/VA Implementation Task Force (which is renamed to METWARN/I TF in next paragraph) could be invited to develop a framework for a regional contingency plan for the Asia/Pacific Region. Using the EUR/NAT contingency plan and the findings of the IVATF and WMO scientific steering committee, the TC/VA I TF would be invited to present the framework to the CNS/MET SG/15 meeting. In completing this task the TC/VA I TF will engage with ATM through the MET/ATM TF. Consequently, this new task will require the modification of the terms of reference of the TC/VA I TF, which coincides with the transition of this task force to the MET Warnings Implementation discussed in the next paragraph.

Expand the Terms of Reference of VA/TC I TF and rename the TF

9. 11 The meeting recalled that the MET part of the CNS/MET Sub-group has four task forces. The meeting noted a proposal to redefine one of these task forces, the VA/TC I TF, to cover all matters concerning meteorological advisories and warnings (including wind shear). The objective of this proposal is to assist in the implementation of SIGMET and other advisories and warnings along similar lines to the Meteorological Warnings Study Group (METWSG). It was suggested that the task force could be called the Meteorological Advisories and Warnings Implementation Task Force (METWARN/I TF) with an amended Terms of Reference, Work Plan and Composition as provided in **Appendix Y** to the Report. The new METWARN/I TF met and updated the TORs and work programme that provides links to the OPMET/M TF and MET/ATM TF where appropriate. In this regard the meeting adopted the following Decision.

Decision 14/30 – Rename VA/TC I TF to METWARN/I TF and Revise TORs and Work Programme

That, the VA/TC I TF be renamed to the METWARN/I TF and the TORs and Work Programme be revised as shown in the **Appendix Y** to the Report.

VAAC Wellington developments

9. 12 The meeting was appraised of recent developments of the VAAC Wellington. In particular, an active volcano period from January to June 2010 was due to three active volcanoes in Vanuatu that prompted 343 volcanic ash advisories, most of which were associated with *Gaua.* The advisories were issued based on AIREP and MODIS satellite imagery, however, normal special air report on volcanic ash dissemination did not occur for one of the events. Due to variability of wind, a box around *Gaua* with the forecast of wind in the remark section was provided in the advisories. Volcanic ash heights mainly remained under 10,000 feet, however, one event that drifted toward New Caledonia prompted an inquiry to provide volcanic ash cloud concentration maps, which is not currently provided by VAAC Wellington (note that VAAC London provided this information in response to the Icelandic Volcano in April 2010). Nevertheless, VAAC Wellington is investigating this user request. Significant changes to the operations at the VAAC include the use of MTSAT imagery in the tropical areas (bi-spectral analysis for geostationary satellite MTSAT) and MODIS imagery in non-real-time (several hour time lag) where possible.

9. 13 The area of responsibility of VAAC Wellington has been expanded on 1 July 2010 to include the vacant area between VAAC Wellington and VAAC Buenos Aires. Furthermore, future developments include new forecaster tools for the production of VAA and SIGMETs including volcanic ash advisory information in graphical form (VAG) and graphical SIGMETs expected to be operational in November 2010. The meeting noted that the graphic volcanic ash SIGMET was for observation time only and forecasts in VAG expected in 2011. Lastly, the meeting acknowledged the future commissioning of a new radar at Mahia on the east coast of the North Island in November 2010. The VAAC Wellington website is available at http://vaac.metservice.com/vaac.

9. 14 The VAAC Wellington papers resulted in a few points of general volcanic ash discussion such as Thailand's concern of which VAAC to reference for volcanic ash information in the Adaman Sea which is served partly by Tokyo and partly by Darwin. The meeting noted that the VAACs are coordinated in issuing advisories and that one responsible VAAC will manage and coordinate advisories with the adjacent VAAC and that a reference will be placed on the website of the passive VAAC. Operational concerns were noted by IATA in the south Pacific when information is scarce as it is treated with significant risk and optimal flight paths not achieved.

Information on the operations of VAAC Darwin

9. 15 The meeting was appraised on the recent activities of the VAAC Darwin which covers more than 150 active volcanoes punctuated with convection and remote sensing difficulties in the region. The following activities were noted by the meeting:

- 1396 Volcanic Ash Advisories were issued from 1 July 2009 to 17 June 2010 with no major eruptions
  - Most were low-level ash plumes detected by satellite

- Rabaul in Papua New Guinea became inactive in December 2009 resulting in less advisories than the previous year

- pilot report of sulphur smell at cruising level northeast of Jakarta
  - No eruption clouds detected by satellite or sulphur dioxide emissions by AIRS and OMI imagery
  - Indonesian Centre for Volcanology and Geological Hazard Mitigation advised no unusual volcanic activity reported

- Comprehensive competency-based training and assessment program for VAAC meteorologists

- Darwin VAAC certified with ISO-9001:2008 in April 2010 Quality Management Standard

- Collaborated with New Zealand in the development of the *Guidance for State Volcano Observatories: The International Airways Volcano Watch*
  - Includes guidance on recovering the cost for providing volcanic activity information to aviation
  - http://www.wovo.org/information-for-state-volcano-observatories-providing-services-to -aviation.html

- Rabaul Volcano Observatory of PNG still needs to implement cost recovery

- Improvements to VAAC Darwin remote sensing capabilities
  - X-band satellite receiver installed near Darwin
  - High resolution MODIS, AIRS and related imagery will soon be available in real-time for detection of volcanic ash and/or SO_2
  - SO_2 and automatic ash detection systems to be implemented

- Developing concepts of coordination and provision of volcano situational awareness information

- Monitoring (and member of) IVATF developments for possible implementation of enhanced products

5th International Workshop on Volcanic Ash

9. 16 The meeting noted the major actions and outcomes of the WMO 5th International Workshop on Volcanic Ash held in Santiago, Chile from 22 to 26 March 2010. The major actions include Airbus to inquire (1) with engine manufactures on safe particle size and (2) concentration of ash sustainable by engines on its aircraft, tolerance level of volcanic ash for turbine engines (will now be under IVATF). Furthermore, a subgroup/working group of VAAC members to examine the use/provision of uncertainty forecasting and probabilistic information, Volcanic Ash (VA) Science Steering Group (VASSG), was established under auspices of WMO. The major outcomes include the need for clear limits of ash content by the manufacturers and aviation licensing authorities, completion of eruption source parameters to dispersion models during eruption when real time observations were unavailable, and the need for applying research and new technology to operations. The full report of the 5th International Workshop on Volcanic Ash can be found at http://www2.icao.int/en/anb/met-aim/met/iavwopsg/Lists/Workshops/AllItems.aspx.

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Agenda Item 10: Regional Implementation of International Tropical Cyclone Watch (ITCW)

10.1 The meeting noted that Amendment 75 to Annex 3 includes the introduction of tropical cyclone advisories in graphical form, which includes the horizontal extent of gale force winds and frequent CB. Suggested dissemination of the graphic advisories is Portable Network Graphic (PNG) via the Internet. Furthermore, no named storms forecast to become names will use the designator NN versus NIL to avoid confusion by the users. This designation change includes TC advisories and SIGMET alike.

10.2 The meeting also noted that MWOs in the MID Region that receive TC advisories from TCAC New Delhi will be included in the tropical cyclone SIGMET (WC SIGMET) test on 10 November 2010 at 0200 UTC for MWOs in ASIA/PAC Region and 0800 UTC for MWOs in MID Region. FASID Table MET 3A has been updated to include the MID Region MWOs that receive advisories from TCAC New Delhi. The text in italics in FASID Table MET 3A indicates outside the Region and helps formalize the plans for the test. In addition, the June 2010 amendment to the SIGMET Guide reflects the expanded coverage of the WC SIGMET test in Appendix J to the SIGMET Guide.

10.3 The meeting was briefed on the latest developments of a pilot project on Aviation-weather Disaster Risk Reduction (ADRR), under the lead of Hong Kong China, for aviation users in the Asia and South-West Pacific Regions. To assist in disaster risk reduction, forecasts of tropical cyclones beyond 24 hours (as provided by TCACs) and 24- or 30-hours (as provided by aerodrome forecasts) were deemed necessary by the Commission for Aeronautical Meteorology (CAeM) of the World Meteorological Organization (WMO). The website of ADRR provides tropical cyclone forecasts and warnings for 24-48 hours ahead and numerical weather prediction products on tropical cyclones from a suite of sources (IP/20). The website also includes forecasts of operational concern (e.g. cross and head winds) highlighted when thresholds are met. In addition, a weather summary includes synoptic information, alternative scenarios, an outlook to 48 hours, and as necessary, wind shear, cross winds and turbulence as they are not weather elements of TAF. User feedback is positive with suggestions for continued improvement in presentation, resolution, and accuracy of forecasts in addition to the inclusion of products from other centres. In response to the users, a tropical cyclone probability map and expansion of coverage area from 125E to 140E was performed. ADRR is expected to be operational by the end of 2010 based on the success of the pilot project. Furthermore, ADRR for the Bay of Bengal and Arabian Sea is underway.

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Agenda Item 11: Implementation of SIGMET and warnings

1) review SIGMET tests
2) SIGMET and warnings implementation issues
3) Review METWSG SIGMET advisory
4) update on SIGMET Guide

11.1 Review SIGMET tests

11.1.1 The meeting reviewed the results of the WC, WV and WS SIGMET tests conducted on 10, 17, and 24 November 2009, and noted the increased participation of States and MWOs, which included 8 first time participants in the State and MWO categories for the WS SIGMET test. Incorrect MWO headers, SIGMET format errors and dissemination of SIGMET test messages to all RODBs have been documented in the OPMET exchange action item list for action by the Regional Office and States. In addition, some errors identified were due to the incorrect documentation (i.e. WMO headers incorrect or lack of entries) in Appendix H of the SIGMET Guide. The meeting also noted with appreciation the RODBs continued improvement in the reception of SIGMET. However, RODB Nadi (MWO did issue SIGMET) had not participated in the SIGMET test analysis for the previous 5 tests. With regard to RODB reception of SIGMET test messages, one category (WS) had a slight decrease in reception rates due to the increased participation and the fact that some new participants did not send SIGMET test messages to all the RODBs. States have been informed to send SIGMET to all RODBs in accordance to the SIGMET Guide. Graphic results of the tests are provided here within.

11.1.2 The meeting noted the **next WC, WV and WS SIGMET tests** will be conducted on **10, 17 and 24 November 2010** and commended States for their participation and encouraged continued participation for the identification of communication and format errors. India reported that participation of VECC is expected and that the State letter inviting States to participate needs to be well in advance of the test for State coordination. ICAO informed the meeting that invitation letters would be sent in late August or early September with a reminder closer to the test dates.

11.1.3 The meeting learned that Japan would conduct an expanded volcanic ash SIGMET test (APANPIRG C20/68 refers) in later half of 2010 due to the volcanic activity experienced in the first half of the year.

11.2 SIGMET and warnings implementation issues

11.2.1 The meeting was informed of utilizing climatology in determining the expected frequency of convective SIGMET. Specifically, the frequency of SIGMET by region (Southern, South-western and North-eastern United States) showed a response to El-Nino in that the number of convective SIGMET is higher for these regions except for the Northeast where they are lower.

11.3 Review METWSG SIGMET advisory

11.3.1 The meeting was informed of the developments with regard to the feasibility study on the regional issuance of SIGMET advisories to assist the issuance of SIGMET by MWOs using regional centres. The Rapporteur of the METWSG SIGMET Advisory Ad Hoc Group described the inception of the ad hoc group as it was developed by the METWSG in response to long standing deficiencies related to the issuance, dissemination and/or format of SIGMET by MWOs identified in all regions (first action of METWSG/2). Further problems identified with the issuance of SIGMET included inconsistencies observed at the FIR boundaries and non-issuance of SIGMET for States without designated MWOs. Despite the efforts made through regular SIGMET tests, bilateral arrangements, educational material (e.g. SIGMET posters), SIGMET seminars and regional guidance material, deficiencies as mentioned still exist.

11.3.2 The ad hoc group's main goal is to determine if SIGMET advisories issued by regional centres (in concept parallel to VAACs and TCACs) assist in the issuance of SIGMET by MWOs. To achieve this goal, four main tasks are assigned to the group and include: (1) establish the content and format of advisory information; (2) select appropriate regional centres; (3) propose arrangements for a trial in one or two regions, and (4) establish any further training requirements. The work plan mirrors the tasks to be performed with further details provided in IP/5.

11.3.3 Progress described includes determining weather phenomena to be used in the trial, frequency of advisories no greater than 4 hours for a validity of up to 6 hours, SIGMET format in textual format similar to existing advisories and graphical advisories allowing for multiple phenomena on a singular chart over multiple FIRs, dissemination via AFTN and Internet, location of trial in ASIA/PAC and AFI Regions, requirements of Host and recipient States, and consideration to training needs based on future changes to WMO training requirements. The trial is proposed for a 3 month period in the first half of 2011 with advanced notification to stakeholders. To assess the trial, airlines and RODB participation is expected in monitoring the issuance and format of SIGMET relative to the baseline (without advisories).

11.3.4 The meeting expressed concern that the regional advisories may not have access to local information and in particular to phenomena not depicted by satellite. Furthermore, limitations still exist with advisories such as non implementation of MWOs and the issuance of SIGMET in a few locations unlikely even with access to advisories. This discussion led to the resurrection of the concept of having regional SIGMET centres (instead of advisory centres), however, the subject was noted to be out of the scope of the meeting.

11.3.5 To assist the assessment of the SIGMET advisory trial, a SIGMET monitoring scheme to provide statistics on the impact of advisory information was deemed necessary by the ad hoc group. To facilitate in monitoring SIGMET issued by MWOs, the Hong Kong Observatory is expanding the current web-based SIGMET monitoring system (http://www.sigmetmon.weather.gov.hk) beyond the ASIA/PAC Region to all the other Regions, which will accommodate the monitoring of other selected regional centres that issue advisories (AFI and possibly CAR/SAM) by the first or second quarter of 2011.

11.3.6 The meeting took note of the enhancements to the global SIGMET and Advisory website and noted further input may be provided by the METWSG:

- Use of geographical information system (GIS) application
  - Regional information of SIGMETs and Advisories at a glance with zoom in capabilities

- Indication of SIGMET issuance
  - FIR shaded denoting valid SIGMET
  - FIR flashing denoting multiple valid SIGMET

- Indication of advisory issuance
  - Icon of meteorological element type shown at advisory centre
  - Icon flashes if multiple advisories are valid at advisory centre
  - TC and VA symbols at location of event

- Display of SIGMET/advisory message
  - Cursor over active FIR or active advisory will display respective message

- Statistics on SIGMET issuance for FIRs concerned during advisory trial

11.3.7 The meeting discussed advantages of overlaying the SIGMET on forecasting systems, but this concept is not currently feasible due to the lack of data format for data exchange. This gave further importance to the use of XML in delivering SIGMET and the meeting encouraged the likely WMO code on SIGMET in the future as XML and WXXM evolves, which will be brought to the attention of the METWSG by direct membership. IATA expressed the need to have the SIGMET monitoring display in user friendly terms for easy interpretation by the airlines.

11.3.8 Currently the Hong Kong Observatory obtains SIGMETs and advisories via SADIS, ISCS and AFTN. The meeting noted that a number of FIRs are missing in the relevant tables of the SADIS and ISCS User Guides. Furthermore, verification of SIGMET reception received by the two WAFCs and disseminated via SADIS and ISCS broadcasts is necessary to develop accurate statistics in the SIGMET advisory trial. To verify SIGMET is received and disseminated, participation in the ASIA/PAC SIGMET test was encouraged and coordination between the ICAO Regional Office and the WAFCs expected. Given the aforementioned, the meeting formulated the following draft Conclusion.

Draft Conclusion 14/31 — 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 Office requirements (Regional FASID Tables)

11.3.9 The meeting agreed that a member of the METWSG will submit a study note to the METWSG/3 meeting to seek monitoring needs to assist the SIGMET advisory trial for possible consideration by SADISOPSG and WAFSOPSG.

Development of a New Turbulence Index

11.3.10 The meeting was informed of developments with regard to a new turbulence index, TBindex, by the Japan Meteorological Agency (JMA), which has been in test operations since February 2010 and will soon be used for SIGMET issuance and domestic SIGWX prognostic charts. The importance of such development was noted in that Japan has had several accidents caused by turbulence in this turbulent prone State. TBindex was constructed with multiple turbulence indices (independent 5 CAT and 5 non-CAT turbulence indices) derived from a numerical weather prediction model. TBindex predicts various kinds of turbulence (clear air turbulence, cloud related turbulences, mountain waves) for lower to upper levels in a comprehensive manner. The forecast accuracy of TBindex is significantly better than conventional turbulence indices due to the ability to forecast turbulence in convective clouds and mountain waves as well as clear air turbulence. This product updates 8 times a day and provides forecasts up to 15 and 33 hours (depending on initial times). Finally, the meeting concurred that such accurate indices would be useful when issuing appropriate SIGMET advisory in the future.

11.4 Update on Regional SIGMET Guide

11.4.1 The meeting was informed of the updates to the ASIA/PAC Regional SIGMET Guide that resulted from its review of incorrect WMO SIGMET headings used in the SIGMET tests. Most changes to the SIGMET Guide were associated with Appendix H to the SIGMET Guide, WMO SIGMET headings, but also included updates that facilitate the participation of MID MWOs that are recipients of tropical cyclone advisories by the TCAC New Delhi in the WC SIGMET test scheduled in November 2010. In addition, SIGMET changes associated with Amendment 75 to Annex 3 applicable 18 November 2010 are highlighted in green to facilitate States in their implementation of the new related standards. A list of updates associated with the June 2010 amendment to the SIGMET Guide is provided in the attachment to WP/14. The June 2010 amendment to the ASIA/PAC Region SIGMET Guide is posted on the Asia/Pacific website at the following address: http://www.bangkok.icao.int/edocs/sigmet_guide4.pdf.

11.4.2 The meeting discussed whether or not the reissuance of SIGMET as per Appendix J, paragraph 3.2.3.1 to the SIGMET Guide should be modified to include the reissuance time of 0200 (immediately after the SIGMET test message is sent) and that the SIGMET be updated to reflect any changes to the SIGMET since the first issuance (e.g. geographic region may have changed). The meeting noted that the procedures as they are have advantages: cancelling the original SIGMET not necessary and for large FIRs reissuing all SIGMET with new attributes may not be possible in a limited amount of time. Furthermore, SIGMET would not have been reissued if it were not for the SIGMET test. The meeting agreed that the OPMET/M TF consider using “Z99” as the SIGMET number and verify that ingest systems can handle out of sequence characters such as Z99. If successful, the SIGMET Guide be updated before the SIGMET test in November 2010.

11.4.3 The meeting was informed of the upcoming MWO assignment changes for the responsibility of FIRs Kunming (ZPKM) and Lanzhou (ZLHW) in China. Specifically, the MWO serving the Kunming FIR will change from the Kunming MWO (ZPPP) to the Chengdu MWO (ZUUU) and the MWO serving the Lanzhou FIR will change from Lanzhou (ZLLL) to Xi'an (ZLXY) beginning 1 September 2010 at 0000 local time. This reassignment is to meet the demands of air traffic growth in these FIRs and utilize existing regional meteorological centres that have advantages in personnel, technology and resources compared with the existing arrangement with aerodrome meteorological offices. Changes to the agreement on the provision of SIGMET for the Phnom Penh FIR by the Kunming MWO are under consideration by China and Cambodia. Consequently, changes to FASID Tables MET 1B, MET 3A, MET 3B, the ROBEX Handbook, SIGMET Guide, ICD and SADIS Annex 3 are necessary. These changes will be made in due time through the ICAO established procedures.

11.4.4 The meeting noted that the ICAO location indicator for the Oakland Oceanic FIR, KZAK, has been in effect since 1 January 2010 and subsequently NOTAMs issued for this FIR reference KZAK. SIGMET, however, is using KZOA (used in the Oakland area) and affects SIGMET collection for airlines. As a result, KZAK will be referenced for SIGMET issued for the Oakland Oceanic FIR beginning 28 July 2010. Subsequently, FASID Table MET 1B, 3B and 3C and Appendix H to the SIGMET Guide will be updated using the proper ICAO location indicator for the Oakland Oceanic FIR.

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Agenda Item 12: Implementation of the issuance of observation, TAF and OPMET exchanges

1) Review of OPMET/M TF/8 meeting
2) Implementation of Amendment 74
3) Other OPMET implementation issues
4) Update on ROBEX Handbook and ICD

12.1 Review of OPMET/M TF/8 meeting

12.1.1 The meeting was informed about the major outcomes of the Eighth Meeting of the ASIA/PAC OPMET Management Task Force (OPMET/M TF/8) held in Bangkok, Thailand, from 23 to 25 March 2010. The meeting was attended by 38 experts from Australia, China, Hong Kong China, Indonesia, Japan, Malaysia, Singapore, Thailand, Viet Nam, United States, and ICAO. The full meeting report was available on the ICAO Asia/Pacific website at http://www.bangkok.icao.int/meetings/2010/opmet_tf8/index.html. Highlights of the meeting include: the ability to send OPMET data by email to the Singapore RODB for further distribution globally, input to the ROBEX Handbook, efforts associated to issuing TAF in accordance to Amendment 74 to Annex 3, and monitoring results by IATA showing the increase in OPMET data from ASIA/PAC received at SADIS. A more extensive list is provided in WP/15. The status of deficiencies addressed by the OPMET/M TF/8 meeting is presented in Agenda Item 17(2). In addition, SIGMET test for tropical cyclone, volcanic ash and other weather phenomena was presented in Agenda Item 11(1).

Review of Terms of Reference (TOR)

12.1.2 The OPMET/M TF/8 meeting reviewed its Terms of Reference (TOR), which was last adopted by the CNS/MET SG/13 meeting (July 2009) which included continuous monitoring of the progress of XML. The OPMET/M TF/8 meeting did not provide any further updates. The CNS/MET SG/14 meeting recommended the TORs of the OPMET/M TF be aligned as to minimize overlap (e.g. SIGMET test) with the METWARN/I TF and provide a link between the two task forces on interdependent tasks. Further alignment with METWARN/I TF in terms of membership was agreed upon by the meeting to reduce the membership of OPMET/M TF to RODBs, IATA, EUR BMG, MID OPMET bulletin board, and WAFCs. The meeting envisioned back to back meetings of the OPMET/M TF and METWARN/I TF for a total duration of 3 days with the middle day used by both task forces on interdependent tasks such as SIGMET tests and monitoring of Meteorological advisories and warnings for deficiencies. In light of the above, the meeting adopted the following Decision.

Decision 14/32 – Revised TOR and Work Programme of the OPMET/M TF

That, the revised TOR and Work Programme for the OPMET/M TF as shown in the **Appendix Z** to the Report be adopted.

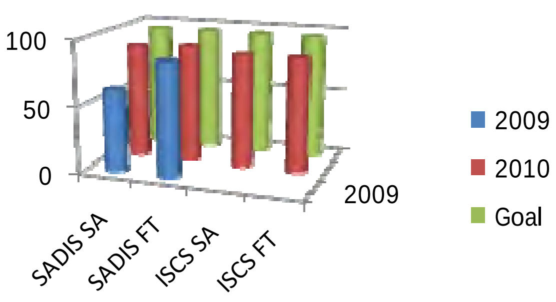
12.1.3 The group briefly referenced the OPMET exchange action items list developed at the RODB/4 meeting (held in Chiang Mai from 11 to 12 February 2010 where the full report can be accessed at http://www.icao.or.th/meetings/2010/rodb4/Index.html. This list was further updated at the OPMET/M TF/8 meeting and maintained at the Regional Office and provided in Attachment 2 to WP/15. This extensive list of OPMET exchange and deficiency issues is categorized by subject (e.g. SIGMET test issues, METAR/TAF format errors) and is updated at respective meetings and by consultation with task force members and States.

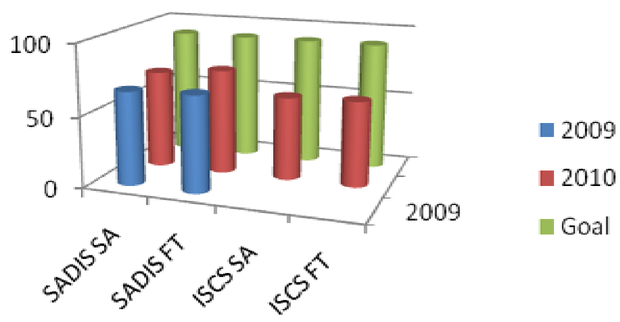
IATA OPMET data monitoring

12.1.4 IATA monitored the OPMET (METAR/TAF) reception for a 9 week period beginning 4 January 2010 against expected reception indicated in FASID Tables MET 1A and 2A (February 2010) (which also corresponds to SADIS SUG Annex 1) for AOP and non-AOP aerodromes. The statistics provided at the OPMET/M TF/8 meeting were encouraging and a summary provided in tabular and graphic form here within.

OPMET Reception									
System	AOP aerodromes			Non-AOP aerodromes			Non-AOP aerodromes not listed in Tables		
	SA (%)	TAF	FC (#)	SA (%)	TAF	FC (#)	SA (#)	TAF (#)	FC (#)
ISCS	85.4	86.3	14	58.7	60.1	1	76	33	1
SADIS	87.3	89.3 (86-2009)	14	69.2 (66.1-2009)	74.1 (67.7-2009)	2	64	24	20 (18 only FC)
Goal	95	95	0	90	90	0			

Graphical Representation of SADIS/ISCS SA/TAF Reception for AOP (left) and non-AOP (right) aerodromes





12.1.5 Reception statistics of OPMET data for AOP aerodromes for two years were only available for SADIS, which revealed an improvement in reception of 25.6% for SA and 3.3% for TAF. Reception statistics for OPMET data for non-AOP aerodromes for two years were only available for SADIS, which revealed an improvement in reception of 3.1% for SA and 6.4% for TAF. Another observation noted was the lower reception of OPMET data at ISCS versus SADIS in all categories. Specifically, SA/TAF reception at SADIS is 4/6 more than ISCS for AOP aerodromes and 15/20 more than ISCS for non-AOP aerodromes, which promotes the need for further harmonization of the two systems (SADISOPSG/15 Conclusion 15/9 refers), which is a continuous process as noted by the meeting.

12.1.6 The above shows a significant improvement in METAR reception at SADIS and modest improvements in the other categories. States are commended for this continued improvement in OPMET provisions. OPMET data missing from SADIS reception can be found in the attachments to WP/28 and WP/29. It is worth noting that the reception statistics may be significantly higher only months after this analysis for a number of reasons: distribution of OPMET in South Pacific by AFTN since April 2010 and many changes to the ROBEX Handbook June amendment that include the addition of numerous non-AOP aerodromes (e.g. Australia, Lao PDR, Japan, and Thailand). Furthermore, with relation to SADISOPSG/15 Conclusion 15/6, which calls for additional OPMET requirements for non-AOP aerodromes, more than 1/3 of the 86 non-AOP aerodromes for the ASIA/PAC Region are distributed via the ROBEX scheme, many associated with the ROBEX Handbook June 2010 amendment. For this reason, a new list of aerodromes that OPMET are not being received at SADIS or ISCS should be provided to the Regional Office to inform States of missing OPMET data.

12.1.7 The meeting noted that requirements for AOP aerodromes are detailed in FASID Table MET 1A. In addition, non-AOP aerodromes are not subject to the Regional Air Navigation Plan requirements; however, IATA and States may concur on requirements and be reflected in FASID Table MET 2A.

12.1.8 With regard to FC issuance by India, the meeting noted that since the monitoring period, India does not distribute FC for international use, with an exception of sporadic issuance for (VOHY). India noted that the 3-hour TAF issuance before the start period of validity was due to the operators needs, though the issuance time requirements are 1 hour before the start period of validity of TAF. Another point made by the meeting was that the AMOFSG is investigating issuing TAF without a lead time.

12.1.9 Irregularities in OPMET data have been identified by IATA for the period from 05 June to 25 June 2010 considering various communication lines (SADIS, ISCS and German MET Office (DWD) as GTS/AFTN) as per the attachment to WP/30. Aerodromes whose METAR/TAF were received more than 10/30 minutes after observation/issuance times are provided in the attachment to WP/30. Note that the ROBEX Handbook section 7.5 details the METAR observation and TAF issuance to reception time of METAR and TAF. Specifically, total time to reception is up to 10 and 20 minutes for METAR and TAF (add 5 minutes if distance greater than 900 km). Suspect observations were also noted when METAR/TAF were received less than 3/10 minutes after observation/issuance times. Regularity was deemed unsatisfactory for METAR/TAF of less than 200 (of total expected 504) / 11 (of total expected 21) noting that accountability to partial operations was not factored.

12.1.10 The meeting was appraised of the recent update to the ROBEX Handbook that indicates availability times of OPMET data such as the non-AOP aerodromes in Thailand.

12.1.11 The meeting noted that the transmission times of States whose MET Services are ISO-9000 credited (Australia, Hong Kong, China, New Caledonia, New Zealand and Singapore) also have unacceptable transmission times and missing OPMET data which raised a concern in the transmission of data. Coordination amongst the OPMET/M TF and CNS, MWOs, RODBs. SADIS and ISCS Provider States and IATA are necessary to verify these transmissions times and the meeting agreed to conduct a mini test for OPMET transmission time verification. In addition, the transmission times were greater for ISCS and more OPMET data was missing on ISCS as noted by Hong Kong, China. Further investigation was suggested and noted by the two WAFCs. To assist in meeting the goals of OPMET availability of 95% and 90% for AOP and non-AOP aerodromes as referenced in APANPIRG Conclusions 20/63 and 20/64, the meeting formulated the following draft Conclusion.

Draft Conclusion 14/33 — Implementation of OPMET reception

That,

a) IATA be invited to conduct another period of OPMET monitoring for reception of METAR and TAF at SADIS and ISCS and provide the Regional Office with a list of AOP and non-AOP aerodromes by State whose OPMET data are not available at SADIS and/or ISCS as well as a list of AOP aerodromes by State that distribute FC TAF; and

b) the Regional Office urge States containing AOP aerodromes whose OPMET is not received at SADIS and/or ISCS of requirements in accordance to the Regional Air Navigation Plan (RANP); and

c) the Regional Office encourage States containing non-AOP aerodromes whose OPMET is not received at SADIS/ISCS to provide OPMET data as already agreed upon; and

d) the Regional Office inform States that FC TAF is no longer disseminated internationally in accordance with the RANP; and

e) the slower transmission times and missing OPMET data associated with ISCS in relation to SADIS be investigated by RODBs Tokyo and Singapore; and

f) the Regional Office inform States of OPMET observation, filing and transmission times as described in the ROBEX Handbook section 7.5; and

g) the Regional Office inform States of OPMET availability and regularity as defined in the Regional Air Navigation Plan and ROBEX Handbook

Note: this Conclusion is intended to assist in achieving the OPMET data availability goals (95% AOP aerodromes and 90% non-AOP aerodromes) described in APANPIRG/20 Conclusions 20/63 and 20/64)

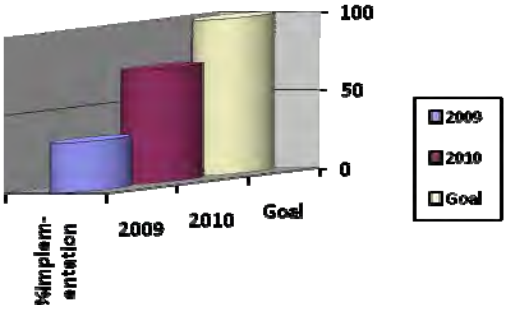
12.1.12 IATA reiterated its position with regards to OPMET availability, as formulated in the IATA METTF/14 meeting, is that all OPMET data currently available should be distributed. This does not mean modifying the airport status in the AOP table. The meeting noted, however, that procedurally, it is up to the State to decide what non-AOP OPMET is available for distribution through ICAO consultation with the State (this is not an amendment proposal, simply concurrence or non concurrence via consultation).

12.2 Implementation of Amendment 74

12.2.1 With regard to the format of TAF, the Region appears to have near full implementation. With regard to no longer disseminating 9- and 12-hour TAF, the Region is near full implementation with the exception of Mongolia and Pakistan. Isolated instances of short TAF are also issued for WIHH in Indonesia and VOHY in India. It was noted that India has included VOHS under ROBEX scheme in lieu of VOHY. Indonesia plans to discontinue the dissemination of the shorter duration TAF in July 2010 and India has ceased sending the shorter duration TAF as of March 2010 and isolated reports of issuance have also ceased. Indonesia also plans to conform to the issuance time in accordance to the RANP as of July 2010.

12.2.2 The meeting noted that implementation of 30-hour TAF in accordance to FASID Table MET 1A is occurring at a steady pace. Implementation of 30-hour TAF at AOP aerodromes in the ASIA/PAC Region is 73% as of July 2010, well more than double from a year ago. Indonesia has completed the implementation of 30-hour TAF as per the RANP in July 2010. Brunei Darussalam reported implementation occurred in November 2008 and India has implemented 30-hour TAF at all their aerodromes where required with additional aerodromes such as VOHS (AOP) and VOHY (non AOP), which was accepted by IATA. These new requirements will be incorporated in the next amendment proposal of the FASID Table MET 1A. Implementation of 30-hour TAF in China (implementation for Beijing, Guangzhou, and Shanghai by end of 2010) and Japan (March 2012) will result in an implementation rate of near 90% and the Region is commended for its continued efforts of implementing these TAF requirements in support to ultra-long haul flights, noting that there is a significant amount of changes associated with this implementation such as manuals and extra man power required especially for larger States.

30-hour TAF implementation



12.3 Other OPMET implementation issues

Progress on XML

12.3.1 The meeting realized that the exchange of OPMET data and eventually SIGMET would likely utilize Extensible Mark-up Language (XML). The OPMET/M TF TORs include the monitoring of XML due to the impact it will have on implementation of the new exchange of OPMET data in the years to come. A status of XML developments as they relate to ICAO and WMO was provided to the meeting.

12.3.2 The meeting was informed of the recent WMO Commission for Aeronautical Meteorology (CAeM)/Commission for Basic Systems (CBS) Expert Team on OPMET Data Representation meeting held in Paris, France on 26 October 2009 for which the full report may be accessed at http://www.wmo.int/pages/prog/www/WDM/ET-ODR-2/Documents.html. Reference is made to section 2.4.1 and 2.4.2 to the report on attendance (by C/MET, ICAO) that include milestones such as the pilot project conducted by WMO in 2009, enabling bilateral exchange of OPMET via XML in 2013 (Amendment 76 to Annex 3), possible endorsement of the future use of Weather Information Exchange Model (WXXM) by the planned conjoint ICAO/WMO MET/AIM Divisional Meeting in 2014 and the possible implementation of WXXM in 2016.

12.3.3 The meeting was appraised that consideration to data volume and upgrades to communication systems (e.g. South Pacific) will be a significant undertaking and requires significant planning and coordination in due time. Furthermore, clarification on the term bilateral exchange is necessary and to be provided by the Secretariat.

Routine TAF amendments

12.3.4 Based upon feedback from the U.S. Meteorological Authority (Federal Aviation Administration) the NWS began routine TAF amendments for 35 higher traffic airports that impact the National Air Space (NAS). This service accommodates air traffic management coordination calls by providing the most up to date information. In addition, it provides a more recent forecast for the critical airport push times.

12.4 Update on ROBEX Handbook and ICD

12.4.1 The meeting noted the recent amendment to the ROBEX Handbook with regard to the new provisions associated with Amendment 75 to Annex 3 (e.g. routine aircraft voice reporting of weather no longer a requirement) that are highlighted in green for proper implementation planning. A new amendment in June 2010 included numerous updates by States on OPMET exchange that are detailed in the ROBEX Handbook list of updates in Attachment 1 to WP/17. In addition, these updates include changes associated with real time monitoring in March 2010 by RODB Singapore and for the most part, validated by States, particularly those present at the OPMET/M TF/8 meeting. The

ROBEX Handbook is referenced in the Regional Air Navigation Plan for scheduled OPMET exchange and is used as reference (truth) in determining performance indices when RODBs monitor OPMET exchange and is therefore important to keep this document current on an annual basis. The June 2010 amendment to the ROBEX Handbook is posted on the Asia/Pacific website at http://www.bangkok.icao.int/edocs/robex2004_e12.pdf.

12.4.2 The meeting discussed section 9 of the ROBEX Handbook as it relates to the regional exchange of routine voice reports of weather by aircraft collected and disseminated by MWOs. Amendment 75 to Annex 3 applicable 18 November 2010 no longer requires routine reporting of weather by aircraft. Therefore the resources necessary for the exchange of this information by MWOs will no longer be applicable for cost recovery. Furthermore, special reports are disseminated in the same way as SIGMET and due to the urgent nature of these reports, hourly collectives deemed unnecessary. The meeting agreed that collection of air reports by the MWOs will no longer be applicable with the implementation of Amendment 75 to Annex 3 and that section 9 and Appendix D of the ROBEX Handbook be removed. The next amendment will be issued by the Regional Office in August 2010 for proper regional planning. This amendment will also include the recommended changes by Fiji (aerodromes added to METAR and TAF bulletins at the request of airlines in New Zealand) and contact information for Japan.

12.4.3 The meeting was informed of updates to the Asia/Pacific OPMET data banks interface control document (ICD) to reflect the current RODB operations of non scheduled exchange of OPMET data in the Region. Specifically, the RODBs Bangkok, Brisbane, Singapore and Tokyo updated their respective appendices A, B, D and E to the ICD. The June 2010 amendment to the ASIA/PAC ICD is posted on the Asia/Pacific website at
http://www.bangkok.icao.int/edocs/OPMET_DataBanksICD2004.pdf.

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Agenda Item 13: Review of regional procedures contained in the ANP/FASID

13.1 The meeting noted several amendment proposals during 2009 and early 2010 resulting in more stable FASID Tables MET. Since the CNS/MET SG/13 meeting, FASID Tables 4A, 4B and 4C were replaced by the ROBEX Handbook and ICD for reference of OPMET exchange in the Region in the Basic ANP and FASID text (APANPIRG/20 Conclusions 20/65 and 20/66 refers). FASID MET Tables 6 and 7 were removed in accordance to WAFSOPSG/5 Conclusion 5/2 as they are global in nature and documented in Annex 3. In addition, the RANP was adapted for the enabling of the public Internet in the retrieval of non-time critical OPMET data in accordance to WAFSOPSG/5 Conclusion 5/2. A more complete list of changes to the RANP during the past year is contained in WP/18. Clarity was also provided to the meeting with regard to the WAFS trial forecasts of CB, icing and turbulence in that they are trial forecasts for evaluation only and available only via SADIS FTP and WIFS (not by satellite broadcast until WAFSOPSG approval).

13.2 Of recent importance, the meeting noted the inclusion of VAAC Toulouse to reflect the issuance of volcanic ash to 11 MWOs in the western Asia Region. Furthermore, MID MWOs that are recipients of tropical cyclone advisories from TCAC New Delhi have been included in FASID Table MET 3A (MWO in italics – outside the ASIA/PAC Region) in preparation for the next WC SIGMET test (MID MET SG/2 draft Conclusion 2/4 refers). In addition, the expanded area of coverage of VAAC Wellington was reflected in FASID Table MET 3B in accordance with IAVWOPSG/5 Conclusion 5/2 beginning 1 July 2010. Lastly, Afghanistan was recently included in the RANP to reflect accreditation to the ASIA/PAC Region.

13.3 The meeting noted the importance of maintaining the Regional Air Navigation Plan and associated FASID Tables MET referenced whose purposes include: (1) regional planning by operators, (2) measurement of implementation which allows for proper focus in implementation strategies by many entities (Operations, States and ICAO); and (3) input to cost-recovery of MET Services provided for international aviation (as referenced in the *Manual on Air Navigation Services Economics*, Doc 9161, 4th edition, 2007). Therefore, an annual review of the latest Basic ANP and FASID Tables MET was strongly encouraged.

13.4 The meeting noted that the ICAO Regional Office (RO) Air Traffic Management (ATM) proposed transferring the responsibility of maintaining FASID Table ATS 2, HF Radiotelephony VOLMET broadcasts, from Air Traffic Service (ATS) to MET (draft Conclusion SG 20/14 of ATM/AIS/SAR/SG/20 refers). Requirements for VOLMET are contained in Annex 3, Meteorological Service for International Air Navigation. Historically, this table is maintained by ATS since this is considered an air traffic service. As this proposed transfer would involve all Regions, the meeting formulated the following draft Conclusion considering its global nature.

Draft Conclusion 14/34 — Transfer FASID Table ATS 2 from ATS to MET

That, ICAO consider the transfer of responsibility of maintaining 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.

Note 1: The ANP/FASID for other Regions would have to be amended accordingly.

Note 2: This draft Conclusion eliminates the need for APANPIRG consideration of draft Conclusion SG 20/14 of ATM/AIS/SAR/SG/20.

Note 3: The Service Provider of HF VOLMET broadcast is a local arrangement

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Agenda Item 14: Regional MET support to ATM

1) Review of MET/ATM TF/1 meeting
2) Exchange of information on MET support for operations at aerodromes, terminal areas and en-route

14.1 Review of MET/ATM TF/1 meeting

14.1.1 The meeting reviewed the highlights of the MET/ATM TF/1 meeting held in Bangkok, Thailand from 2-4 December 2009. The full report is located at the following website http://www.bangkok.icao.int/meetings/2009/metatm_tf1/index.html. Highlights of the meeting included a review of the previous survey on ATM requirements for MET, ASIA/PAC MET/ATM Coordination Seminar 2006 outcomes, States developments on coordination and services of MET for ATM, new Terminal Weather Forecast (now referenced as MET Services for the Terminal Area - MSTA). This task force meeting was essentially for the exchange of information and for planning for future exchanges.

14.1.2 The meeting noted that the MET/ATM TF/1 meeting proposed changes to the terms of reference (TORs) to take into account ingestion of MET information in decision support tools, sub-regional exchange of MET information to support ATM, monitoring of global policies on source and delivery of MET data for ATM and adding a link to the METWARN/I TF in developing contingency plan on weather phenomenon that includes volcanic ash, tropical cyclone, Tsunami and radioactive cloud. In light of the above, the meeting adopted the following Decision.

Decision 14/35 – Update of MET/ATM TF TORs

That, the revised Terms of Reference of the MET/ATM TF provided in **Appendix A1** to the Report be adopted.

14.1.3 The meeting briefly discussed the status of the upcoming MET/ATM Seminar and TF/2 meeting in Fukuoka, Japan during the fourth week of January 2011 and requested the meeting be held in coordination with WMO so that the WMO expert team and task team on MSTA be held back to back with the Seminar. Given the aforementioned, the meeting formulated the following draft Conclusion.

Draft Conclusion 14/36 – MET/ATM Seminar

That, ICAO in coordination with WMO conduct a MET/ATM Seminar in early 2011.

Note: This draft Conclusion reinstates APANPIRG Conclusion 19/53.

14.1.4 The meeting noted the results of the Air Traffic Flow Management (ATFM) survey that includes a MET component that was conducted in 2010 in accordance to APANPIRG/20 Conclusion 20/13. In particular, data from the flow control unit was available in more States than anticipated and useful to determining MET needs for ATM. IATA noted that strategic decisions with regard to operations is conducted in part using the available capacity versus the demand. The meeting agreed that further analysis is necessary by the MET/ATM TF and that the ATM use of the survey should be followed as well.

14.1.5 The meeting also discussed paragraph 1.1 of the MET/ATM TF/1 report with regard the concept of obtaining MET data for aviation purposes. The source of MET data was not explicit in this paragraph and clarification is requested. Furthermore, clarification on the reason and feasibility of the concept that Least Developed Countries obtains MET products through vendors was also requested. The interpretation presented to the meeting was that MET data for ATM seem to be supplied to States in a fashion similar to the WAFS model, though not explicit in the report and was not raised at the MET/ATM TF/1 meeting. Furthermore, it is doubtful that LDCs would have the financial viability to obtain MET products from commercial vendors where cost recovery mechanism is not in place. Clarification on the provision of MET Services to support ATM, including the role of Contracting States in the provision of MET data and MET products to support ATM, the applicability of global MET requirements for ATM to LDCs, and related charges were requested. In response, ICAO noted that a position on the delivery of future MET requirements for ATM is not yet known and that the position provided in the MET/ATM TF/1 meeting was that of one State. Since the CNS/MET SG meeting is focused on implementation issues, the meeting agreed that policy issues related to future MET requirements for ATM will be monitored by the MET/ATM TF and that if members of global MET study groups participate in these discussions, they may provide the information relevant to implementation to the future APANPIRG related meetings.

14.2 Exchange of information on MET support for operations at aerodromes, terminal areas and en-route

14.2.1 The meeting noted a summary of the NextGen concept for meteorological services in support to air traffic management for performance-based navigation (PBN). In particular, *Flight and Flow Information for a Collaborative Environment* is a document in response to Air Traffic Management Requirements Performance Panel (ATMRPP) to improve the efficiency of traffic flow with PBN. It is noted that documents mention of reference weather, but does not specify the meteorological services required for global ATM. NextGen will incorporate weather elements in space and time in Flight Management Systems, air transportation systems and decision-support systems utilizing a Single Authoritive Source (SAS) in support to optimizing capacity and flight trajectories given a set of user parameters (minimum criteria for operating – e.g. landing minima, aircraft weather avoidance limits, and risk tolerance). This concept also promotes common situational awareness. The development stages will progress from the current reactive mode to weather to proactive mode using probabilistic forecasts of weather that would allow ATM to respond iteratively and eventually be automated in providing optimum flight trajectories and operation choices would be provided (e.g. earlier departure time, changed trajectory). Four levels of Decision Support Tools (DST) include the following:

- Level 1 – stand alone (little to no weather integration)
- Level 2 – Over-lapping (high “glance value” weather impact information overlaid with decision support tool outputs)
- Level 3 – Minor human involvement (user-in-the-loop tools: Weather fully integrated within tool but separate weather information also provided for human understanding)
- Level 4 – Fully integrated (machine-to-machine: Weather and uncertainty fully integrated into decision tool outputs)

14.2.2 Weather information is expected to be automatically translated into probabilistic weather impacts on air traffic and be ingested into decision algorithms (ground and aircraft) by 2025. The AMOFSG established an ad hoc working group to formulate an initial set of requirements, elements and metrics for MET in support to global ATM and PBN where initial proposals are expected to be complete by November 2010. This information may be reported by an ad-hoc member to the MET/ATM Seminar in Fukuoka in early 2011.

<u>Wind shear</u>

14.2.3 The meeting noted that the pilot reports of wind shear and turbulence are necessary for Air Traffic Control (ATC) to warn other aircrafts and to help validate automated wind shear systems. For example, an expanding network of Doppler weather radars in India is also being used to assist aviation in providing hazardous information such as thunderstorms, severe local storms and wind shear warnings. Chennai wind shear warnings generated from an S band Doppler radar with high volume of data samples (several elevation scans utilized to cover the lowest 850m) could not be validated as the feedback from Pilots are not encouraging. Though the aircraft reports are correlated with a meager sample, it is absolutely inevitable to report all types of wind shear experienced by the pilot not only for validation of Doppler Weather radar based algorithms but also for alerting incoming aircrafts where the Radar facility is not available. In this connection, the member re-iterated that low-level wind shear are quite probable during active monsoon conditions and during winter season over airports located in western Ghats of southern peninsular India such as VOTV, VOCI, VOCL, VOML, and VOCB wherein no low level wind shear alert system is available as of now and the aircraft reports are essential for these airports. The meeting agreed that during adverse weather such as thunderstorms that produce wind shear or at high altitudes when significant turbulence is present, aircraft reports are essential in warning other aircraft and validating automated systems and is required in Annex 3 (5.6). IATA expressed concern of the few aircraft reports reported in a wind shear prone environment and encouraged further coordination. Also noted was that NULL wind shear cases are important for determining false alarm rates of a system.

Online Aviation Meteorological Briefing System (OLBS)

14.2.4 The meeting also noted that aviation users are pleased with the delivery of WAFS products and locally generated SIGWX charts in electronic form via an online aviation meteorological briefing system (OLBS) for all FIRs in India. Upgrades to the OLBS have allowed the user to access forecasts and current weather information for any desired route using a mouse. Since March 2010, this service has been extended to low-level flights (from FL030 to FL070) on a trial basis in Chennai and expected to expand to the whole FIR. Therefore, the member pointed out that to provide low level flight briefing service from all the airports throughout the world, low-level wind and temperature forecasts are desirable albeit the same are not provided below FL050, as of now, by WAFS.

14.2.5 The meeting noted that WAFS GRIB forecasts may not provide the spatial resolution desired at low levels and suggested caution with regard to the limitation of global numerical weather prediction models in regard to wind and temperature information in the low levels especially in mountainous areas. In addition, requirement changes to WAFS data should be raised to the WAFSOPSG where considerations to bandwidth availability and user requirements are factored. Information for FL070 may be the first achievable request. Further need for low level wind and temperature information was provided by New Caledonia on behalf of the South Pacific islands.

Aviation Thunderstorm Nowcasting System (ATNS)

14.2.6 The meeting was informed of the latest developments with regard to the aviation thunderstorm nowcasting system (ATNS) used in trial form since mid-2009 to support ATM and airline operators in the terminal area of the Hong Kong International Airport (HKIA). Based on user feedback the following new features have been developed:

- Extension of areal coverage of the 1-hour forecast of thunderstorms out to 256 km from HKIA
- Inclusion of lateral sector boundaries within HK FIR
- Automatic grouping of contiguous radar pixels into polygons overlaid with motion vectors

The latter is related to the development of the Meteorological Services for Terminal Areas (MSTA) (formerly the New Terminal Forecast) under the Commission for Aeronautical Meteorology (CAeM) of the World Meteorological Organization. This relation is specific to the nowcast category of MSTA which consists of nowcast (0-1 hour), short-term forecast (to 6 hours) and outlook of convective weather (to two days). Taking advantage of low bandwidth required, a trial of uplinking these polygons to aircraft via Electronic Flight Bag (EFB) was being explored with a local airline and could be expanded to other forecast products in the future.

14.2.7 Verification of ATNS in real-time is permissible utilizing archives up to 1 week and used for continued product improvement. Evaluation of how the product is used by ATM and airlines is conducted using flight tracks provided by ATFM overlaid onto the radar images and their derivatives (reflectivity, echo top, vertically integrated liquid, vertically maximum intensity core). Operating in trial mode for ATM and ATFM since mid-April 2010 provides insight on adjustments to alert levels of the radar parameters associated with severe convective weather. The users' desire for weather impact levels (avoidance) is also useful in the development of MSTA with the end goal of providing safety and efficiency (unnecessary closure of routes) without the need for interpretation. Further development such as growth and dissipation of thunderstorms is underway.

Significant Convective Forecast

14.2.8 The meeting was provided with latest developments on the significant convection forecast product by the Hong Kong Observatory – HKO and the weather briefing for ATC in support of ATFM. Knowledge of significant convection impacts on key ATC areas out to 6 hours in advance facilitates in decision making for use of flow control measures. To facilitate the weather briefings, an integrated web-based monitoring and forecast display was developed in consultation with the users that provide the following:

- Animation of previous hour radar images at 6 minute intervals overlaid with ATC sector boundaries and checkpoints (useful in monitoring the development of convection and potential impact to ATC)
- Animation of previous three hour radar images and ATC graphics combined with satellite image of potential deep convection highlighted in bright white at half hour intervals for the HKFIR and vicinity
- Forecasts for significant convection using numerical model outputs up to 12 hours every 3 hours that allows for manual adjustments (useful in including and excluding convection based on forecast skills and tools)

Understanding the forecast accuracy was one important outcome of the Joint Workshop conducted for ATC personnel and aviation forecasters. Future work will focus on forecasting runway capacity and airspace capacity (further relates to flight delay) based on user-defined thresholds of convective impacts to operations out to 9 hours that would be deduced in the weather briefings. Future weather product development entails inclusion of radar echo top, HKO tropical cyclone forecast track on the composite satellite and radar images.

14.2.9 IATA expressed their desire to access the MET services described above, which are currently available for ATC as these products are being developed. With regard to the various products provided, IATA also desires conformity of services and minimum interpretation. Providing these products to airlines and operators would be considered in the future.

Introduction of Significant Weather Briefing Sheet for ATMC

14.2.10 The meeting was briefed on developments with significant weather (SIGWX) briefing sheet issued by Air Traffic Meteorology Center (ATMetC) for the Air Traffic Management Center (ATMC) when significant weather is forecasted for some major aerodromes in Japan. The SIGWX briefing sheet was developed in response to the need of a greater than 6 hour forecast for air traffic impacts caused by strong wind at Tokyo International Airport and heavy snow at the New Chitose Airport. The period of validity is up to 16 hours and amended if necessary (for the first 12 hours of validity) with a tabular type form showing the air traffic flow impact (runway capacity, flight deviation), time interval of impact, severity level, significant weather conditions, and forecast comments.

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Agenda Item 15: Other MET issues

1) Amendment 75 implementation issues
2) Implementation of QMS

15.1 Review Amendment 75 implementation issues

15.1.1 The meeting noted MET requirement changes associated with Amendment 75 to Annex 3 adopted by the ICAO Council on 22 February 2010, which are provided in the attachment to IP/13. These included, but are not limited to the following changes:

- improved horizontal, vertical and temporal resolutions for WAFS forecasts
- introduction of an enabling clause for the implementation of WAFS trial forecasts of cumulonimbus clouds, icing and turbulence (available on SADIS FTP and WIFS only – satellite broadcasts subject to WAFSOPSG approval)
- elimination of routine voice reports related to weather
- enabling the provision of graphical MET information in the cockpit
- enhancement of the provision of information on volcanic ash and toxic chemicals
- aerodrome observations enabling the use of fully automatic observing systems for the provisions of local reports and the replacement of km/h by m/s for the SI unit to report wind speed
- implementation of tropical cyclone advisory graphics that include the extent of gale force wind and frequent CB
- no name storms indicated as NN versus current NIL with regards to tropical cyclone advisories and WC SIGMET
- inclusion of the forecast time in the second line of SIGMET message
- inclusion of “headwind gain” and “headwind loss” information for wind shear warnings
- enable the use of the public Internet for the exchange of MET data that is used for flight planning
- MET elements requiring quality management system will be effective in 2012

15.1.2 The meeting expressed concern with the inclusion of the forecast time in the second line of SIGMET message. That is, the use of “FCST AT” and the time was not clear as to whether the time is the beginning time of the forecast or any time during the period of forecast is valid. Another point provided to the meeting is that the Volcanic Ash graphic SIGMET example provided by WMO was only for observed, not for forecast and as a result, New Zealand will issue a two-panel graphic depicting observed ash in an upper panel map and forecast ash in the lower map. Australia also commented that note 27 of table A-6-1 in Amendment 75 to Annex 3 implies that the use of “AND” is for two Tropical Cyclone or Volcanic Ash phenomena within a single FIR, whereas Australia believes the intended use is for two flight levels of a Volcanic Ash event or two time steps for a single Tropical Cyclone.

15.1.3 The meeting discussed the inclusion of ‘moderate’ category in special aircraft observation of turbulence and icing and their reporting in special air report associated with Amendment 75 to Annex 3 (Table A4-2 of Appendix 4 and Table A6-1 of Appendix 6). It was noted that moderate and severe turbulence are defined for automatic systems in terms of Eddy Dissipation Rate (EDR), however the manual observation of turbulence remains subjective (Appendix 1 PANS-ATM). Pilots were sited that it may be difficult to differentiate between moderate and severe turbulence and consequently a report of ‘moderate to severe’ turbulence may be issued. Furthermore, IATA noted that turbulence reporting is largely a function of aircraft type and type of turbulence. In terms of the MWO, it is not certain what category to issue (moderate or severe). The categories selected by the METWSG are in accordance with those in PANS-ATM (Doc 4444) for simplicity reasons. The meeting sought clarity in defining moderate and severe turbulence to assist pilots and MWOs.

15.1.4 Before a long-term solution to the problem of interpreting a ‘moderate to severe’ turbulence report is available, IATA deemed the use of ‘severe’ acceptable if the report is issued as ‘moderate to severe’ provided that the frequency of occurrence of this reporting is limited (e.g. less frequent than once an hour) and that caution was placed on the size of the SIGMET issued, if warranted (area defined be as concise as possible given the event). The meeting agreed that this information be provided in the SIGMET Guide after consultation with Headquarters and a select number of States (e.g. Hong Kong China, Australia and New Zealand). This was considered a pragmatic approach while the overall issue of determining the feasibility of providing guidance on manual observation and reporting of turbulence and icing as required in Amendment 75 be considered by ICAO.

15.1.5 The meeting agreed that the fastest route to bring this to the attention of ICAO (Headquarters) would be that a member of the METWSG submit a study note to the METWSG/3 meeting being held in November 2010 (an APANPIRG Conclusion would not be addressed by the Air Navigation Commission until January 2011 and the METWSG meeting in November 2010 would have passed). Determining the frequency of this occurrence would help the user further understand the implications of being conservative in issuing severe turbulence SIGMET (or SPECIAL AIREP) for a ‘moderate to severe’ turbulent air report.

15.2 Implementation of QMS

15.2.1 The meeting noted that requirements for Quality Management System (QMS) for all MET elements in Annex 3 associated with Amendment 75 will become a requirement in 2012, as opposed to 18 November 2010 for other changes associated with Amendment 75.

Quality control for aviation MET products in Republic of Korea

15.2.2 The meeting acknowledged the pre-quality control programme for OPMET data to verify and correct meteorological elements before the transmission of OPMET data through the Aeronautical Fixed Telecommunication Network (AFTN). The pre-quality control system is working at two levels, first, at Aerodrome Meteorological Observation System (AMOS) level and second, meteorological message level such as METAR, MET REPORT, TAF, WARNING, SIGMET and AIRMET at 13 airport weather offices in the Republic of Korea since December 2009. The pre-quality control programme is aligned with ICAO Annex 3 and notifies errors to personnel by pop-up windows to re-check before transmission of the message. Pre-quality control elements at AMOS level are continuity, limitation, interval based on seasonal norms and sudden variations at the meteorological message level, timeliness, format conformity, typo/omission, observing standards and so on. The result of this pre-quality control system is expected to increase the accuracy of OPMET data required for the aviation operational efficiency.

Aerodrome Climatological Summaries

15.2.3 The meeting acknowledged the establishment of aerodrome climatological summaries for selected Australian airports consistent with ICAO and WMO recommendations. These summaries assist in aerodrome forecasting and aviation industry strategic and operational planning. Climatological summaries of the frequency of threshold weather elements at given times of the day for a particular month were given for visibility and cloud-base height combination, visibility, cloud-base height, surface temperature range, and concurrent wind direction and speed. Criteria in developing these tables include a minimum of 5 continuous years of record and only aerodrome observations used. Meteorological data from automated sensors will be considered in the future. The initial set of climatological summaries for 233 sites is expected to be available to users through a customized web interface in the second half of 2010.

Meteorological satellite launch

15.2.4 The meeting acknowledged the first launch of a meteorological satellite, Communication, Ocean and Meteorological Satellite (COMS) by the Korea Meteorological Administration (KMA) on 27 June 2010 which is located 36,000 km above longitude 128.2 degrees East and the Equator. The COMS has been sending pictures since 12 July 2010 and is expected to be operational in early 2011 after 6 months of trial operation. Meteorological elements driven out from the meteorological data processing system of COMS consist of 16 elements such as cloud detection, radiation, surface temperature, ice/snow coverage, fog, and aerosol including Asia-dust and so on. Observation products provided by COMS are every 3 hours for the hemisphere, every 15 minutes for the East Asia Region, and every 8 minutes during severe weather phenomenon for the Korean Peninsula. Future developments by the Korea Aviation Meteorological Agency (KAMA) in cooperation with the National Meteorological Satellite Centre (NMSC) include analysis methods of severe weather on air spaces such as typhoons, lightning, and turbulence that impact air routes, and improved forecast technology for aviation that improve MET services to aviation.

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Agenda Item 16: Review

1) CNS related Performance Framework Forms
2) MET related Performance Framework Forms
3) review and update CNS/ATM Implementation Planning Matrix

Regional Performance Framework Objective

16.1 The meeting reviewed and discussed the regional Performance Objectives and associated Asia/Pacific performance Metrics.

16.2 The meeting noted that ATM/AIS/SAR SG/20 held two week ago noted that States were required to provide a large number of data making it more difficult to report such information and IATA clarified that there is need to indicate number of measurements for PBN implementation which had been discussed at the sixth meeting of PBN Task Force.

16.3 It was recalled that CNS/MET SG/13 discussed the proposed metrics in particular APAC Efficiency-4 and considered it necessary to further develop the harmonized methodology for measurement once the Metrics are adopted by APANPIRG because the delay could be because of various reasons. The meeting noted that ATM/AIS/SAR SG/20 developed a draft Conclusion to invite ICAO to develop a common set of performance metrics for all the ICAO regions so as to facilitate comparative analysis and establish the globally harmonised guidance on methodology of how to collect the data in order to achieve commonality.

16.4 The meeting also noted that NAT SPG/46 had considered the need to have a clearly defined common approach to performance monitoring and measurement and the need to agree on a uniform set of metrics. The NAT SPG acknowledged the need to identify a suitable set of metrics – Key Performance Indicators (KPI) related to key performance areas (KPA) of: access, capacity, cost effectiveness, efficiency, environment, flexibility, predictability and safety. NAT implementation management group (NAT IMG) has been tasked to identify such metrics i.e. KPIs. These metrics would then be incorporated into a performance monitoring process.

16.5 The meeting recalled that APANPIRG/20 also adopted Conclusion 20/3 to encourage States to use the similar template format from the regional objectives as the basis for their national objectives to align with Regional & National performance Objectives. The meeting noted that States are expected to collect and provide data to support the existing four APAC regional metrics and report to APANPIRG/21.

Performance Framework Forms in the CNS and MET fields

16.6 The meeting reviewed and updated the regional Performance Framework Forms (PFFs) for the CNS and MET fields that were adopted by APANPIRG/20 via Conclusion 20/2 in support to the ICAO planning objective to achieve a performance based global air traffic management (ATM) system through the implementation of air navigation systems and procedures in a progressive, cost-effective and cooperative manner. The MET WG updated the performance frame work forms to include monitoring of the IVATF developments in order to develop a framework for an ASIA/PAC contingency plan for weather phenomena that include volcanic ash events, tropical cyclone, Tsunami and radioactive cloud. In addition, the renaming of the task force VA/TC I TF to METWARN/I TF with broader responsibilities was accounted for. Added tasks of the MET/ATM task force were included. Lastly, the implementation of WIFS by 2012 associated with the cessation of ISCS-G2 in June 2012 was reflected in the forms. Given these changes, the meeting adopted the following decision.

Draft Decision 14/37 - Performance Framework Forms (PFFs)

That, updated performance Framework Forms (PFFs) of CNS and MET fields as contained in **Appendix A2** to the Report be adopted.

Review of CNS/ATM Implementation and Planning Matrix

16.7 The Secretariat presented the matrix reflecting implementation status of CNS/ATM systems in Asia/Pacific Regions. It was noted that the CNS/ATM Implementation Planning Matrix was developed in accordance with the Conclusion 11/37 of APANPIRG and the 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 meeting was informed that the Matrix was updated by the Fifth meeting of ATN Study and Implementation Task Force held in May 2010 and will be further updated at the next ADS-B Study and Implementation Task Force meeting to be held in middle August 2010.

16.8 The meeting encouraged the member States of the Sub-group to provide updates to the information contained in the Table from time to time. It was considered unnecessary to wait for meetings to update the information.

16.9 The meeting reviewed and updated the information in the Matrix which is provided in **Appendix A3** to this Report.

Fellowship Programme – Republic of Korea

16.10 Under this agenda item, the meeting also noted information regarding fellowship training programme provided by the Republic of Korea (ROK) to the developing countries in accordance with MOU signed with ICAO. Since 2001 the ROK has provided assistance to train 360 fellows from 84 countries in the field of air navigation and ROK will continuously make every possible effort to contribute to balanced development of international civil aviation.

16.11 While the meeting appreciating the training programme provided by the Republic of Korea and important role of training, there was a request for a need to issue the letter of invitation to States and their nominated and selected trainees at least 2 months in advance to allow necessary arrangement for travel which can be made in time.

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Agenda Item 17: Review of deficiencies in the CNS and MET fields:

1) status of CNS deficiencies (APANPIRG Deficiency List)
2) status of MET deficiencies (APANPIRG Deficiency List)

17.1 **Status of CNS deficiencies**

17.1.1 While reviewing the status of deficiencies identified by APANPIRG/20, the meeting observed that resolving safety related deficiencies was one of the most important tasks of PIRGs. The meeting reviewed the deficiencies listed in the Deficiency List in the CNS fields and noted the following observations

Air-ground communication in Yangon FIR
(AP-CNS-01 First reported in 1998 and later in July 2010)

17.1.2 The extended-range VHF coverage in the northern part of Yangon FIR utilizes 3 RCAG stations located at Lashio, Mandalay and Sittwe operating on 126.750 MHz. To improve the signal quality, a procedure for selection of RCAG stations has been developed based on the statistics and samples. For the Southern part of Yangon FIR, Yangon ACC utilizes local VHF station in Yangon airport and another two RCAG stations located at Myeik and Pathein operating on 128.750 MHz.

17.1.3 In 2009, IATA provided monitoring reports on the air/ground communications status in Yangon FIR. These reports indicated that some improvement of VHF communication had been achieved. Preliminary review of the report revealed that some 70 percent reports from pilots indicated they had normal air ground communication. Based on the statistics collected by Myanmar, loss of communication with aircraft in Yangon FIR is rare. However, communication difficulties were still experienced by some pilots flying over the FIR

17.1.4 A report was received on 1 July 2010 indicating poor to no communication in the Yangon FIR on VHF 126.750 MHz and HF at 18:00 UTC at FL360. Signal strengthen was only 1 to 2. No COMS lasting up to 15 minutes.

17.1.5 Myanmar requested IATA and the operators to provide timely feedback for communication problems experienced. It was expected that the report or feedback for investigation should include the following minimum information. The operators are also required to be aware of the characteristics of the communication infrastructure and their condition.

- Time of occurrence and position of occurrence added in the report template;
- ATS Route no. and the closest waypoint when problem experienced;
- Flight level which is important to analyze the coverage of RCAG; and
- The report is required to be forwarded to DCA Myanmar as soon as possible preferably within 1 to 2 days of the occurrence.

17.1.6 While noting and appreciating the efforts made by the Administration and close coordination between IATA and ICAO Regional Office, IATA informed the meeting that roadmap is being workout to remove requirement for the IFBP in Yangon FIR.

ATIS function at Kathmandu and Dhaka airports
(AP-CNS-02 First reported in May 2007)

17.1.7 The meeting noted that the ATIS function has been implemented at TIA, Kathmandu and the deficiency (AP-CNS-03) had been deleted from the list of deficiencies in CNS field in 2009.

The ATIS function has been implemented at Dhaka Airport and official notification was received from Bangladesh on 17 September 2009. The deficiency (AP-CNS-02) has been deleted from the list of deficiencies in CNS field accordingly.

Manila-Hong Kong AFTN circuit and Manila – Hong Kong ATS Direct Speech Circuit (First reported in 2007).

17.1.8 The circuit resumed operation on 4 May 2008. An official notification from Air transportation Office on the Restoration was received on 13 May 2008. However, again in May 2009 there was a 719 minutes of circuit outage when cable was upgraded between CAAP and Philcom on 1 May 2009.

17.1.9 Since February 2010, the circuit stays quite stable. In the last 13 months, there were only three interruptions due to equipment maintenance/problems at Phicom in March, June and August 2009. The circuit serviceability performance has shown that it has achieved satisfactory status i.e. more than 97% except for August, September 2009 which were 85% and 96.4% respectively. CAAP has been invited to notify the Regional Office for removal of the deficiency (AP-CNS-04) from the list.

HF Communication problem in Mumbai FIR
(First report in September 2006)

17.1.10 Concerns on High Frequency (HF) air-ground communications at Mumbai FIR were expressed at Sixteenth Meeting of ATM/AIS/SAR Sub-group and subsequently in the Seventeenth Meeting of APANPIRG in 2006. The concerns were on the quality of communication particularly, the noisy reception conditions and channel congestions. Follow-up actions were taken by the Airport Authority of India (AAI) to improve HF communications over Mumbai FIR.

17.1.11 However, negative contact on the route B459 has been reported by an operator in 2009. The matter has been taken up and the State has been requested to investigate into the matter and take up urgent rectification to mitigate the problem. . In one report filed on 9 April 2010, Captain of the South African Airways reported 'No HF communications were established with Mumbai on BOM-JNB. All published frequencies tried including the frequencies given over VHF.' In a separate report received from the operator's representative, it has been reported that 'HF Communication channels over crowded. The same frequencies are in use by multiple control stations. Superfluous information is requested and passed – this causes channel congestion. When contact is made, communication quality is good'.

17.1.12 India informed the meeting that efforts have been made by Airport Authority India to improve the services by replacing antenna. HF receivers will be replaced with new ones at end of this year. The recent report from a flight on JNB-BOM indicated that the HF communications in Mumbai FIR has been improved. In view of the foregoing, the meeting agreed not to include it into the list of Deficiencies for the time being.

Navigation Aids Performance deficiencies in Philippines
(First report in September 2009)

17.1.13 Disruption of Air Traffic Services in Manila FIR was reported on 13 September 2009 for about two hours. It was reported that the Standby Power source failed to takeover the load when the main power failed. It has been reported that action for the new CNS/ATM project is in procurement stage and is expected to be operational by 2013. Interim project of replacement of the 14 year old ATM System in Manila has also been taken up.

17.1.14 Subsequently on 19 June 2010, failure of DVOR at Manila was reported at 05:30 leading to non availability of instrument approach procedures at the Ninoy Aquino International Airport (NAIA). The facility was restored for normal operations on 7 July 2010. Both the ILSs provided to serve the instrument runway were unserviceable. It has earlier been reported that the ILSs and DVOR provided at the NAIA are quite old and have become unreliable. Moreover, difficulty is being faced in getting spares for the equipment. The ILS 24 and ILS 06 became unserviceable on 26 September 2009 and 27 October 2009 respectively. The Administration has been urged to take necessary remedial action at the earliest. This was considered as deficiency in CNS field subject to remedial action by the Civil Aviation Authority of Philippines.

Poor ground/ground communication between Afghanistan and Pakistan

17.1.15 Because lack of reliable communication infrastructure between Afghanistan and Pakistan, the poor performance of Aeronautical Fix Service including data communication between Kabul and Karachi and ATS voice communication between Lahore and Kabul has become an issue of concern. Karachi – Kabul AFTN circuit became intermittent since 29 June 2010 due to unstable performance of VSAT system. Currently e-mail and AFTN messages are sent from Karachi AFTN centre but no response is normally received. AFS requirements as specified in the regional air navigation plan are not met. Administrations were urged to work out a remedial solution and improve AFS service.

17.1.16 The updated List of Air Navigation Deficiencies in the CNS filed is in **Appendix A4** to the Report.

17.2 Status of MET deficiencies (APANPIRG deficiency list)

17.2.1 The meeting recalled APANPIRG/20 Conclusion 20/74 which resulted in the removal of the deficiency (AP-MET-15) on the provision of SIGMET for the Phnom Penh FIR. The Kunming MWO provides SIGMET for the Phnom Penh FIR since June 1, 2009 in accordance to a bilateral agreement between China and Cambodia. The establishment of an MWO (AP-MET-11) still exists for Cambodia since other provisions (e.g. dissemination of radioactive material information) are necessary for a MWO. Note that the bilateral agreement is being updated to reflect the MWO responsibility change from Kunming to Chengdu for consideration by Cambodia.

17.2.2 Myanmar has informed the Regional Office (February 2010) that SIGMET is provided by the Yangon MWO. The meeting also noted that Myanmar participated in the SIGMET tests in November 2009 (except for WC SIGMET since an advisory was not issued by TCAC New Delhi). As a result of the RODB/4 meeting, Myanmar was recently informed by the Regional Office to issue SIGMET to all RODBs in the Region via AFTN. SIGMET monitoring by RODB Bangkok was conducted from 18-31 May 2010, which revealed approximately a dozen SIGMET issued, however, some were not justified as they referenced tropical depression, which is not a SIGMET phenomenon element. In addition, format errors were identified and Myanmar notified on 10 June 2010. The issuance of SIGMET is now a part of the normal duties of the Yangon MWO and there are improvements (format of period of validity, the use of TS instead of CB), however, some errors still noted (e.g VYYY Yangon FIR missing on second line of SIGMET). The meeting was encouraged, but agreed (along with IATA) that another monitoring period in August was needed to prove a high degree of compliance for removal of AP-MET-13 at APANPIRG/21. In light of the above, the meeting formulated the following draft Conclusion.

Draft Conclusion 14/38 – Removal of the APANPIRG Air Navigation Deficiency AP-MET-13

That, the air navigation deficiency AP-MET-13 be removed from the APANPIRG air navigation deficiencies list *provided remaining errors identified in the issuance of SIGMET are resolved and proven in the next monitoring period in early August 2010.*

17.2.3 The meeting also noted that Myanmar notified the Regional Office (February 2010) of an action plan on obtaining SADIS FTP in 2010 that would provide the required WAFS information in flight briefings (AP-MET-10). Confirmation of WAFS information in flight documentation is needed for removal of this deficiency.

17.2.4 The meeting noted that Lao PDR plans to establish a MWO responsible for the provision of SIGMET in 2010 and that Lao PDR participated in the November 2009 SIGMET tests. The meeting agreed that once this is achieved, a RODB monitor for the issuance of SIGMET for the removal of the related deficiency (AP-MET-12).

17.2.5 The meeting recalled that DPR Korea notified the Regional Office on 30 March 2009 of the establishment of an MWO at Sunan (published in AIP) and has participated in the WS SIGMET test on 24 November 2009. Furthermore, DPR Korea acknowledged the request to send SIGMET to all RODBs in the Region and planned to follow this request beginning 10 March 2010. As a result, FASID Table MET 1B reflects the establishment of the MWO (approved amendment proposal - SN: APAC 10/06 - MET).

17.2.6 The meeting noted that the removal of the deficiency (AP-MET-16) on SIGMET for DPR Korea is contingent upon sufficient evidence of SIGMET issuance through monitoring by RODB Tokyo. RODB Tokyo monitored the issuance of SIGMET for the period 1 April to 20 June 2010 for the Sunan FIR and neighboring FIRs (Shenyang, Incheon, and Vladivostok) which revealed dozens of SIGMET in the neighboring FIRs, but none from Sunan FIR. SYNOP and TAF data from DPR Korea were also used in the analysis which revealed thunderstorm observed at one of the SYNOP stations in a three hour period over 100 times and 8 TAF with thunderstorm in the forecast. Note that the strength and aerial coverage of thunderstorms were not verified. Nevertheless, the meeting agreed that there is not enough sufficient evidence for the removal of this air navigation deficiency at this time.

17.2.7 The meeting recalled APANPIRG/20 Conclusion 20/75 which resulted in the addition of 5 deficiencies to the APANPIRG list of deficiencies. These deficiencies were a result of findings from the ICAO Technical Co-operation Project *Cooperative Agreement for Enhancement of the Meteorological Service for Aviation in the South Pacific (CAEMSA-SP)*. Specifically, lack of WAFS forecasts in flight briefings for Nauru, Kiribati, and Solomon Islands (AP-MET-18, -19 and -20), lack of meteorological observing station for Nauru (AP-MET-21), and lack of volcano monitoring for the Kingdom of Tonga (AP-MET-17) were included in the list of APANPIRG deficiencies.

17.2.8 With regards to AP-MET-18, -19 and -20, States are encouraged to obtain WAFS forecasts via WIFS, which would mitigate this deficiency. The cost of acquiring WIFS will be provided by the United States and added in the proposal to obtain a sponsor to assist States in acquiring WAFS products. With regards to AP-MET-21, assistance is likely needed from a Donor to provide the necessary equipment and possible training for maintenance or a maintenance contract, which is expected to be discussed at the ICAO TCB CAEMSA-SP Phase II Donor Workshop in Vanuatu in October 2010. This Workshop is expected to secure donations and develop and assign tasks necessary in mitigating the MET deficiencies identified in CAEMSA-SP. With regards to AP-MET-17, an agreement between the Ministry of Transport of the Kingdom of Tonga (MTKT) and the Ministry of Lands, Survey and Natural Resources of the Kingdom of Tonga (MLSNRKT) on the dissemination of volcanic ash information from MLSNRKT to MTKT for distribution to ACCs, MWOs and VAACs is under consideration.

17.2.9 The meeting noted that coordination with States on formalizing inter State MET Services in the South Pacific was conducted to address recommendation six, safety oversight, of the CAEMSA-SP Project Terminal Report. Agreements on the provision of **TAF** by Fiji for several Island States (Kiribati, Niue, Samoa, Cook Islands and Tonga) were drafted for States' consideration. In addition, a draft agreement was developed for the provision of **SIGMET** by Papua New Guinea on behalf of the Solomon Islands.

17.2.10 IATA made tribute to the efforts being made with the deficiencies referenced above and encouraged continued effort in mitigating these deficiencies. IATA further noted that aerodromes in the South Pacific are critical to safety of operations, in particular to ETOPS.

Cost Recovery Proposal

17.2.11 To partly address recommendation eleven, cost recovery, of the CAEMSA-SP Project Terminal Report, the meeting reviewed the dilemma of providing necessary MET services for international aviation when cost recovery is not sufficient in certain States, particularly those with minimal air traffic (e.g. South Pacific Island States), yet their location for alternate aerodrome planning is crucial to the overall planning by airlines. To assist in finding an option for providing the necessary MET services based on cost recovery, the meeting agreed that larger air space blocks would need to be determined to develop and maintain a level of MET service that satisfies Annex 3 provisions. Since the current documentation, in particular the *Manual on Air Navigation Services Economics* (Doc 9161, 4th edition, 2007) is limited in addressing this dilemma, the meeting agreed to formulate the following draft Conclusion.

Draft Conclusion 14/39 – 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.

17.2.12 The meeting noted that tracking of and reporting on the above Conclusion would be useful and that the development should be in concert with WMO documents that provide guidance on cost recovery. Furthermore, to make cost recovery successful, other legislative matters such as the establishment of a MET Authority is necessary and that the establishment of MET in the Pacific Aviation Safety Oversight (PASO) would assist in these matters (as recommended by TCB CAEMSA-SP).

17.2.13 One Member State expressed a view that consideration for charging airlines and ATM for cost recovery can be vastly different in view of the difference in the nature of their 'business'.

17.2.14 The updated List of Air Navigation Deficiencies in the MET filed is in **Appendix A5** to the Report.

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Agenda Item 18: Future Programme.

TOR and Subject/Tasks List of CNS/MET Sub-group

18.1 The meeting reviewed the Terms of Reference of the Sub Group. The meeting did not identify the need to amend the Terms of Reference. The meeting also reviewed the Subject/Tasks List and included several new items including further development of regional HF radio communication guidance material and conducting analysis of ionospheric data collected for development of model for GNSS, promote implementation of AIDC and improve AMS(R)S communication in the remote and oceanic area in the Tasks List. The MET field tasks were updated to align with the change of task force structure in that the VA/TC I TF broadened duties to include meteorological advisories and warnings and now referenced as METWARN/I TF. The status of on-going tasks was also updated where necessary. Accordingly the meeting adopted the following Decision.

Draft Decision 14/40 - Updated Subject/Tasks List of the CNS/MET Sub-group

That, the updated Subject/Tasks List of the CNS/MET Sub-group provided in **Appendix A6** to the Report be adopted.

Next Meeting

18.2 It was agreed that the Fifteenth Meeting of the CNS/MET Sub Group should be scheduled tentatively for 18 to 22 July 2011 at the ICAO Regional Office, Bangkok. The dates are to be confirmed by the APANPIRG/21 meeting.

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Agenda Item 19: Any other Business

19.1 Under this agenda item, meeting was provided with an updates on the development of NextGen by the USA. Current demands on the United States of America's national air transportation system are exceeding its ability to provide sufficient system capacity domestically and abroad. Operating and maintenance costs of the air traffic system are outpacing revenues, and the air carrier industry is experiencing a period of dramatic change. Security requirements established in the aftermath of the 11 September 2001 jetliner attacks have significantly impacted costs and the ability to efficiently move people and cargo. In addition, growth in air transportation is provoking community concerns over aircraft noise, pollution, and congestion.

19.2 Merely adapting air transportation's current paradigm will not be sufficient to meet its challenges. Instead, transformation of today's system is required to ensure a healthy, environmentally friendly, globally interoperable air transportation system for 2025. In 2003, the U.S. Congress established the Joint Planning and Development Office (JPDO) to define a national strategy for developing the Next Generation Air Transportation System (NextGen). The NextGen vision for 2025 enables the safe, efficient and reliable movement of large numbers of people and goods throughout the air transportation system in a way that is consistent with national security objectives. NextGen's vision is founded upon an underlying set of principles and enabled by a series of key capabilities that will free the U.S of many current system constraints, support a wider range of operations, and deliver an overall system capacity up to three times greater than that of current operating levels.

19.3 The meeting noted the initiative taken by India in implementing automation to improve the overall capability in Aeronautical Information Service through establishing an Integrated AIS/AIM System to manage aeronautical data chain processes involved in designing to publication stages of Aeronautical Information Publication products including Aeronautical Maps/Charts and Circulars.

19.4 The meeting expressed appreciation and gratitude to DGCA, Indonesia for hosting the meeting and for the excellent arrangements made for the meeting and the warm hospitality extended to the participants.

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List of Follow-up to APANPIRG/20 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 22 July 2010	ANC action
D 20/26	**Revision of Subject/Tasks List of ATNICG**	That, the revised Subject/Tasks List of ATNICG provided in **Appendix A** to the Report on Agenda Item 3.4 be adopted.	**Notify ATNICG WG/6 and ATNICG**	**ICAO APAC Office**	**ATNICG informed and paper prepared**	**Sept 2009** **May 2010**	**<u>Completed</u>** ATNICG WG/6 held from 22 to 25 Sept 2009 informed. ATNICG/7 notified	
C 20/27	**ATN/AMHS Guidance Material**	That, the following guidance materials for ATN/AMHS Implementation be adopted and published. – Version 3.1 of the Asia/Pacific IDRP Routing Policy provided in **Appendix B** to the Report on Agenda Item 3.4**;** – AMHS/ATN Network Management Operational Procedure Guidelines provided in **Appendix C**; – Amended AMHS Conformance Testing (AMHS Manual provided in **Appendix D;** and – Aeronautical Telecommunication Network Security Checklist provided in **Appendix E.**	**Publish on website**	**ICAO APAC Office**	**Published on website. States notified**	**Oct 2009**	**<u>Completed</u>** State Letter dated 12 October 2009 issued	

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 22 July 2010	ANC action
C 20/28	**Short-term procedure for Global AMHS address Coordination**	That, ICAO request States to register their AMHS addresses with EUROCONTROL AMC through Aeronautical Radio of Thailand (Aerothai) and provide a copy of this information to ICAO Asia/Pacific Office.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Nov 2009**	**Completed** State Letter dated 3 November 2009 issued	
C 20/29	**AMHS Addressing Scheme**	That, a) States be urged to update information in respect of their administrations in the regional AMHS Naming Register; and b) States hosting BBIS hubs be requested to process both the XF and CAAS addressing schemes.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Nov 2009**	**Completed** State Letter dated 3 November issued	
C 20/30	**Revision of FASID Tables CNS-1B, CNS-1C and CNS-1E**	That, FASID Tables CNS-1B, 1C and 1E for ATN Router Plan, AMHS Routing Plan and AIDC Routing Plan be replaced with the revised CNS Tables provided in **Appendices F, G** and **H** respectively to the Report on Agenda Item 3.4.	**Prepare amendment proposal**	**ICAO APAC Office**	**Amendment proposal issued and processed**	**March 2010**	**Completed** State letter dated 26 March issued	

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 22 July 2010	ANC action
C 20/31	**State and Operator aircraft information for GOLD**	That, a) States be urged to provide Region & State Information for inclusion in the GOLD Appendix E, by sending the completed forms(s) provided in **Annex 1** to the Report on agenda item 3.4 for their flight information regions (FIRs) or control areas (CTAs) by 30 October 2009; and b) IATA be urged to coordinate with member airlines for providing operator & aircraft information for the GOLD Appendix F by sending completed form(s) as provided in **Annex 2** to the Report on agenda item 3.4 for each variance, clarification, or addition to applicable aircraft type by 30 October 2009.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Sept 2009**	**Completed** State Letter dated 25 September 2009.	

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 22 July 2010	ANC action
C 20/32	**Second Satellite Data-link Operational Continuity Meeting**	That, ICAO be invited to organize 2nd Satellite Data-link Operational Continuity Meeting in 2010 for stakeholders to review the developments on the performance and provision of satellite data link communication in the Asia/Pacific Region and develop a solution.	**Coordination and organize SOCM/2 Meeting**	**ICAO APAC Office**	**Meeting conducted**	**Oct 2010**	Postponed to end of 2010 or early 2011 due to FANS SATCOM Improvement Team Meeting (FSIT) had not been reconvened as planned	

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 22 July 2010	ANC action
C 20/33	**Coordinate Implementation of Reduced Horizontal Separations with CSPs**	That, recognizing the technical limitations in satellite data link communications capability for the provision of ADS-C and CPDLC, States intending to implement reduced horizontal separations based on RNAV 10 and RNP 4 PBN specifications in oceanic and remote area commence early coordination with Communication Service Providers (CSPs) in order to ascertain adequate data link communication/surveillance capability to support the proposed implementation. Outcomes should be recorded in a formal Service Level Agreement (SLA) between implementing States and CSPs, jointly or severally, to ensure that capabilities are available to properly support RCP 240/D specifications contained in Appendices B and C to the GOLD on an ongoing basis.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Jan 2010**	**Completed** State Letter dated 7 January 2010 issued	**Noted**

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/34	**Technical Limitations in Satellite Data Link Communications Capability**	That, recognizing current technical limitations in satellite data communications capability that impacts PBN based separation applications particularly for RNAV10 and RNP 4 in the remote and oceanic areas, ICAO be invited to address this issue at global level.	**Prepare Issue Form**	**ICAO APAC Office** **ICAO HQ** ANB/CNS ATB	**Issue Form sent HQ** **Global monitoring**	**Dec 2009** **On going**	**Completed**	Noted and that ICAO will undertake a case study on the ownership and control of the air navigation services infrastructure, including the development of a draft service level agreement for use by air navigation service providers. Furthermore, usage of two or more autonomous networks by States and international organizations will provide much better availability. The Secretariat to monitor further developments.

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 22 July 2010	ANC action
C 20/35	**Asia-Pacific Flight Procedure Programme**	That, States be encouraged to participate in the Asia-Pacific Flight Procedure Programme in order to build or improve their instrument flight procedure capabilities, meet the PBN implementation goals of Assembly Resolution A36-23 and enhance flight safety, efficiency and environmental protection.	**Notify States**	**ICAO APAC Office** ICAO HQ ANB/ATM	**State Letter**	**July 2009** **2011**	**Completed** **State Letter** T6/13.11.2-AP089/09 issued on 29 July 09 & follow-up letters had been issued	Noted Welcomed the imitative and requested the Secretariat to follow it up for with a similar approach for AFI region.
C 20/36	**Preparation for PBN Implementation**	That, States that have not done so, are urged to develop their State PBN Implementation Plans, and take action in accordance with those plans to implement WGS-84 and Electronic Terrain and Obstacle Data in their States.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Nov 2009**	**Completed** State Letter dated 4 November 2009 issued	Noted

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/37	**Guidance material for PBN Implementation**	That, ICAO be invited to develop guidance materials on: a) establishing common implementation rules and technical standards for GNSS reporting and prediction requirements; b) assigning PBN capability to GPS IFR aircraft in the first instance without the need for recertification; and c) PBN-specific aspects of en-route safety assessment.	**Prepare Issue Form**	**ICAO APAC Office** ICAO HQ/ ANB/ATM ICAO HQ/ ANB/ATM	**Issue Form sent HQ** Guidance material for PBN implementation Status report	**Dec 2009** **2011** **June 2010**	**<u>Completed</u>**	Noted To address these PBN issues through appropriate ANC Panel and Study Groups. Requested the Secretariat to provide a status report on global implementation of PBN.
D 20/38	**Regional RAIM prediction System**	That, PBNTF be tasked to examine the feasibility of establishing a regional RAIM prediction system.	**Notify PBNTF**	**ICAO APAC Office**	**PBNTF informed and paper prepared**	**Feb 2010**	**<u>Completed</u>** PBN TF/6 notified about the task through WP/8	

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 22 July 2010	ANC action
C 20/39	**RNAV Human Factors**	That, RNAV safety message provided in **Appendix J** to the Report on Agenda Item 3.4 be distributed to the States for further distribution to all operators involved in RNAV operations in order to apply the lessons learnt.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Nov 2009**	**Completed** State Letter dated 3 November 2009 issued	
C 20/40	**PBN Implementation Progress Report Template**	That, States be urged to use the PBN Implementation Progress Report Template provided in **Appendix K** to the Report on Agenda Item 3.4 for all future reporting of their status of PBN implementation. The Report should be submitted at each of the future PBN Task Force Meeting.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Jan 2010**	**Completed** A SL had been sent to States on 4 Aug09) urging States to provide progress report using the template. Reminder was sent.	
C 20/41	**Asia/Pacific Regional PBN Implementation Plan**	That, the Asia/Pacific Regional PBN Implementation Plan provided in **Appendix L** to the Report on Agenda Item 3.4 be adopted as Version 1.0.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Nov 2009**	**Completed** State Letter dated 4 November 2009 issued	**Noted**

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/42	**PBN Safety Assessment Training**	That, ICAO be requested to assist in addressing the PBN safety assessment training needs in the region.	**Prepare Issue Form**	**ICAO APAC Office** ICAO HQ ANB/ATM	**Issue Form sent HQ** PBN safety assessment training needs	**Dec 2009** **2012**	**<u>Completed</u>**	**Noted** To address this performance based navigation issue through appropriate ANC Panels and Study Groups.
C 20/43	**RNP AR Approach Implementation**	That, States be urged to give detailed considerations to the operational need, safety and cost benefits prior to deciding on RNP AR Approach implementation.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Nov 2009**	**<u>Completed</u>** State Letter dated 4 November 2009.	
D 20/44	**PBN Task Force Activities**	That, the PBN Task Force continues with the current TORs for two additional meetings in 2010.	**Notify PBNTF**	**ICAO APAC Office**	**PBNTF informed and paper prepared**	**Feb 2010**	**<u>Completed</u>** PBN TF/6 informed about APANPIRG Conclusion through WP	
C 20/45	**Sharing Information on ICAO Panels/SGs**	That, ICAO be requested to consider sharing information on ICAO Panels and Study Groups activities/outcome regularly with regional planning/implementation groups**.**	**Prepare Issue Form**	**ICAO APAC Office** **ICAO HQ**	**Issue Form sent HQ**	**Dec 2009**	**<u>Completed</u>**	

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 22 July 2010	ANC action
C 20/46	**Revision of the Strategy for the Provision of Navigation Services in the Asia/Pacific Region**	That, the updated Strategy for the provision of navigation services provided in **Appendix M** to the Report on Agenda Item 3.4 be adopted and published.	**Notify States**	**ICAO APAC Office**	**State Letter Updated Strategy posted on website**	**Nov 2009**	**Completed** State Letter dated 5 November 2009	
D 20/47	**Guidance material for flight inspection/validation of ADS-B ground stations**	That, ADS-B SITF be tasked to study the need for developing guidance material for flight inspection/validation of ADS-B ground stations.	**Notify ADS-B SITF**	**ICAO APAC Office**	**ADS-B SITF informed and paper prepared**	**May 2010**	ADS-B SITF/9 will be notified. The meeting has been rescheduled for Mid Aug.10	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/48	**Flight Inspections and Validation of Flight Procedures**	That, ICAO be invited to: a) carry out a study for use of DGPS as a positioning reference system for flight inspection; b) provide guidelines for selecting GP reference point for flight inspection; c) review areas of possible misinterpretations in ICAO Doc 8071 such as the ones shown in **Appendix N** to the Report on Agenda Item 3.4 and provide necessary guidance on the interpretation of the ICAO requirements in order to avoid inconsistency of interpretations and to harmonize application of ICAO Standards and Recommended Practices; d) review information on flight validation as contained in ICAO Doc 8071 Volume II consequent to new Doc 9906 Volume V becoming applicable; and e) develop templates for flight validation reports for PBN IFPs including RNP APCH procedure. A sample template developed by Aerothai for RNP APCH is provided in **Appendix O** to the Report on agenda item 3.4.	**Prepare Issue Form**	**ICAO APAC Office** ICAO HQ/ ANB/ATM	**Issue Form sent HQ** Flight Inspections and Validation of Flight Procedures	**Dec 2009** 2011	**Completed**	**Noted** To address this performance based navigation issue through appropriate ANC Panels and Study Groups.

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 22 July 2010	ANC action
C 20/49	**Update of procedures and infrastructure**	That, the States be a) reminded of the contents of State Letter AN 7/5-01/52 dated 11 May 2001 on ILS maintenance procedures; b) reminded to provide updates to information as contained in the eighth edition of the flight inspection catalogue; and c) urged to consider upgrading their FIS to include the flight inspection requirements of GNSS, Interference, ADS-B, Multi-lateration etc. as necessary.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Nov 2009**	**Completed** State Letter dated 5 November 2009.	
D 20/50	**Subject/Tasks List of ADS-B Study and Implementation Task Force**	That, the Subject/Tasks List for ADS-B Study and Implementation Task Force provided in **Appendix P** to the Report on Agenda Item 3.4 be adopted.	**Notify ADS-B SITF**	**ICAO APAC Office**	**ADS-B SITF informed and paper prepared**	**April 2010**	ADS-B SITF/9 will be Informed. The meeting has been postponed to Mid Aug.10.	
C 20/51	**Workshop on ADS-B OUT equipage requirement**	That, ICAO be invited to organize a workshop on ADS-B OUT equipage requirement before May 2010 with the assistance from Australia and USA.	**Organise the workshop**	**ICAO APAC Office, Australia and USA**	**The workshop conducted**	**April 2010**	The workshop has been further postponed to Mid Aug.10.	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/52	**Table CNS 4A and Table CNS 4B**	That, the FASID Table CNS 4A and Table CNS 4B be replaced with updated Tables provided in **Appendix Q** and **Appendix R** to the Report on Agenda Item 3.4 in accordance with the established procedure.	**Prepare amendment proposal**	**ICAO APAC Office**	**Amendment proposal issued and processed**	**March 2010**	**Completed** **SL issued on 29 March 2010**	
C 20/53	**Revised Guidelines for Development of ADS-B Implementation Plan by States**	That, the revised guidelines for Development of ADS-B Implementation Plan by States provided in **Appendix S** to the Report on Agenda Item 3.4 be adopted.	**Notify States**	**ICAO APAC Office**	**State Letter Updated Strategy posted on website**	**Nov 2009**	**Completed** State Letter dated 4 November 2009 issued	

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 22 July 2010	ANC action
C 20/54	**Regional ADS-B Equipage Requirement**	That, States be urged to issue ADS-B authorizations for the interim period 2010-2020 (or until requirements can be harmonized globally) in Non-Radar Areas (NRA) airspace based on: – AMC20-24 certification or – Approval by CASA Australia or – The requirements of the CASA Civil Aviation Order 20.18 Amendment (No. 1) 2009 and Advisory Circular AC21-45 *Note: States that have not yet published regulations should implement necessary regulations that recognize that any one of the above requirements is acceptable and not specify an individual requirement.*	**Notify States**	**ICAO APAC Office**	**State Letter**	**Dec 2009**	**<u>Completed</u>** State Letter dated 18 December 2009 issued	
C 20/55	**Forward Fitment Requirements for SA Aware and FDE functionality**	That, ICAO recommends States concerned to adopt forward fitment requirements which include SA aware and FDE functionality as soon as reasonable.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Dec 2009**	**<u>Completed</u>** State Letter dated 18 December 2009	

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 22 July 2010	ANC action
C 20/56	**Coordination for SSR MODE S II Codes**	That, a) the Table on SSR Mode S Interrogator Identifier Codes as provided in **Appendix T** on Agenda Item 3.4 to the Report be adopted; and b) States be advised to provide the required information as specified in the Table on SSR Mode S Interrogator Identifier Codes to the ICAO Asia/Pacific Office for coordination and registration.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Jan 2010**	**Completed** State Letter dated 27 October 2009 issued	
C 20/57	**Planning Criteria for SSR Mode S II Code Assignment**	That, the Planning criteria for SSR Mode S II code coordination and assignment as provided in **Appendix U** to the Report on Agenda Item 3.4 be adopted as a provisional guidance material for use in the Asia/Pacific Region.	**Notify States**	**ICAO APAC Office**	**State Letter**	**Jan 2010**	**Completed** State Letter dated 27 October 2009.	**Noted**

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/58	**ICAO Position for the World Radio Communication Conference – 2011 (WRC-11) Agenda Items**	That, States be urged to: a) integrate ICAO Position on WRC-11 Agenda Items into their State Position presented to the regional telecommunication forum (APG) involved in the preparation of joint regional position on the Agenda Items; b) include ICAO Position on WRC-11 Agenda Items into the State Position to the extent possible; c) undertake to provide experts from their civil aviation authorities to participate in the development of State and regional positions; and d) ensure to the extent possible, State delegation to regional conferences, ITU Study Groups and WRC should include experts from Civil Aviation authorities.	**Notify States**	**ICAO APAC Office** **States**	**State Letter** Support to ICAO position on WRC agenda through participation in WRC 2011 now postponed January 2012	**October 2009** **Jan 2010**	**<u>Completed</u>** State Letter dated 12 October 2009	Appreciated the ongoing contribution of APANPIRG in addressing this issue in a number of forums and requested the Secretary General to urge States to continue to participate at various levels in different forums to provide support to the ICAO position.

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 22 July 2010	ANC action
D 20/59	**Use of the public Internet to access OPMET data and WAFS forecasts**	That, OPMET data and WAFS forecasts currently distributed through the ISCS, if only used for flight planning, can be considered non-time critical and therefore, can be accessed through the public Internet. *Note: Relevant ICAO guidance will be updated accordingly, subject to consideration of a similar decision by the WAFSOPSG/5 Meeting and subsequent endorsement by ANC.*	**(with regards to the note) – ANC consideration**	**ICAO HQ** ICAO HQ/ ANB/MET/ AIM	**Updated guidance material if clarity is needed** **Updated guidance material**	**Nov 2010** **2010**	**<u>Completed</u>** Issue form submitted to HQ Oct2009	Noted Requested the Secretariat to update the guidance in Doc 8896
C 20/60	**Extension of the ISCS-G2 and the implementation of the WAFS Internet file server (WIFS)**	That, WAFC Washington Provider State advise the ISCS user States about its intentions to: a) continue to work on extending the current ISCS-G2 service through 30 June 2012 to allow users sufficient time for transition to replacement services; and b) provide an operational WAFS Internet File Server (WIFS) by March 2010.	**Inform States of ISCS-G2 cessation date** **Develop WAFS Internet File Server (WIFS)**	**WAFC Washington Provider State/ APAC Office** **WAFC Washington Provider State**	**ISCS website update/ State Letter** **WAFS products available by Internet**	**Dec 2009** **Mar 2010**	**<u>Completed</u>** (SL - dated 10 May 2010) **<u>Completed</u>** (SL - dated 10 May 2010)	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/61	**Replacement of ISCS-G2**	That, a) the ICAO Regional Office, in coordination with the ISCS Provider State, prepare a survey to be circulated to the ISCS user States and focal points on their intentions as to the future reception of OPMET data and WAFS forecasts, i.e. ISCS-G3 vs. WIFS; *Note 1: the survey would include pros and cons of the two systems, together with the associated cost estimates, to be provided by the ISCS Provider State and seek information about the States' capability to assume these costs in view of establishing possible funding arrangements.*	**Develop and disseminate survey**	**ISCS Provider State / ICAO APAC office**	**Survey results**	**1 Dec 2009**	**<u>Completed</u>** (SL- dated 22 Oct 09)	
		Note 2: the Secretariat request States to revalidate their respective focal point to further promote coordination between the ISCS Provider State and the user States in the Asia/Pacific Region.	**Update ISCS focal points**	**ICAO APAC office**	**Updated ISCS focal point list**	**Nov 2009**	**<u>Completed</u>** (SL- dated 22 Oct 09)	
		b) after completion of action under a) above by 1 December 2009, the ISCS Provider State inform the ISCS user States concerning their plans for the replacement of the ISCS-G2; and	**Inform ISCS user States of ISCS-G2 replacement system plans**	**ISCS Provider State / ICAO APAC office**	**Update ISCS website / State Letter**	**Feb 2010**	**<u>Completed</u>** (SL - dated 10 May 2010)	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
		Note 3: the ISCS Provider State is expected to indicate its future plans concerning ISCS-G3 and the WIFS c) the WAFSOPSG be invited to consider preparing an amendment to all ICAO regional procedures in the ANP/FASID to render WIFS and SADIS FTP Service as an alternative to the respective satellite broadcasts as the primary means of obtaining WAFS forecasts and OPMET data for flight planning purposes. *Note 4: WAFS user States are responsible for the procurement of the necessary tools to access WAFS forecasts and OPMET data provided by the WAFCs.* *Note 5: The adoption of this Conclusion reinstates the APANPIRG Conclusion 19/45, Transition to ISCS 3rd Generation.*	**Update ANP/FASID**	**ICAO HQ (through WAFSOPS G)**	**Amendment Proposal to ANP/FASID (if deemed necessary by WAFSOPS G/5)**	**Jan 2010**	**<u>Completed</u>** FASID approved 22 Jan 2010 {APAC 09/23} ANP approved 18 Mar 2010 {APAC 09/22}	

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 22 July 2010	ANC action
C 20/62	**Harmonization of procedures for OPMET data issuance**	That, ICAO Regional Office be invited to						
		a) Include examples of correct methods of issuing OPMET data for inclusion in the ROBEX Handbook;	**Update ROBEX Handbook**	**ICAO APAC Office**	**Updated ROBEX Handbook**	**Oct 2009**	**Completed**	
		b) After completion of a) above request States in the Asia/Pacific Region to implement these methods as a matter of priority; and	**Inform States**	**ICAO APAC Office**	**State Letter**	**Oct 2009**	**Completed** (SL dated 28 Sep 2009)	
		c) Consult the RODBs to monitor the progress of OPMET data issuance in compliance with the Regional Air Navigation Plan for reporting at the OPMET/M TF/8 Meeting.	**RODB monitoring of OPMET compiling/filing times**	**RODBs / ICAO APAC Office**	**Inclusion of monitoring results in OPMET/M TF/8 Report**	**Apr 2010**	**Completed** (reinstated in CNS/MET SG/14 draft Conclusion 14/33)	

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 22 July 2010	ANC action
C 20/63	**Improvement of OPMET data availability for AOP aerodromes**	That, after the next round of harmonization of OPMET data between SADIS and ISCS Provider States, a) IATA be invited to monitor the availability of OPMET data for AOP aerodromes; and	**SADIS/ISCS harmonization**	**ISCS and SADIS Provider States/ ICAO APAC Office**	**ISCS/SADIS OPMET harmonizati on**	**Oct 2009**	**<u>Completed</u>** (reinstated SADISOPSG/ 15 C15/9)	
		b) ICAO Regional Office, based on the results of the monitoring in a) above, remind States concerned of unavailability of OPMET data.	**IATA OPMET monitoring**	**IATA**	**Table of AOP aerodromes not available on SADIS**	**Dec 2009**	**<u>Completed</u>** (reported to OPMET/M TF and CNS/MET SG meetings)	
		Note: the aim will be an availability of 95% of all OPMET data (METAR and TAF) from AOP aerodromes on SADIS and ISCS.	**Inform States**	**ICAO APAC Office**	**State Letter**	**Jan 2010**	**<u>Completed</u>** (reinstated in CNS/MET SG/14 draft Conclusion 14/33)	

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 22 July 2010	ANC action
C 20/64	**Improvement of OPMET data availability for non-AOP aerodromes**	That, after the next round of harmonization of OPMET data between SADIS and ISCS Provider States, a) IATA be invited to monitor the availability of OPMET data for non-AOP aerodromes; and b) ICAO Regional Office, based on the results of the monitoring in a) above, approach States concerned to confirm their agreement to continue providing OPMET data *Note: the aim will be an availability of 90% of all OPMET data (METAR and TAF) from non-AOP aerodromes on SADIS and ISCS.*	**SADIS/ISCS harmonization** **IATA OPMET monitoring** **Inform States**	**ISCS and SADIS Provider States/ ICAO APAC Office** **IATA** **ICAO APAC office**	**ISCS/SADIS OPMET harmonization** **Table of AOP aerodromes not available on SADIS** **State Letter**	**Oct 2009** **Dec 2009** **Jan 2010**	**<u>Completed</u>** (reinstated SADISOPSG/ 15 C15/9) **<u>Completed</u>** (reported to OPMET/M TF and CNS/MET SG meetings) **<u>Completed</u>** (reinstated in CNS/MET SG/14 draft Conclusion 14/33)	

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 22 July 2010	ANC action
C 20/65	**Replace FASID Tables MET 4A and 4B by the ROBEX Handbook**	That, the FASID Tables MET 4A and 4B be replaced with the ROBEX Handbook when referencing the ROBEX Scheme in the Basic ANP and FASID in accordance to **Appendices V** and **W** to the APANPIRG/20 Report on Agenda Item 3.4. Subsequently, FASID Tables MET 4A and 4B will be removed from the FASID.	**Update ANP/FASID**	**ICAO APAC Office**	**Amendment Proposal to ANP/FASID**	**Dec 2009**	**Completed** FASID approved 22 Jan 2010 {APAC 09/23} ANP approved 18 Mar 2010 {APAC 09/22}	
C 20/66	**Replace FASID Table MET 4C by the Asia/Pacific regional OPMET data banks interface control document**	That, the FASID Tables MET 4C be replaced with the Asia/Pacific regional OPMET data banks interface control document when referencing the responsibilities of the ASIA/PAC OPMET data banks for collection and dissemination of OPMET bulletins to support the ROBEX Scheme in the Basic ANP and FASID in accordance to **Appendices V** and **W** to the APANPIRG/20 Report on Agenda Item 3.4. Subsequently, FASID Table MET 4C will be removed from the FASID.	**Update ANP/FASID**	**ICAO APAC Office**	**Amendment Proposal to ANP/FASID**	**Dec 2009**	**Completed** FASID approved 22 Jan 2010 {APAC 09/23} ANP approved 18 Mar 2010 {APAC 09/22}	

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 22 July 2010	ANC action
C 20/67	**Cost Recovery by Volcano Observatories**	That, the ICAO CNS/MET Sub-group VA/TC Implementation Task Force, in coordination with the VAAC Provider States and the ICAO Secretariat, be invited to investigate examples of agreements between State volcanic observatories and the civil aviation authorities that may be used by other States in considering the recovery of the cost in accordance with ICAO provisions.	**Investigate cost recovery examples by volcanic observatories**	**VA/TC I TF/ VAACs/ ICAO HQ (IAVWOPS G)/ ICAO APAC Office**	**State Letter**	**June 2010**	**Completed** (SL - sent 29 Mar 2010)	
C 20/68	**Expanded WV SIGMET Test Development**	That, a) Japan be invited to further develop an expanded WV SIGMET Test utilizing automated templates in consultation with the Darwin VAAC; and b) upon completion of a) above, Japan conducts the expanded WV SIGMET Test and produce an analysis to the OPMET/M TF/8 meeting for further review and subsequent reporting to the CNS/MET SG/14 meeting to determine the next phase of the test.	**Develop WV expansion SIGMET test** **Conduct and report on trial test**	**Japan/ VAAC Darwin** **Japan**	**Updated WV expansion SIGMET Test** **Test results included in OPMET/M TF/8 and CNS/MET SG/14 reports**	**Apr 2010** **Apr 2010 / Jul 2010**	**ON GOING** **Trial test expected in later half of 2010**	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/69	**Implementation of SIGMET on Radioactive Clouds and Aerodrome Warnings on Tsunami**	That, in view of clarifying existing Annex 3 provisions, a) the IAVWOPSG consider developing Annex 3 provisions and guidance material, as necessary, related to the issuance of SIGMET on radioactive clouds; and b) ICAO considers developing Annex 3 provisions and guidance material as necessary related to the issuance of aerodrome warnings on Tsunami.	**Proposals to develop provisions and guidance material on radioactive cloud SIGMET and Tsunami aerodrome warnings**	**ICAO HQ** ICAO HQ ANB/MET/ AIM	**Amendment criteria to be included in Am. 76 or 77 to Annex 3, as necessary; guidance** Annex 3 provisions and guidance material as necessary related to the issuance of aerodrome warnings on tsunami.	**2013 or 2016**	<u>**Completed**</u> **ISSUE Form submitted to HQ** IAVWOPSG/ 5 C5/24 development of guidane on issuance of SIGMET for accidental release of radioactive material into the atmosphere (for inclusion in Doc 9691 to report back to IAVWOPSG/ 6) Tsunami aerodrome warnings to likely be discussed at METWSG/3 to Montréal, Nov 2010	Noted Invited the IAVWOPSG to consider the need for developing additional ICAO provisions related to SIGMET on radioactive clouds and requested the Secretariat, with the assistance of the METWSG, to consider the need for developing additional ICAO provisions related to aerodrome warnings on Tsunami

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 22 July 2010	ANC action
C 20/70	**Training on QMS**	That, WMO, in coordination with ICAO, be invited to organize a seminar/workshop on QMS related to aeronautical meteorological services during the first half of 2010.	**Conduct QMS Seminar/ Workshop**	**WMO/ ICAO HQ/APAC Office** ICAO HQ ANB/MET/ AIM	**Seminar/ Workshop** **Harmonized QMS**	**June 2010** **TBD**	**ON GOING**	Requested the Secretariat to invite WMO to conduct, in coordination with ICAO, a seminar/ Workshop on QMS. (invitation letter sent to WMO Feb 2010) Requested the Secretariat to harmonize QMS methodology for all fields of air navigation systems.
D 20/71	**Updated Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group**	That, the revised Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group provided in **Appendices Y** and **Z** to the Report be adopted.	**Notify CNS/MET SG**	**ICAO APAC Office**	**CNS/MET SG informed and paper prepared**	**July 2010**	**Completed**	

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 22 July 2010	ANC action
C 20/72	**Ionospheric Data Collection – Focal Point of Contact**	That, the States be urged to: a) cooperate with each other to collect data and characterize ionosphere model in the APAC region that will lead to smooth introduction of GNSS in ASIA/PAC Region; and b) provide the name and contact details of the Focal Point of Contact to ICAO Regional Office for coordinating collection and exchange of ionospheric data with the ultimate objective of establishing a standard ionospheric model for the region.	**Notify States**	**ICAO APAC Office**	**State Letter**	**January 2010**	**<u>Completed</u>** State letter dated 2 February 2010	

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as of 22 July 2010	ANC action
C 20/73	**Adopt GOLD to replace FOM**	That, upon release of the Global Operational Data Link Document (GOLD) by the Ad-Hoc GOLD Working Group in first quarter 2010, the FANS-1/A Operations Manual (FOM) be withdrawn and replaced by the GOLD as Asia/Pacific regional guidance material for use by States and airspace users as the basis for operating Automatic Dependent Surveillance – Contract (ADS-C) and Controller Pilot Data Link Communications (CPDLC), in conjunction with *Annex 10 – Aeronautical Telecommunications Volume II – Communications Procedures including those with PANS status* and the *Procedures for Air Navigation Services – Air Traffic Management (PANS–ATM Doc 4444).*	**Notify States**	**ICAO APAC Office**	**Upon release of the GOLD by the AD-Hoc GOLD Working Group, transmit State Letter**	**First quarter 2010**	**Completed** (SL - dated 28 June 2010)	**Noted**
C 20/74	**Removal of the APANPIRG Air Navigation Deficiency AP-MET-15**	That, the air navigation deficiency AP-MET-15 be removed from the APANPIRG air navigation deficiencies list.	**Update list of APANPIRG air navigation deficiencies**	**ICAO APAC Office**	**Updated list of APANPIRG air navigation deficiencies**	**Dec 2009**	**Completed**	

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 22 July 2010	ANC action
C 20/75	**MET deficiencies to be added to the APANPIRG list of Air Navigation Deficiencies**	That, the list of proposed air navigation deficiencies in **Appendix F** to the APANPIRG/20 Report on Agenda item 4, obtained by the ICAO TCB CAEMSA-SP reports be added to the list of APANPIRG air navigation deficiencies list tagged with the U status.	**Update list of APANPIRG air navigation deficiencies**	**APAC Office**	**Updated list of APANPIRG air navigation deficiencies**	**Dec 2009**	**<u>Completed</u>**	
C 20/76	**Continuation of CAEMSA-SP**	That, the DGCA/46 conference considers funding and resources be allotted by donor States, WMO, and ICAO for the continuation of the CAEMSA-SP in order to meet international requirements in the provision of meteorological services which would achieve the necessary safety and efficiency levels for airlines operating in the South Pacific.	**Provide necessary means for the continuation of CAEMSA-SP**	**DGCA Conference**	**Continuation of CAEMSA-SP**	**Oct 2009**	**<u>Completed</u>** (through DGCA action item 46/11 – Technical Cooperation) Also planning for Phase II workshop in second half of 2010	Noted and requested the Secretary General to urge States to develop and implement an action plan for each deficiency and to provide information to the Bangkok Regional Office.

*** 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.*

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 18/23	**Discontinuation of Asia/Pacific Regional Plan for New CNS/ATM Systems**	That a) in order to harmonize planning process with the Global Air Navigation Plan, Regional Plan for New CNS/ATM Systems be discontinued; and	Notify states	ICAO APAC Office	State letter	Oct 2007	**COMPLETED**. State Letter AP0112/07 (CNS) issued on 16 Oct. 07
D		b) ICAO be invited to develop detailed proposals for incorporating the useful information contained in the Regional Plan for the CNS/ATM Systems into the Asia Pacific Regional Air Navigation Plan (Doc 9763) and completed by 2009.	Establish proposals	ICAO APAC Office	Proposal for the consideration at APANPIRG 20 in September 2009	2009	CLOSED Task in b) to be undertaken in coordination with HQ **CNS:** Task in b) was undertaken in coordination with HQ Some useful information has been transferred to Regional PBN plan. **MET:** consensus between HQ and RO that necessary information is currently provided in Annex 3, Global ANP, and RANP for which the latter is updated routinely based on global groups. This Conclusion is considered closed.

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 18/53 **D**	**Development of State PBN Implementation Plans**	That, the Regional Office encourages 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).	Encourage States to develop State PBN implementation plan by 2009	ICAO APAC Office	State Letter based on regional PBN implementation plan to be developed by PBN task force	2009 Revised 2010	COMPLETED. PBN/TF has developed models for such plans. More than 20 States submitted State PBN Implementation Plan for review by the PBNTF.
C 18/59 **D**	**Resolution of ATM and OPS Deficiencies in the South West Pacific Small Island Developing States (SIDS)**	That, in recognizing the safety implications of the long-standing ATM and OPS deficiencies in the South-West Pacific SIDS included in the APANPIRG Deficiency Data Base, ICAO, in coordination with the international organizations and regional bodies concerned, considers providing urgent assistance to these States in order to build their capacity to provide the required services in a sustainable and cost-efficient manner	Assist in establishment of TC project	ICAO HQ	TC Project	2008	**ON GOING** -TC project in MET and AGA area have been established and to be further followed up. Deficiencies in ATM field need to be addressed.

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 19/3 **A D**	**Assistance in South West Pacific Small Island States and Mongolia, Myanmar and Timor Leste in implementing the requirements of aerodrome certification and SMS**	That, in recognizing the importance on the implementation of Annex 14, Volume I provisions related to aerodrome certification and SMS in the South West Pacific Small Island States and Mongolia, Myanmar and Timor-Leste, ICAO considers providing assistance to these States in order to build their capacity to provide the required services in a sustainable and cost efficient manner. [*Note: An appropriate form of providing assistance could include establishment of an ICAO technical cooperation project with funding sought from donor agencies.]*	Assist in establishment of TC Project	ICAO HQ/ICAO APAC Office	appropriate assistance Project	2009/ 2010	**ON GOING** SL dated 13/02/09 sent to these States to update status on implementation. ANC: Supported for the establishment of ICAO TC Project. *IFFAS application being processed.*

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 19/18 **A D**	**ATS Message Management Center (AMC) Software**	That, to facilitate implementation and management of ATN in Asia/Pacific Region, ICAO be urged to facilitate transfer of Eurocontrol AMC Software to Aerothai and to allow Aerothai to modify the Software to suit the requirements of Asia/Pacific Region.	Coordinate with parties concerned.	ICAO HQ	MOU signed and AMC software transferred.	May 2009. Revised June 2009.	ANC: Noted that the secretariat is reviewing the feasibility. **CLOSED** ICAO HQ issued State Letter on 19 April 2009 asking all States to use European AMC service for the off-line address management. AMC also provides other guidance to the States and conducted training for users in regions.

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

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 19/45 **A D**	**Transition to ISCS 3rd Generation**	That, in view of the plans by the ISCS Provider State to upgrade the ISCS broadcast to a new 3rd Generation service (ISCS 3G) by the end of 2009: a) the ISCS Provider State be urged to provide timely information to the ISCS user States on the planned changes including specifications of the hardware and software changes, transition timeline and expected cost implications for the users if any; and b) the ISCS user States be urged to keep abreast of the planned developments through the established channels of communication with the ISCS Provider State and plan well in advance any resources required for the transition to the ISCS 3G; *Notes:* *1) The ISCS Provider State will use the established network of ISCS focal points as its basis for keeping States informed.* *2) The Secretariat will undertake the task to keep the list of ISCS focal points up-to-date to ensure efficient communication between the ISCS Provider State and the ISCS user States in the ASIA/PAC Region.* *3) All information on the planned transition will be available on: http://www.weather.gov/iscs*	Provide specifications Notify ISCS user States	ISCS provider State ICAO APAC Office	Specification information available State Letter	Mar 2009 Apr 2009	**COMPLETE** **C 19/45 reinstated in C 20/61 which was completed through SL- T4/8.4, T 4/8.4.1: AP073/10 (MET) sent 10 May 2010**

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 19/53 **D**	**Convening MET/ATM TF meeting and organizing MET/ATM seminar**	That, a meeting of MET/ATM Task Force be convened in 2009 to review and update the Work Programme of the group and prepare a programme for the second ASIA/PAC MET/ATM Seminar to be held in 2010. *Note: Coordination with the ATM/AIS/SAR Sub-group is essential for the planned meeting of the MET/ATM TF.*	Organize meeting	ICAO APAC Office	Meeting convened	Dec 2009	**COMPLETE** **(MET/ATM TF/1 Meeting 2-4 Dec 2009)** **MET/ATM Seminar to be held by Jan 2011**

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

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

46th Conference of Directors General of Civil Aviation
Appendix A **Asia and Pacific Regions**

LIST OF ACTION ITEMS ARISING FROM THE 46th CONFERENCE

Agenda Item 1

Action Item 46/1 **Seamless Sky – ATM**

Recognizing the leadership role of ICAO Asia and Pacific Office and the efforts of APANPIRG in promoting and fostering the implementation of the ICAO provisions for the short and medium term according to the Regional Air Navigation Plans, the Conference requested the ICAO Asia Pacific Office to coordinate with Chairman APANPIRG and 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 through the collaboration with Asia/Pacific States / Administrations.

Action Item 46/2 **Seamless Sky - Air Cargo, Security**

Recognizing that the security of air cargo is critical, and appreciating the need to enhance air cargo security and facilitate international trade, the Conference requested ICAO to examine the inclusion of provisions on air cargo security in ICAO Annex 17 with the aim of securing safety and protecting the entire cargo supply chain for transport of cargo by air.

Action Item 46/3 **Seamless Sky – Aviation Safety**

To ensure a high standard of safety the Conference urged States to:

a) implement the State Safety Programme;

b) ensure that service providers within their jurisdiction effectively implement safety management systems;

c) monitor the safety of foreign aircraft operating into their jurisdictions, including the conduct of ramp inspections; and

d) co-operate in the above efforts, in sharing such safety information, and in promoting harmonization.

Agenda Item 2

Action Item 46/4 **Submission of Implementation Status – List of Action Items**

Taking note of the low percentage of submission of implementation status on the Action Items arising from the earlier DGCA Conference by the States / Administrations, the Conference urged the States / Administrations to provide ICAO APAC Office with a summary of actions taken within the timeframe agreed by the DGCA Conference (six months of the Conference) and a follow-up report (at least two months) prior to the next Conference.

Action Item 46/5 **Asia Pacific Consultative Link**

Taking note of the progress made in establishing the APCL Portal and agreeing that the APCL has the potential to serve as an effective mechanism of communication among the Asia and Pacific DGCAs, the Conference urged States / Administrations that have not nominated their APCL Coordinators or who have not logged into the revamped APCL to do so as soon as possible.

Agenda Item 3

Action Item 46/6 **Implementation of Continuous Descent Operations**

Recognizing the efficiency and environmental benefits of Continuous Descent Operations (CDO), and the need to harmonize these operations in the interest of safety and efficiency, the Conference encouraged States to include implementation of Continuous Descent Operations (CDO) as part of their PBN implementation plans and to implement CDO in accordance with the ICAO CDO Manual, to be available by April of 2010.

Action Item 46/7 **Asia-Pacific Flight Procedure Programme**

Taking note of the lack of adequate procedure design capability as a major obstacle to meeting the PBN implementation goals of Assembly Resolution A36-23, the Conference, urged States to indicate their intention to participate in the Asia-Pacific Flight Procedure Programme by 22 October 2009 in order to build or improve their instrument flight procedure capabilities, meet the PBN implementation goals of Assembly resolution A36-23 and enhance flight safety, efficiency and environmental protection in their States and the region.

Agenda Item 4

Action Item 46/8 **Preparation for WRC 2011**

Recognizing the crucial importance of protecting the aeronautical frequency spectrum at the World Radiocommunication Conference (WRC-2011), the Conference strongly urged Asia Pacific States:

a) to give high priority to ensure support to ICAO position for WRC-2011 through enhance coordination between the respective authorities; and

b) to actively implement APANPIRG Conclusion 19/41 and 20/58.

Agenda Item 5

Action Item 46/9 **USOAP Pre-audit Documents**

Taking note of the lack of submission of the USOAP Compliance Checklists and the SAAQ by a sizeable number of States and recognizing the importance of establishing an effective Safety Oversight System, the Conference urged States:

a) to note that the ultimate responsibility for safety oversight rests with the Contracting State, who should continuously review their respective safety oversight capabilities;

b) to submit their pre-audit documents as required under the Comprehensive Systems Approach (CSA) audit [State Aviation Activity Questionnaire (SAAQ) and the Compliance Checklists (CC)] at the earliest so as to facilitate undertaking and better understanding by the audit team; and

c) that have been audited to share their USOAP audit experience and provide assistance to States in need of help.

Action Item 46/10 **Language Proficiency Requirements**

Noting that language provisions address a safety concern and that the transition period to comply with the language proficiency requirements will terminate in March 2011, any additional measures will be considered by ICAO only if there is a clear and definite indication of widespread non-compliance among States, the Conference urged States to:

a) ensure that the questionnaire attached to ICAO State letter AN 12/44.6-09/53 dated 17 July 2009 is completed and returned to ICAO Headquarters; and

b) explore possibilities of technical co-operation and assistance amongst States in terms of training, expertise and experience.

Agenda Item 8

Action Item 46/11 **Technical Cooperation**

Recognizing the multifarious difficulties faced by Contracting States in fulfilling their obligations for the effective safety and security oversight of aviation activities taking place under their jurisdictions and, making note of the enormous potentials in the Regional Cooperative Arrangements to help solve such situations, the Conference:

a) requested the States to actively participate at the various ongoing Regional Technical Cooperation Programmes such as CASP, CAPSCA, COSCAP and PASO etc.;

b) requested the States to make the optimum use of the opportunities, facilities or services provided by such Programmes or Projects to meet their national requirements including the staff training;

c) requested the international agencies and donor community to continue extending their support in cash and/or in kind for the wellbeing of the Regional Cooperative Programmes;

d) appealed to States having necessary resources and expertise to join the ICAO Developing Countries Training Programmes in order to provide assistance to States for training of national staff; and

e) requested the Developing States to make use of the opportunities provided under the ICAO Developing Countries Training Programmes for training of their national staff as and when they are made available.

Agenda Item 9

Action Item 46/12 Recognising the support from States to have "International Aviation and the Environment" as a separate Agenda Item in future Conferences of the DGCAs, the Conference urged States to submit papers under this Agenda Item for the 47th DGCA Conference.

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/5 Update
1	ATN Implementation Coordination	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Review of implementation problems and develop co-ordinated solutions (2) Coordinate/compile the regional implementation schedule (3) Monitor Implementation	Expedite implementation activities, ensure system compatibility through out the region	(1) Co-ordination Report (2) Waterfall schedule (3) Monitor AMHS Implementation Planner	(1)Ongoing/Semi-annually until (2010)-(2) Schedule 09/2009 (3) On going	Kapoor (India)	All members	(1)Updated the information in the ATN Router and AMHS planning tables and the implementation status.(2) Completed, maintain the AMHS Implementation Planner
2	ATN Operational Procedures	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Development of Interim Database for Directory Services	Make available real time and quality assurance addresses for ATN message delivery	(1) Interim Database	(1) (2007)	Robert Hallman (USA)	Thailand, Hong Kong China, Japan	The database was demonstrated. Aerothai will maintain the database on behalf of the regional ICAO Office. Aerothai will serve as POC for AMC coordination between Asia/Pac States and Eurocontrol. ATN Operational Procedures is completed and forward for adoption.
				(2) Develop the operational database management procedures		(2) Operational Procedures	(2) (2007)			Completed.
3	ATN Certification & Validation Process	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Develop conformance procedures and checklist for AMHS and ATN routers	Expedite implementation activities, ensure global system compatibility	(1) Checklist	(1) (2007)	Sin Hie Sng (Singapore)	China, Hong Kong China, Indonesia,ROK,USA,	Completed

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/5 Update
				(2) Develop validation process document		(2) Conformance Document	(2) 2007			Completed and forward to CNS/MET SG and APANPIRG/20 for review and adoption
						(3) Update to Conformance Document	(3) Ongoing until 2010			Completed ~~Document need to be kept up-to-date to reflect defect report from States~~
4	(1) ATN Documentation (2) Review all documents adopted by ATNICG and ATNTTF	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Study DIR objects/attributes proposed in ACP and follow development within other groups (2) Update document tree/establish tracking table for suspended dates (3) Standardized Report form and Guidance Material	Expedite implementation activities, ensure global system compatibility	(1) Directory Report (2) Tracking table/Updated documentation tree (3) AMC report (4)Report Form and Report Guidance	(1) Annually until (2010) (3) Periodically (4) 2010	Chonlawit B. (Thailand)	USA	Update the database. AMC mandated by ICAO. Training completed. Directory Service will be implemented in coordination with ACP and phases will be developed.
				(2) Development AIDC documentation (including ICD) and follow development within other groups		(2) AFTN AIDC/ATN Gateway Specification ATN AIDC ICD	(2) 2008 (ACP-dependent)	(Thailand)	Thailand	Task Closed in view of the removal of provision from Doc 9880
				(3) Update of AMHS ICD to comply with SARPs 3rd Edition		(1) Report differences between existing ICD and requirements for Edition 3 of Doc 9705 (3) Updated AMHS ICD	(1) Sept 2010(3) (2007)	US	Japan	

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/5 Update
				Managing PDR	Update ICAO Documents (9880/9896)	**PDR filing and tracking**	**On-going**	**US**	**All the Member States**	**Additional Task proposed in ATNICG/5**
5	**ATN Performance**	**D. Efficiency**	**GPI-17, GPI-19, GPI-22**	**(1) Develop/establish/adapt/monitor/identify/analyse performance indicators**	**Assure QOS, service continuity, timely delivery of services**	**(1) AMHS performance report**	**(1) Annually until (2010)**	**Japan**	**Republic of Korea, India**	**Final Draft of the Document complete. Will be presented.**
6	**ATN Service Enhancements**	**D. Efficiency**	**GPI-17, GPI-19, GPI-22**	**(1) Review the impact of the implementation of Directory Services in the Region**	**Enhancing the service**	**(1) Report on directory**	**(1) Annually until (2010)**	**Fiji**	**USA, Thailand, New Zealand, Japan, Australia**	**Complete. AMC has been adopted by ICAO. Aerothai has been designed as POC for Asia/Pac region**
				(2) Directory Service - Implementation Strategy	**Enhancing the operation**	**Requirement Analysis Report & Implementation Strategy**	**1)2011 2) 2012**	**Thailand**		Additional Task Proposed in ATNICG/5
				ATN/IPS Implementation Plan	**Inter-regional and intra regional network compatibility**	**1) ATN/IPS router ICD 2) IPS addressing plan 3) ATN/OSI - ATN/IPS Transition Plan 4) ATN/IPS routing policy 5) Update FASIS Tables to accommodate IPS**	**-2011 2)2011 3) 2011 4) 2012 5) 2011 6) 2010**	**USA**	**Australia, China, India, Fiji, HongKong, China, Japan, and USA**	**Proposed an additional task**

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/5 Update
				Providing support for emerging requirements of OPMET, AIS/AIM, AIDC etc.	Enhancing the service	Task Report on XML based messages over AMHS platform	2011	USA	Hong Kong China,	Additional Task proposed in ATNICG/5
				(5) Study for transition of AFTN-based AIDC as an alternative to ATN based AIDC to ATN environment	Improving the service and lowering the operating cost	(5) Report on the impact of transition of AFTN-AIDC to ATN-AIDC AFTN AIDC/ATN Gateway Specification	(5) (2008)	Thailand	India, Indonesia, New Zealand, USA,	A Draft specification of AFTN AIDC/ATN Gateway was presented~~.~~ Completed. Task closed in view of removal of provision from Doc ~~9880~~
		D. Efficiency	GPI-17, GPI-19, GPI-22	Analyze Common Address Prefix Proposal	Improving the service and routing efficiency	Report on common prefix based analysis conduced	End of 2008	Mark Brown (Japan)	Australia, Fiji, HongKong China, New Zealand and USA	Completed. Action Items developed at ATNICG/2 for follow-up at WG meetings.
7	Security	B. Security	GPI-17, GPI-19, GPI-22	(1) Develop ATN System Security policy	Safe and Secure Inter and Intra Regional Communication and service infrastructure	(1) Policy Document	(1) Annually until (2010)	Vidyut Patel (USA)	Australia, Hong Kong China	Adopted by APANPIRG/19
				(2) Develop ATN System Security Guidance		(2) Guidance Document	(2) (2011)			On-Going review and update

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/5 Update
				(3) Develop ATN System Security Solution for Initial and Enhanced Services		**(3) Security, Technical, Management and Operational Control**	**(3) (2008)**			**Completed ~~On-Going review and update~~**
				(4) Co-ordinate and monitor ACP working group and other regions including Directory Service, PDRs		**(4) Report**	**(4) Semi-Annually until (2010)**		**Thailand**	**On-Going review and update**
				5) Develop IPS Security Policy and update the relevant guidance documents **(5) Develop ATN System Security Check List based on Security Control and Regional Incident Response Plan and Contingency Plan**		**Policy and updated guidance documents** **(5) Check List, Regional Incident Response Plan and Contingency Plan**	**2011** **(5) (2009)**			Proposed additional task to facilitate ATN/IPS **Forward to CNS.MET SG and APANPIRG for review and adoption**

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/5 Update
8	**ATN Service Enhancements (supporting amended ICAO Flight Plan and ATS Message Formats)**	**D - Efficiency**	**GPI - 17, GPI - 19, GPI - 22**	**1) Review the impact of the impleemntation of Amendment 1 to 15th Edition of Doc. 4444 effective 15 Nov. 2012 (PANS ATM Chapter 4 and Appendix 3 relating to the ICAO Flight Plan and associated ATS Message formats to the AFS**	**Enhancing the service**	**1) Report on capability of existing and planned AFS systems to the revised ICAO Flight Plan and ATS Message Format**	**1) Annually until 2011**	**USA**	**Fiji India Hong Kong New Zealand Singapore USA**	**Pending result from ICAO Flight Plan and ATS Message TF**
				2) Indentify the new requirements for AMHS/AFTN to support new message format	**Enhancing the operation**	**2) Report on impact of New ATS message format in AMHS**	**2) 2010**	**Thailand**	**Fiji India Hong Kong New Zealand Singapore USA**	**On-going task-Report at ATNICG/4**
				3) Identify the link control procedure using the AMHS to support the revised ATS message format to the ATC automation system	**Enhancing the service**	**3) Report whether special link control procedure is required**	**3) 2010**	**Thailand**	**Fiji India Hong Kong New Zealand Singapore USA**	**On-going task**

The ATN PERFORMANCE OBJECTIVE

The APAC ATN ground-to-ground infrastructure will be fully operational 53 percent at 23 locations by December 2007.

(GPI-22) COMMUNICATION NETWORK INFRASTRUCTURE

Related ATM objectives: AMSS; HF data; VHF data; SSR Mode S; ATN

Scope: To evolve the aeronautical mobile and fixed communication infrastructure, supporting both voice and data communications, accommodating new functions as well as providing the adequate capacity and quality of service to support ATM requirements.

(GPI-19) METEOROLOGICAL SYSTEMS

Objective: To improve the availability of meteorological information in support of a seamless global ATM system.

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/5 Update

(GPI-17) IMPLEMENTATION OF DATA LINK APPLICATIONS

Scope: Increase the use of data link applications

Related ATM objectives: Application of data link; Functional integration of ground systems; with airborne systems; ATS inter-facility data communication (AIDC)

AMHS Implementation Planner

Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS Australia (Brisbane)	Australia (Melbourne)	China (Beijing)	Hong Kong, China (Hong Kong)	India (Mumbai)	Fiji (Nadi)	Japan (Fukuoka)	Singapore (Singapore)	Thailand (Bangkok)	USA (Salt Lake City)	USA (Atlanta)
Australia (Brisbane)	A						Q2/10					
	B											
	C											
	D						Q3/10	2010				
Australia (Melbourne)	A								Q4/06			
	B								TBD			
	C								TBD			
	D								TBD		2010	
China (Beijing)	A				Q2/10							
	B				Q2/10							
	C				Q3/10							
	D				Q3/10	2009 / 2010		2010		2009		
Hong Kong, China (Hong Kong)	A			Q2/10				TBD		TBD		
	B			Q2/10				TBD		TBD		
	C			Q3/10				TBD		TBD		
	D			Q3/10				TBD		TBD		
India (Mumbai)	A								Q3/09			
	B								Q4/09			
	C								Q4/09			
	D			2009 / 2010					Q4/10	2009 / 2010		
Fiji (Nadi)	A	Q2/10									Q2/10	
	B										Q3/10	
	C										Q3/10	
	D	Q3/10									Q3/10	
Japan (Fukuoka)	A				TBD				TBD			
	B				TBD				TBD			
	C				TBD				TBD			
	D	2010		2010	TBD				TBD		2006/ Implemented	
Singapore (Sinagpore)	A		Q4/06			Q3/09		TBD		Q4/06		
	B		TBD			Q4/09		TBD		Q4/10		
	C		TBD			Q4/09		TBD		Q4/10		
	D		TBD			Q4/10		TBD		TBD		
Thailand (Bangkok)	A				TBD				Q4/06			
	B				TBD				Q4/10			
	C				TBD				Q4/10			
	D			2009	TBD	2009 / 2010			TBD			
USA (Salt Lake City)	A						Q2/10					
	B						Q3/10					
	C						Q3/10					
	D		2010				Q3/10	2006/ Implemented				
USA (Atlanta)	A											
	B											
	C											
	D											

AMHS Implementation Planner

Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS: Australia (Brisbane)	Australia (Melbourne)	China (Beijing)	Hong Kong, China (Hong Kong)	India (Mumbai)	Fiji (Nadi)	Japan (Fukuoka)	Singapore (Singapore)	Thailand (Bangkok)	USA (Salt Lake City)	USA (Atlanta)
Bahrain	A								2011			
	B								2011 (IPS-based connection)			
	C								2011			
	D								TBD			
Europe	A											
	B											
	C											
	D							TBD				
Italy	A											
	B											
	C											
	D									TBD		
Kuwait	A											
	B											
	C											
	D			TBD								
Russian Federation	A											
	B											
	C											
	D			TBD				TBD				
South Africa	A	TBD										
	B											
	C											
	D											
United Kingdom	A								Q4/10			
	B								Q4/10 (IPS-based connection)			
	C								Q4/10			
	D								TBD			
Indonesia (Jakarta)	A								Q1/08			
	B								Q1/09			
	C								Q2/10			
	D								TBD			
New Zealand (Christshurch)	A	Q4/12									Q4/12	
	B	Q4/12 (IPS-based connection)									Q4/12 (IPS-based connection)	
	C	Q1/13									Q1/13	
	D	Q1/13									Q1/13	
Timor States (Dili)	A											
	B											
	C											
	D											
Nauru (Nauru)	A											
	B											
	C											
	D											
Papau New Guinea (Port Moresby)	A											
	B											
	C											
	D											

AMHS Implementation Planner

Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS										
		Australia (Brisbane)	Australia (Melbourne)	China (Beijing)	Hong Kong, China (Hong Kong)	India (Mumbai)	Fiji (Nadi)	Japan (Fukuoka)	Singapore (Singapore)	Thailand (Bangkok)	USA (Salt Lake City)	USA (Atlanta)
Solomon Islands (Honiara)	A											
	B											
	C											
	D											
Vanuatu (Port Vila)	A											
	B											
	C											
	D											
DPRKorea (Pyongyang)	A											
	B											
	C											
	D											
Macau, China (Macau)	A			Q1/09	Q2/09							
	B			Q1 - Q2/09	Q3/09							
	C			Q1 - Q2/09	Q3/09							
	D			TBD	Q4/09							
Mongolia (Ulaanbaatar)	A											
	B											
	C											
	D											
Myanmar (Yangoon)	A											
	B											
	C											
	D											
Nepal (Kathmandu)	A			Q4/10		Q4/10						
	B			Q4/10 (IP-based connection)		Q4/10 (IP-based connection)						
	C			Q1/11		Q1/11						
	D			Q1/11		Q1/11						
Pakistan (Karachi)	A					2009						
	B					Q1/10						
	C					Q1/10						
	D					Q2/10						
Republic of Korea (Seoul)	A											
	B											
	C											
	D											
Vietnam (Ho Chi Minh / Hanoi)	A				TBD				TBD			
	B				TBD				TBD			
	C				TBD				TBD			
	D				TBD				TBD			
Philippines (Manila)	A				TBD				2011			
	B				TBD				2011			
	C				TBD				2011			
	D				TBD				2011			

AMHS Implementation Planner

Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS Australia (Brisbane)	Australia (Melbourne)	China (Beijing)	Hong Kong, China (Hong Kong)	India (Mumbai)	Fiji (Nadi)	Japan (Fukuoka)	Singapore (Singapore)	Thailand (Bangkok)	USA (Salt Lake City)	USA (Atlanta)
Taibei	A				TBD							
	B				2009							
	C				2009							
	D				2012 - 13							
Bangladesh (Dhaka)	A											
	B											
	C											
	D											
Bhutan (Paro)	A											
	B											
	C											
	D											
Kenya	A											
	B											
	C											
	D											
Oman	A											
	B											
	C											
	D											
Sri Lanka (Colombo)	A								TBD			
	B								TBD			
	C								TBD			
	D								TBD			
Kiribati (Tarawa)	A											
	B											
	C											
	D											
New Caledonia (Noumea)	A											
	B											
	C											
	D											
Tuvalu (Funafuti)	A											
	B											
	C											
	D											
Wallis Island (Wallis)	A											
	B											
	C											
	D											

AMHS Implementation Planner

Interconnection, Connected to router of: *Administration (Location of Router)*	Stage	BBIS Australia (Brisbane)	Australia (Melbourne)	China (Beijing)	Hong Kong, China (Hong Kong)	India (Mumbai)	Fiji (Nadi)	Japan (Fukuoka)	Singapore (Singapore)	Thailand (Bangkok)	USA (Salt Lake City)	USA (Atlanta)
Brunei Darussalam (Brunei)	A								TBD			
	B								TBD			
	C								TBD			
	D								TBD			
Malaysia (Kuala Lumpur)	A								Q1/2007	Q2/2010		
	B								Q1/2007	Q2/2010		
	C								Q4/2011	Q4/2011		
	D								Q4/2011	Q4/2011		
Cambodia (Phnom Penh)	A											
	B											
	C											
	D											
Lao PDR (Vientiane)	A											
	B											
	C											
	D											
American Samoa (Pago Pago)	A											
	B											
	C											
	D											
Marshall Islands	A											
	B											
	C											
	D											
Micronesia, Federated State of Chuuk	A											
	B											
	C											
	D											
Micronesia, Federated State of Kosrae	A											
	B											
	C											
	D											
Micronesia, Federated State of Ponapei	A											
	B											
	C											
	D											
Micronesia, State of Yap	A											
	B											
	C											
	D											
Palau	A											
	B											
	C											
	D											

Note:

A	Physical connections
B	Router Connection Tests
C	MTA Interoperability Tests
D	AMHS Commission
Q1/09	e.g. 1st Quarter in 2009

STRATEGY FOR IMPLEMENTATION OF THE AERONAUTICAL TELECOMMUNICATION NETWORK (ATN) IN THE ASIA/PACIFIC REGION

Considering that:

1) the requirement for a robust ground-to-ground Aeronautical Telecommunication Network (ATN) to meet the growing need for digital data communication to support the Air Traffic Management Concept;

2) the availability of ICAO SARPs and technical manuals for the ATN based on the OSI protocols (ATN/OSI) and the Internet Protocol Suite (ATN/IPS), and the availability of equipment and readiness of vendors to support both ATN/OSI and ATN/IPS ground-to-ground communications;

3) the availability of AMHS Transition and Implementation guidance materials required to assist States to ensure harmonization of procedures and protocols and thereby assure inter-operability within the region;

4) the need to support States currently using AFTN terminals for communication with other States, and the need to replace these aging terminals with ATS Message User Agents (UA); and

5) the backbone States in the Asia/Pacific region have already implemented, or are in the process of procuring and implementing, AMHS based ATN/OSI.

THE GENERAL STRATEGY FOR THE IMPLEMENTATION OF THE ATN INFRASTRUCTURE AND ASSOCIATED ATN APPLICATIONS IN THE ASIA/PACIFIC REGION IS AS FOLLOWS:

a) strategically deploy a backbone network of ATN/OSI routers and AMHS Message Transfer System (MTS) to provide a reliable infrastructure to initially support ground-to-ground applications and the planned ATN/OSI air-ground applications.

b) strategically deploy an ATN/IPS backbone network as a private network which comprises dedicated point-to-point circuits without connection to the Public Internet to support data communication, and migrate ATN/OSI router interconnections from X.25 sub-network to IP sub-network connectivity;

c) permit non-backbone States, and States in other regions with connections to the Asia/Pacific region, to connect their Message Transfer Agents (MTA) to backbone States using either the OSI-based ATN Internet Communications Services (ICS) or the ATN IPS on a bilateral basis;

d) permit States with limited AFS connections or traffic with other States to operate only UA terminals and to use the MTA of another State, subject to bilateral agreement. Such UA to MTA connections may use the Public Internet subject to appropriate security provisions and access control;

e) complete migration from AFTN to AMHS within the time frame specified in the FASID ; and

f) once a robust ATN/IPS backbone network has been established, eventually phase out use of the ATN ICS by AMHS and operate the AMHS MTA network using the ATN/IPS as specified in ICAO Doc 9880 section 3.2.2.2.3.

IN ORDER TO ACHIEVE THE ABOVE STRATEGY THE FOLLOWING IS REQUIRED OF STATES IN THE ASIA/PACIFIC REGION:

g) States shall provide implementation in compliance with Annex 10 SARPS and ICAO Manuals, and with the Plans, Policies and AMHS Transition and Implementation guidance materials adopted by APANPIRG;

h) Backbone States shall implement AMHS MTAs that support both the ATN ICS and ATN/IPS network services as specified in ICAO Doc 9880 section 3.2.2.2. Non-backbone States may implement MTAs that support either or both network services.

i) Backbone States shall implement ATN/OSI routers with X.25 sub-network capability and later migrate to IP sub-network capability for interconnection with other Backbone States and Non-backbone States.

j) States shall work co-operatively to assist each other on a multinational basis to implement the ATN and AMHS in an expeditious and coordinated manner and to ensure system inter-operability; and

k) States shall organize training of personnel to provide necessary capability to maintain and operate the ground-to-ground ATN infrastructure and applications.

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AMC INFORMATION FORM

Network Inventory - Persons & Contact / COM Centre **(In column A and E : You can pick up from drop-down list)**

Country	First Name	Surename	Local Title	Personal Roles	Phone Number	FAX Number	E-mail Address	COM Centre Postal Address	AFTN Address (Option)

Example

System Administrator

Firstname	Somnuk	**Telex**	
Surname	Rongthong	**Email**	somnuk@aerothai.co.th
Phone1	6622859904	**AFTN**	VTBBYFYX
Phone2		**CIDIN/AFTN**	
Phone3		**CIDIN/OPMET**	
Fax	6622850240	**Sita**	

Applications

Code	Description
AFTN/AMHS GW	AFTN/AMHS Gateway
ATS MSGSRV	ATS Message Server

Administrative Status: EXTERNAL

Postal Address

Aeronautical Radio of Thailand
102 Ngamduplee RAMA 4 Road,
Tungmahamek Santhorn
Bangkok 10120
THAILAND

AMC INFORMATION FORM

AFTN Capacities **(In each column, you can pick up from drop-down list)**

Ax - VCG mapping capability	Ad - Ax mapping capability	Ax - VCG mapping actual used	Ad - Ax mapping actual used

VCG = Virtual Circuit Groups

AMC INFORMATION FORM

AMHS Capabilities **(In column C, H and I : You can pick up from drop-down list)**

MTA Name	Maximum Content Length	Extended Encoded Information Types	Messages Lifetime (Minutes)				ATS Message Server	AFTN/AMHS Gateway	Currently Authorized Message Length	Maximum Number of Address	Converted General-Text Body Parts	Operation Status
			Urgent	Non Urgent	Normal	Report						

Remarks :

IA5 and General-Text Body Part (ISO 646) are mandatory requirements for an ATS Message Server compliant with the "EUR Profile for ATS Message Handling Service".

Maximum Content Length : A minimum value of 2000000 is necessary for an ATS Message Server to be compliant with the "EUR Profile for ATS Message Handling Service"

Messages Lifetime (Minutes) : Three fields for each message priority level, and one field for reports. The maximum value is 5760 (corresponds to four days).

Currently Authorized Message Length : A minimum value of 65536 is necessary for an ATS Message Server to be compliant with the "EUR Profile for ATS Message Handling Service".

Operation Status : 'OP' for operational, 'NON-OP' for not operational, and 'UNKNOWN'

AMC INFORMATION FORM

Connections **(In column D and H : You can pick up from drop-down list)**

Existing Connections

Remote COM	Protocol	Network Address	Link Type	Capacity	Supplier	Active	Circuit Type	Remark

Planned Connections

Remote COM	Protocol	Network Address	Link Type	Capacity	Supplier	Active	Circuit Type	Remark

AMC INFORMATION FORM

AMHS MTA Table

Contracting State	MTA ID	User Agent ID	Addressing Scheme (CAAS/XF)	Country-name	Administration-domain-name	Private-domain-name	Organization name	Organization unit-name-1	User Agent (Direct User only)	Description of user	MTA Name	NSAP address	T-sel Value	P-sel Value	S-sel Value	Capability
				(C)	(A)	(P)	(O)	(OU1)	(CN)							

THE PROPOSED IPv4 ADDRESS PLAN

1 Introduction

The IPv4 address scheme is proposed by the Caribbean and South American Regional for its ATN/IPS Network. The Caribbean and South American region also proposed in their plan for a global IPv4 addressing assignment which includes Asia/Pacific region. The Asia/Pacific Region is requested to review this proposed IP addressing assignment for consideration and adoption.

1.1 Objective

This document is meant to describe the addressing plan for IPv4 addresses throughout the Asia/Pacific Region. This document defines the recommended address format for IPv4 addresses. The IPv4 network is to be used within region.

1.2 References

[1]	ICAO Doc 9705-AN/956	Manual of Technical Provisions for the ATN
[2]	ICAO Doc 9896	Manual for the ATN using IPS Standards and Protocols
[3]	ICAO Doc 7910	ICAO Location Indicators
[4]	RFC 1518	An Architecture for IP Address Allocation with CIDR
[5]	RFC 1918	Address Allocation for Private Internets
[6]	RFC 2050	BGP-4 Internet Registry IP Allocation Guidelines
[7]	RFC 3330	Special-Use IPv4 Addresses
[8]	RFC 4271	BGP-4 Specification

1.3 Terms Used

Administrative Domain	–	An administrative entity in the ATN/IPS. An Administrative Domain can be an individual State, a group of States, an Aeronautical Industry Organization (e.g., an Air-Ground Service Provider), or an Air Navigation Service Provider (ANSP) that manages ATN/IPS network resources and services. From a routing perspective, an Administrative Domain includes one or more Autonomous Systems.
Autonomous System	–	A connected group of one or more IP prefixes, run by one or more network operators, which has a single, clearly defined routing policy.

Intra-domain (interior gateway) routing protocol	–	Protocols for exchanging routing information between routers within an AS.
Inter-domain (exterior gateway) routing protocol	–	Protocols for exchanging routing information between Autonomous Systems. They may in some cases be used between routers within an AS, but they primarily deal with exchanging information between Autonomous Systems.
Local Internet Registry	–	A Local Internet Registry (LIR) is an IR that primarily assigns address space to users of the network services it provides. LIRs are generally ISPs, whose customers are primarily end users and possibly other ISPs. [LACNIC]

1.4 Acronyms

AMHS	–	ATN Message Handling System
ARP	–	Address Resolution Protocol
ATN	–	Aeronautical Telecommunications Network
BGP	–	Border Gateway Protocol
DNS	–	Domain Name Service
IANA	–	Internet Assigned Numbers Authority
ICS	–	ATN Internet Communication Service
IP	–	Internet Protocol
IPv4	–	Internet Protocol Version 4
IPv6	–	Internet Protocol Version 6
IPS	–	Internet Protocol suite
LACNIC	–	Latin American and Caribbean Internet Address Registry
LIR	–	Local Internet Registry
OSPF	–	Open Shortest Path First
RIR	–	Regional Internet Registry

1.5 Overview of Addressing Issues

The following subsections present issues that affect the completion of the addressing plan for operating the IPS-based AMHS network.

1.5.1 Public or Private Address

An important decision for the region is whether to use private or public addresses. Private addresses can be used if coordinated by all participating States and Organization; however, it is possible that existing networks already use addresses in the private block ranges. Public addresses must be obtained from a Regional Internet Registry (RIR). The Internet Assigned Numbers Authority (IANA) has delegated responsibility for administration of Internet numbering to the Latin American and Caribbean Internet Address Registry (LACNIC).

1.5.2 Address of Systems in External Regions

Systems in external regions could be assigned an address from the APAC address space rather than use an address in their regional address block. Note however that this must be coordinated with private addresses so as to avoid collisions.

2 IPv4 Addressing Overview and Fundamentals

In the Internet Protocol a distinction is made between names, addresses, and routes. A name indicates what we seek. An address indicates where it is. A route indicates how to get there. The Internet protocol deals primarily with addresses. Its main task is to forward data to a particular destination address. It is the task of higher-level protocols to make the mapping from names to addresses, for example using a domain name service (DNS). The Internet protocol forwards packet data units (PDU) to a destination address using routing tables maintained by a routing protocol. The routing tables contain the address of the next hop along the route to the destination. There are in general two classes of routing protocols: inter-domain or exterior routing protocols such as the Border Gateway Protocol (BGP) and intra-domain or interior routing protocols such as the Open Shortest Path First (OSPF) protocol. In order to forward PDUs to the next hop address, there must be a mapping from this address to the link level address, for example, an Ethernet address. This mapping is maintained by an address discovery protocol such as the Address Resolution Protocol (ARP).

An IPv4 address consists of four bytes (32 bits). These bytes are also known as octets. For readability purposes, humans typically work with IP addresses in a notation called dotted decimal. This notation places periods between each of the four numbers (octets) that comprise an IP address. For example, an IP address that a computer sees as

00001010 00000000 00000000 00000001

is written in dotted decimal as

10.0.0.1

Because each byte contains 8 bits, each octet in an IP address ranges in value from a minimum of 0 to a maximum of 255. Therefore, the full range of IP addresses is from 0.0.0.0 through 255.255.255.255. That represents a total of 4,294,967,296 possible IP addresses.

A network may be set up with IP addresses to form a private or public network. On a private network a single organization controls address assignment for all nodes. On a public network there must be some conventions to assure that organizations do not use overlapping addresses. In the Internet this function is performed by the Internet Assigned Numbers Authority (IANA), which delegates authority to Regional Internet Registries (RIR). For the CAR/SAM Region the RIR is the Latin American and Caribbean Internet Address Registry (LACNIC).

IPv4 Addresses are a fixed length of four octets (32 bits). An address begins with a Network ID, followed by a Host ID as depicted in Figure 2-1.

Figure 2-1. IPv4 Address Format

The original IP addressing scheme divided the Network ID from the Host ID is in a several octet boundaries. In this scheme the main classes of addresses were differentiated based on how many octets were used for the Network ID. This method is called classful addressing. Classful addressing was by convention further modified so that the Host ID could be split into subnet ID and sub host ID. This is typically accomplished using a subnet mask and is called classful addressing with subnetting. This eventually evolved into classless addressing where the division between the Network ID and Host ID can occur at an arbitrary point, not just on octet boundaries. With classless addressing the dividing point is indicated by a slash (/) followed the number of bits used for the Network ID. This value is called the prefix length of the address and the address value up to that point is called the network prefix.

Private Addressing is defined in RFC 1918. IANA has reserved the following three blocks of the IP address space for private Internets:

10.0.0.0 - 10.255.255.255 (10/8 prefix)
172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

Because of the number of bits available to users, these blocks are referred to as a "24-bit block", a "20-bit block", and a "16-bit" block. An enterprise that decides to use IP addresses out of the private address space defined by RFC 1918, can do so without any coordination with IANA or an Internet registry. Addresses within this private address space will only be unique within an enterprise or a group of enterprises (e.g., an ICAO region), which chose to cooperate over this space so they may communicate with each other in their own private Internet.

3 IPv4 Addressing

3.1 Overview CAR/SAM

3.1.1 During the fourth meeting of ATN/TF4 (Santo Domingo, Dominican Republic, 27 to 28 June 2008) the group analyzed different alternatives for the implementation of the TCP/IP in the CAR/SAM Regions identifying the available options that would facilitate this implementation in the AMHS Service and future applications. This was reviewed in accordance with Document 9880 Part IIB of the ICAO. In this respect the Meeting decided two viable options for the implantation the TCP/IP:

a) AMHS using the RFC1006 on Guiders TCP/IP (IPv4) to allow AMHS to directly interface with IPv4 Guiders for the intra-regional connections.

b) Configurating AMHS, as specified in a) with capacity for IPv4 conversion to IPv6 through the implementation of a function of IP router as gateway for the interregional connections.

3.1.2 The Sixth Meeting of Committee ATM/CNS (ATM/CNS/6) (Santo Domingo, Dominican Republic, 30 June to the 04 July 2008) analyzed this Plan of IP Addressing for CAR/SAM Regions and considered that such a plan would be sent to the ICAO for revision.

3.1.3 During the ACP/WG/I/8 (Montreal, Canada, 25 to 29 August 2008) it was concluded that it is possible to consider a regional scheme of IPv4 addressing. Taking into consideration that the private sector would be using the propose addressing scheme in other applications, the Meeting considered nonviable to apply the IP addressing scheme at a global level.

3.1.4 The Third Meeting of the Group of Regional Implementation SAM/IG/3 (Lima, Peru, 20 to 24 April 2009) considered that, taking into account specified in Table CNS 1Bb from the FASID, the AMHS system to be installed in the SAM Region will use IP protocol and will initially use the IPv4 version. The block of used IPv4 addresses will follow the format established during the ATM/CNS/SG/6 Meeting.

3.2 IP Addressing Plan

When we began to work on the plan of IP addressing, we once again reviewed the scheme that was originally proposed, analyzed the amount of States/Territories by

Region, the amount of addressing that each State/Territory could use and the amount of addressing reserved for the interconnection between States/Territories. The result of this study concluded that:

3.2.1 1 bit would be reduced to State/Territory level. This means the transfer of 256 States to 128 States by region. In the EUR/NAT Region, which is most numerous, has 53 States/Territories, means that there are many vacant numbers.

3.2.2 1 bit at Host's level would be added. This would allow the transfer from 4096 to 8190 hosts per State/Territory. This was considered due to the amount of future applications that would be implemented, mainly in the more developed States, and could cause the amount of directions not to be sufficient. The structure is shown below:

IPv4 Address						
10		Region / State / Territory		State / Territory / Host's		Host's
0 0 0 0 1 0 1 0	.	0 0 0 0 0 0 0 0	.	0 0 0 0 0 0 0 0	.	0 0 0 0 0 0 0 1
1st. Byte	.	2nd. Byte	.	3rd. Byte	.	4th. Byte

3.2.3 It should be noted the networks assigned to each State are private networks (RFC 1918). The first Bytes that integrate the assigned address will always maintain a decimal value of 10. Whereas the other three Bytes are used to distribute, in hierarchic form, the blocks of directions corresponding to each State.

3.2.4 The first four bits of the second Byte (4 bits) will be used to identify the regions in around which the States/Territories of the world are grouped:

- 0000 => SAM: South American Office.
- 0001 =>. NACC: North American, American Power station and Caribbean
  Office.
- 0010 => APAC: Asia and Pacific Office.
- 0011 => MID: Middle East Office.
- 0100 => WACAF: Western and Central African Office.
- 0101 => ESAF: Eastern and Southern African Office.
- 0110 => EUR/NAT: European and North Atlantic Office.

3.2.5 On the other hand, the last four bits of the second Byte, and the first three bits of the third Byte (7 bits) will be used to identify the States/Territories of each region.

3.2.6 Whereas the last five bits of the third Byte and the eight bits that compose the fourth Byte (13 bits) will be used by each one of the States/Territories to assign addressing to their terminals/servers

3.2.7 The proposed IPv4 address allocation scheme will be able to cover:

- 16 Regions.

- o 128 States/Territories by each Region.
- o 8190 Host' s for each State/Territory

3.2.8 The proposed IPv4 addressing plan would allow each State/Territory tobe able to make use of the block of directions assigned as needed.

a) Each State has been assigned 8190 usable Network addresses, which seem to be sufficient to cover existing needs.

b) In the development of the mentioned scheme, a flexible margin has been designated so that it will allow the future growth or change in the network in the future. For example, if a region were subdivided in two or more regions, or the emerging of a new State/Territory.

c) Argentina has already implemented its ATN network with a scheme of addresses different from the proposed one, prior to the publication of this document, has placed a border devise with the intention that this devise will make the address translation between the outer directions .

3.3 Network Assignment by Region (ASIA/PACIFIC)

Region	Issue	State/ Territory	Network	Direction Used	Decimal Notation	Binary Notation			
							Region	State/Territory	Host's
APAC	1	Australia	10 . 32 .0.0 / 19	First	10 . 32. 0 . 1	00001010.	0010	0000 . 000	00000 . 00000001
				Last	10 . 32. 31 . 254	00001010.	0010	0000 . 000	11111 . 11111110
	2	Bangladesh	10. 32. 64 .0 / 19	First	10 . 32. 32 . 1	00001010.	0010	0000 . 001	00000 . 00000001
				Last	10 . 32. 63 . 254	00001010.	0010	0000 . 001	11111 . 11111110
	3	Bhutan	10. 32. 64.0 / 19	First	10 . 32. 64 . 1	00001010.	0010	0000 . 010	00000 . 00000001
				Last	10 . 32. 95 . 254	00001010.	0010	0000 . 010	11111 . 11111110
	4	Brunei Danussaian	10. 32. 96.0 / 19	First	10 . 32. 96 . 1	00001010.	0010	0000 . 011	00000 . 00000001
				Last	10 . 32. 127 . 254	00001010.	0010	0000 . 011	11111 . 11111110
	5	Cambodia	10. 32. 128. 0 / 19	First	10 . 32. 128 . 1	00001010.	0010	0000 . 100	00000 . 00000001
				Last	10 . 32. 159 . 254	00001010.	0010	0000 . 100	11111 . 11111110
	6	China	10. 32. 160. 0 / 19	First	10 . 32. 160 . 1	00001010.	0010	0000 . 101	00000 . 00000001
				Last	10 . 32. 191 . 254	00001010.	0010	0000 . 101	11111 . 11111110
	7	Cook Islands	10. 32 . 192. 0 / 19	First	10 . 32 . 192 . 1	00001010.	0010	0000 . 110	00000 . 00000001
				Last	10 . 32 . 223 . 254	00001010.	0010	0000 . 110	11111 . 11111110
	8	Cook Islands	10. 32 . 224. 0 / 19	First	10 . 32 . 224 . 1	00001010.	0010	0000 . 111	00000 . 00000001
				Last	10 . 32 . 255 . 254	00001010.	0010	0000 . 111	11111 . 11111110
	9	Democratic people's Republic of Korea	10. 33 . 0 . 0 / 19	First	10 . 33 . 0 . 1	00001010.	0010	0001 . 000	00000 . 00000001
				Last	10 . 33 . 31 . 254	00001010.	0010	0001 . 000	11111 . 11111110
	10	Fiji	10. 33 . 32 . 0 / 19	First	10 . 33 . 32 . 1	00001010.	0010	0001 . 001	00000 . 00000001

				Last	10 . 33 . 63 . 254	00001010.	0010	0001 . 001 11111 . 11111110
	11	India	10. 17 . 64 . 0 / 19	First	10 . 33 . 64 . 1	00001010.	0010	0001 . 010 00000 . 00000001
				Last	10 . 33 . 95 . 254	00001010.	0010	0001 . 010 11111 . 11111110
APAC	12	Indonesia	10. 33 . 96 . 0 / 19	First	10 . 33 . 96 . 1	00001010.	0010	0001 . 011 00000 . 00000001
				Last	10 . 33 . 96 . 254	00001010.	0010	0001 . 011 11111 . 11111110
	13	Japan	10. 33 . 128 . 0 / 19	First	10 . 33 . 128 . 1	00001010.	0010	0001 . 100 00000 . 00000001
				Last	10 . 33 . 159 . 254	00001010.	0010	0001 . 100 11111 . 11111110
	14	Kiribati	10. 33 . 160 . 0 / 19	First	10 . 33 . 160 . 1	00001010.	0010	0001 . 101 00000 . 00000001
				Last	10 . 33 . 191 . 254	00001010.	0010	0001 . 101 11111 . 11111110
	15	Lao People's Democratic Republic	10. 33 . 192 . 0 / 19	First	10 . 33 . 192 . 1	00001010.	0010	0001 . 110 00000 . 00000001
				Last	10 . 33 . 223 . 254	00001010.	0010	0001 . 110 11111 . 11111110
	16	Malaysia	10. 33 . 224 . 0 / 19	First	10 . 33 . 224 . 1	00001010.	0010	0001 . 111 00000 . 00000001
				Last	10 . 33 . 255 . 254	00001010.	0010	0001 . 111 11111 . 11111110
	17	Maldives	10. 34 . 0 . 0 / 19	First	10 . 34 . 00 . 1	00001010.	0010	0010 . 000 00000 . 00000001
				Last	10 . 34 . 31 . 254	00001010.	0010	0010 . 000 11111 . 11111110
	18	Marshall Islands	10. 34 . 32 . 0 / 19	First	10 . 34 . 32 . 1	00001010.	0010	0010 . 001 00000 . 00000001
				Last	10 . 34 . 63 . 254	00001010.	0010	0010 . 001 11111 . 11111110
	19	Micronesia	10. 34 . 64 . 0 / 19	First	10 . 34 . 64 . 1	00001010.	0010	0010 . 010 00000 . 00000001
				Last	10 . 34 . 95 . 254	00001010.	0010	0010 . 010 11111 . 11111110
	20	Mongolia	10. 34 . 96 . 0 / 19	First	10 . 34 . 96 . 1	00001010.	0010	0010 . 011 00000 . 00000001

			Last	10 . 34 . 127 . 254	00001010 .	0010	0010 . 011 11111 . 11111110
21	Myanmar	10. 34 . 128 . 0 / 19	First	10 . 34 . 128 . 1	00001010 .	0010	0010 . 100 00000 . 00000001
			Last	10 . 34 . 159 . 254	00001010 .	0010	0010 . 100 11111 . 11111110
22	Nauru	10. 34 . 160 . 0 / 19	First	10 . 34 . 160 . 1	00001010 .	0010	0010 . 101 00000 . 00000001
			Last	10 . 34 . 191 . 254	00001010 .	0010	0010 . 101 11111 . 11111110
23	Nepal	10. 34 . 192 . 0 / 19	First	10 . 34 . 192 . 1	00001010 .	0010	0001 . 110 00000 . 00000001
			Last	10 . 34 . 223 . 254	00001010 .	0010	0001 . 110 11111 . 11111110
24	New Zealand	10. 34 . 224 . 0 / 19	First	10 . 34 . 224 . 1	00001010 .	0010	0001 . 111 00000 . 00000001
			Last	10 . 34 . 255 . 254	00001010 .	0010	0001 . 111 11111 . 11111110
25	Palau	10. 35 . 0 . 0 / 19	First	10 . 35 . 0 . 1	00001010 .	0010	0010 . 000 00000 . 00000001
			Last	10 . 35 . 31 . 254	00001010 .	0010	0010 . 000 11111 . 11111110
26	Papua New Guinea	10. 35 . 32 . 0 / 19	First	10 . 35 . 32 . 1	00001010 .	0010	0010 . 001 00000 . 00000001
			Last	10 . 35 . 63 . 254	00001010 .	0010	0010 . 001 11111 . 11111110
27	Philippines	10. 35 . 64 . 0 / 19	First	10 . 35 . 64 . 1	00001010 .	0010	0010 . 010 00000 . 00000001
			Last	10 . 35 . 95 . 254	00001010 .	0010	0010 . 010 11111 . 11111110
28	Republic of Korea	10. 35 . 96 . 0 / 19	First	10 . 35 . 96 . 1	00001010 .	0010	0010 . 011 00000 . 00000001
			Last	10 . 35 . 127 . 254	00001010 .	0010	0010 . 011 11111 . 11111110
29	Samoa	10. 35 . 128 . 0 / 19	First	10 . 35 . 128 . 1	00001010 .	0010	0010 . 100 00000 . 00000001
			Last	10 . 35 . 159 . 254	00001010 .	0010	0010 . 100 11111 . 11111110
30	Singapore	10. 19 . 160 . 0 / 19	First	10 . 35 . 160 . 1	00001010 .	0010	0010 . 101 00000 . 00000001
			Last	10 . 35 . 191 . 254	00001010 .	0010	0010 . 101 11111 . 11111110
31	Solomon Islands	10. 35 . 192 . 0 / 19	First	10 . 35 . 192 . 1	00001010 .	0010	0010 . 110 00000 . 00000001
			Last	10 . 35 . 223 . 254	00001010 .	0010	0010 . 110 11111 . 11111110

	32	Sri Lanka	10. 35. 224 . 0 / 19	First	10 . 35 . 224 . 1	00001010.	0010	0010 . 111	00000 . 00000001
				Last	10 . 35 . 255 . 254	00001010.	0010	0010 . 111	11111 . 11111110
	33	Thailand	10. 36 . 0 . 0 / 19	First	10 . 36 . 00 . 1	00001010.	0010	0011 . 000	00000 . 00000001
				Last	10 . 36 . 31 . 254	00001010.	0010	0011 . 000	11111 . 11111110
	34	Timor Leste	10. 36. 32 . 0 / 19	First	10 . 36. 32 . 1	00001010.	0010	0011 . 001	00000 . 00000001
				Last	10 . 36. 63 . 254	00001010.	0010	0011 . 001	11111 . 11111110
	35	Tonga	10. 36 . 64 . 0 / 19	First	10 . 36 . 64 . 1	00001010.	0010	0011 . 110	00000 . 00000001
				Last	10 . 36 . 95 . 254	00001010.	0010	0011 . 110	11111 . 11111110
APAC	36	Vanuatu	10. 36 . 96 . 0 / 19	First	10 . 36 . 96 . 1	00001010.	0010	0011 . 011	00000 . 00000001
				Last	10 . 36 . 127 . 254	00001010.	0010	0011 . 011	11111 . 11111110
	37	Vietnam	10. 36 . 128 . 0 / 19	First	10 . 36 . 128 . 1	00001010.	0010	0011 . 100	00000 . 00000001
				Last	10 . 36 . 159 . 254	00001010.	0010	0011 . 100	11111 . 11111110
	38	Isla de Pascua (Chilie)	10. 36 . 160 . 0 / 19	First	10 . 36 . 160 . 1	00001010.	0010	0011 . 101	00000 . 00000001
				Last	10 . 36 . 191 . 254	00001010.	0010	0011 . 101	11111 . 11111110
	39	French Polynesia	10. 36 . 192 . 0 / 19	First	10 . 36 . 192 . 1	00001010.	0010	0011 . 110	00000 . 00000001
				Last	10 . 36 . 223 . 254	00001010.	0010	0011 . 110	11111 . 11111110
	40	New Caledonia (French)	10. 36 . 224 . 0 / 19	First	10 . 36 . 224 . 1	00001010.	0010	0011 . 111	00000 . 00000001
				Last	10 . 36 . 255 . 254	00001010.	0010	0011 . 111	11111 . 11111110
	41	Wallis & Futuna Islands (French)	10. 37 . 0 . 0 / 19	First	10 . 37 . 0 . 1	00001010.	0010	0100 . 000	00000 . 00000001
				Last	10 . 37 . 31 . 254	00001010.	0010	0100 . 000	11111 . 11111110
	42	Niue (New Zealand)	10. 37 . 32 . 0 / 19	First	10 . 37 . 32 . 1	00001010.	0010	0100 . 001	00000 . 00000001
				Last	10 . 37 . 63 . 254	00001010.	0010	0100 . 001	11111 . 11111110

	43	Pecan Island (United Kingdom)	10. 37 . 64 . 0 / 19	First	10 . 37 . 64 . 1	00001010.	0010	0100 . 010	00000 . 00000001
				Last	10 . 37. 95 . 254	00001010.	0010	0100 . 010	11111 . 11111110
	44	American Samoa (United States)	10. 37 . 96 . 0 / 19	First	10 . 37. 96 . 1	00001010.	0010	0100 . 011	00000 . 00000001
				Last	10 . 37. 127 . 254	00001010.	0010	0100 . 011	11111 . 11111110
	45	Guam (United States)	10. 37 . 128 . 0 / 19	First	10 . 37. 128 . 1	00001010.	0010	0100 . 100	00000 . 00000001
				Last	10 . 37. 159 . 254	00001010.	0010	0100 . 100	11111 . 11111110
	46	Johnson Island Kingman Reef (United States)	10. 37 . 160 . 0 / 19	First	10 . 37. 160 . 1	00001010.	0010	0100 . 101	00000 . 00000001
				Last	10 . 37. 191 . 254	00001010.	0010	0100 . 101	11111 . 11111110
	47	Midway (United States)	10. 37 . 192 . 0 / 19	First	10 . 37. 192 . 1	00001010.	0010	0100 . 110	00000 . 00000001
				Last	10 . 37. 223 . 254	00001010.	0010	0100 . 110	11111 . 11111110
APAC	48	Northern Mariana Islands (United States)	10 . 37 .224. 0 / 19	First	10 . 37 . 224 . 1	00001010.	0010	0100 . 111	00000 . 00000001
				Last	10 . 37 . 255 . 254	00001010.	0010	0100 . 111	11111 . 11111110
	49	Palmyra (United States)	10 . 38 . 0 . 0 / 19	First	10 . 38 . 0 . 1	00001010.	0010	0101 . 000	00000 . 00000001
				Last	10 . 38 . 31 . 254	00001010.	0010	0101 . 000	11111 . 11111110
	50	Wake Islands (United States)	10. 38. 32 . 0 / 19	First	10 . 38 . 32 . 1	00001010.	0010	0101 . 001	00000 . 00000001
				Last	10 . 38 . 63 . 254	00001010.	0010	0101 . 001	11111 . 11111110
	51	VACANCY	10.37. 64 .0 / 19	First	10 . 38 . 64 . 1	00001010.	0010	0101 . 010	00000 . 00000001
				Last	10 . 38 . 95 . 254	00001010.	0010	0101 . 010	11111 . 11111110
	-	-	-						

	-	-	-						
	128	RESERVE	10. 47 . 2244 . 0 / 19	First	10 . 47 . 224 . 1	0 0 0 0 1 0 1 0 .	0 0 1 0	1 1 1 1 . 1 1 1	0 0 0 0 0 . 0 0 0 0 0 0 0 1
				Last	10 . 47 . 255 . 254	0 0 0 0 1 0 1 0 .	0 0 1 0	1 1 1 1 . 1 1 1	1 1 1 1 1 . 1 1 1 1 1 1 1 0

3.4 Using IPv4-Compatible Address Formats

In many instances, you can represent a 32-bit IPv4 address as a 128-bit IPv6 address. The transition mechanism defines the following two formats.

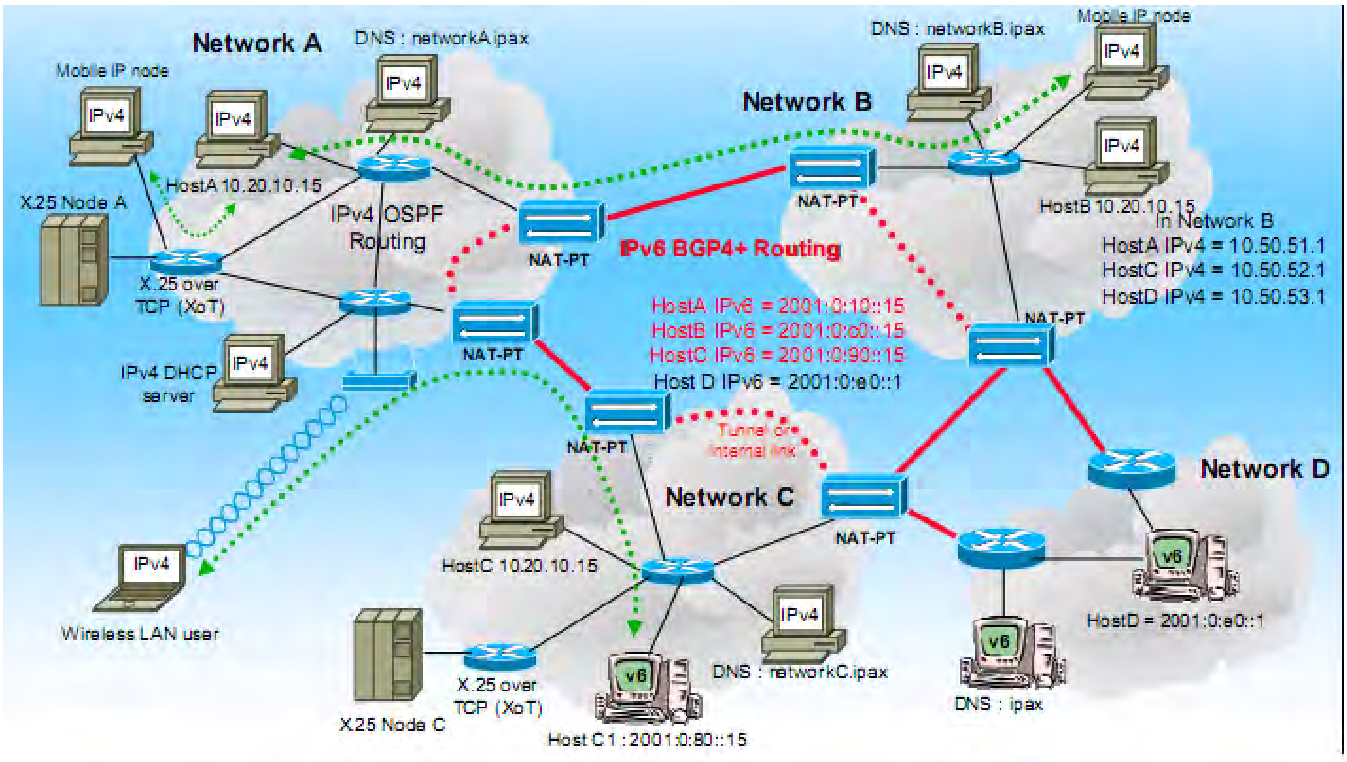
IPv4-compatible address

000 ... 000	IPv4 Address

IPv4-mapped address

000 ... 000	0xffff	IPv4 Address

The mapped address format is used to represent an IPv4 node. The only currently defined use of this address format is part of the socket API. An application can have a common address format for both IPv6 addresses and IPv4 addresses. The common address format can represent an IPv4 address as a 128-bit mapped address. However, IPv4-to-IPv6 protocol translators also allow these addresses to be used.



4. CONCLUSION

The meeting is invited to consider the proposed private network IPv4 address assignment for adoption. It is further recommended that the IPv4 address assignment table be modified to include States using Message Transfer Agent (MTA) only, since the connection between MTA and their associated User Agent (UA) is considered a local matter.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA AND PACIFIC OFFICE

ASIA/PACIFIC ATN NETWORK SERVICE ACCESS POINT (NSAP) ADDRESSING PLAN

Third Edition – September 2010

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SCOPE OF THE DOCUMENT

This document provides technical guidance on the Planning and the transition of Aeronautical Fixed Telecommunications Network (AFTN) communications to Aeronautical Telecommunications Network (ATN) within the Asia/Pacific Region. The material is intended for Regional Planning, although the plan itself is left to the States to proceed with planning and implementation.

Based upon the ATN SARPs as published in ICAO Annex 10 and Technical specifications as specified in ICAO Doc. 9705, ICAO Regions are expected to develop naming and addressing plans. This document provides guidance for the assignment of NSAP addresses within the Asia/Pacific Region. Each field of the NSAP address is presented with the recommended method of assigning values. Fields which are purely local State matters are identified.

DOCUMENT CONTROL LOG

Edition	Date	Comments	Section/pages affected
First	2001	This document was adopted by 12th meeting of APANPIRG held in 2001 for distribution to States in the Asia/Pacific and adjacent regions.	All
Second	March 2004	Re-issued as 2nd Edition of the Regional ATN Planning Document in March 2004.	All
Third	September 2010	i. Editorial updates – change of document version number ii. Updated table of contents iii. Creation of document control log iv. Inclusion of common address prefix for the Asia, Pacific and North America ICAO regions for the ADM field	All 2 3 9 to 11

1. INTRODUCTION

This paper presents the Network Service Access Point (NSAP) address assignment conventions for use in the Asia/Pacific Region.

The Asia/Pacific Regional ATN Addressing Plan consists of a set of recommendations for each State to assign regional NSAP addresses in a consistent manner. Using these recommendations, it should be possible to develop efficient routing policies that limit the amount of information exchange while providing comprehensive ATN services. Further, the application of this plan will permit simplified ATN service growth with a minimum of router re-configuration.

1.1 Objectives

The objectives of the document are to provide:

- Guidance in the specification of NSAP addresses,
- Guidance in the specification of routing domain identifiers (RDI) for Routing Domains (RD) and Routing Domain Confederations (RDC).

In providing guidance on the specification of NSAP addresses, each NSAP address field is described with the recommendations on how the field may be used. This is important so that consistency in the use of NSAP addresses is obtained and efficiency in routing is maintained.

The guidance on the specification of RD and RDC identifiers is a continuation to the specification of the NSAP address structure. By applying the rules of the address assignments to the addressing of RDs and RDCs, it will be ensured that the efficiency of the routing mechanisms is maintained.

1.2 Scope

The scope of the document includes:

- Describing the NSAP address format, and
- Recommending the values in the fields of the regional NSAP addresses.

The Asia/Pacific Regional ATN Addressing Plan will comply with the NSAP format as specified in ICAO Doc. 9705.

The Asia/Pacific Regional ATN Addressing Plan defines the method for assigning values to each of the fields of the NSAP address. States within the Region may choose to assign their NSAP addresses based upon the recommendations made here.

1.3 Document Structure

Section 2 contains the background information for the formulation of recommendations.
Section 3 contains the assumptions on which the recommendations are based upon.
Section 4 contains the NSAP address structure and the recommended values to be used in Asia/Pacific Region.

1.4 Terms Used

Network Addressing Domain – A subset of the global addressing domain consisting of all the NSAP addresses allocated by one or more addressing authorities.

Network Entity (NE) – A functional portion of an internetwork router or host computer that is responsible for the operation of internetwork data transfer, routing information exchange and network layer management protocols.

Network Entity Title (NET) – The global address of a network entity.

Network Service Access Point (NSAP) Address – A hierarchically organized global address, supporting international, geographical and telephony-oriented formats by way of an address format identifier located within the protocol header. Although the top level of the NSAP address hierarchy is internationally administered by ISO, subordinate address domains are administered by appropriate local organizations.

NSAP Address Prefix – A portion of the NSAP Address used to identify groups of systems that reside in a given routing domain or confederation. An NSAP prefix may have a length that is either smaller than or the same size as the base NSAP Address.

Routing Domain (RD) – A set of End Systems and Intermediate Systems that operate the same routing policy and that are wholly contained within a single administrative domain.

Routing Domain Confederation (RDC) – A set of routing domains and/or routing domain confederations that have agreed to join together. The formation of a routing domain confederation is done by private arrangement between its members without any need for global coordination.

Routing Domain Identifier (RDI) – A generic network entity title as described in ISO/IEC 7498 and is assigned statically in accordance with ISO/IEC 8348. An RDI is not an address and cannot be used as a valid destination of an ISO/IEC 8473 PDU. However, RDIs are like ordinary NETs, assigned from the same addressing domain as NSAP addresses.

1.5 References

Reference 1	Manual of Technical Provisions for the ATN (Doc 9705-AN/956) Third Edition.
Reference 2	Comprehensive Aeronautical Telecommunication Network (ATN) Manual (Doc 9739-AN/961) Second Edition 2002.
Reference 3	ACCESS - ATN Compliant Communications European Strategy Study Define Network topology – Addressing Plan Addressing Plan of the European ATN Network
Reference 4	ICAO Location Indicators – Document 7910
Reference 5	Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services - Document 8585

2. BACKGROUND

2.1 System Level Requirements

The ATN SARPs are divided into a set of System Level Requirements. These requirements are found in the ICAO Annex 10 text and are repeated in ICAO Doc. 9705 (Reference 1), Sub-Volume 1. The System Level Requirements detail specific requirements that all ATN compliant systems must meet and form the basis for the technical specifications. Some of the System Level Requirements may best be satisfied through Regional Planning and Regional specification of procedures.

The following list presents the important System Level Requirements and Recommendations that form the basis of the NSAP Addressing Plan.

- System Level Requirement #11 (Annex 10) presents the basis for the definition of NSAP addresses: "The ATN shall provide a means to unambiguously address all ATN end and intermediate systems."
- System Level Requirement #13 (Annex 10) presents the basis for the need of Regional Planning: "The ATN addressing and naming plans shall allow State and organizations to assign addresses and names within their own administrative domains."

System Level Requirement #11 forms the basis for assigning at least one unique NSAP address for each end system and intermediate system. The assignment of NSAPs to systems enables the unambiguous identification of ATN components and applications.

System Level Requirement #13 forms the basis for Regional Planning in the area of NSAP address assignment. The establishment of Regional plans for assigning addresses assists States and Organizations within a Region to develop consistent address assignment procedures that will result in more efficient routing policies.

2.2 Basis for ATN Address Planning

2.2.1 Regional Planning

At the second meeting of the ATN Panel, it was recognized that the establishment of naming conventions and registration procedures were necessary for the successful deployment of the ATN. Two specific Recommendations were developed at that meeting and subsequently approved by the Air Navigation Commission.

Recommendation 4/1 Advice to States on ATN addressing issues
"That ICAO advise States and international organizations to take the necessary actions for the assignment, administration, and registration of ATN names and addresses within their allocated name/address space, using the information provided."

Recommendation 4/2 Setting up an ICAO ATN addressing process
"That ICAO take the necessary actions to provide a facility for maintaining an up-to-date repository of ATN addresses and names registered in the Air Traffic Services Communication (ATSC) domain, and publish the repository entries at usual regular intervals."

2.2.2 Asia/Pacific Regional Planning

The APANPIRG agreed that a consistent plan for naming and addressing is required to simplify the transition to ATN.

3. ASSUMPTIONS

In developing the recommendations for the Asia/Pacific Regional ATN Addressing Plan, several assumptions were made about the structure of the Region's ATN implementation. Some of these assumptions may appear unnecessary, but they tend to guide the development of the recommendations presented in Section 4.

- The Asia/Pacific Regional ATN Addressing Plan will comply with the rules in ICAO Doc. 9705 (Reference 1). This means that the syntax, semantics and encoding rules of the NSAP address fields as specified in ICAO Doc. 9705 must be observed.
- There will be a number of ATN routers deployed in the Region. This assumption drives the need for multiple routing domains within the Region and the need to develop a plan that allows for efficient routing.
- The regional routing architecture will eventually include RDCs such as Island RDCs and Backbone RDCs. Therefore the Asia/Pacific Regional ATN Addressing Plan must allow for the addressing of these RDCs.
- The Region will have at least one ATN router in each defined routing domain. This assumption is based on the ATN requirement for the establishment of routing domains.
- The Region will support both ground-ground and air-ground services and applications.

4. NSAP ADDRESSING PLAN

4.1 Introduction

The Asia/Pacific Regional ATN Addressing Plan provides guidance to the States within the Region in assigning NSAP addresses to their ATN systems. The Plan addresses the need for consistency within the Region for address assignment.

To find a suitable ATN addressing convention that would be acceptable for use in the Asia/Pacific Region requires a routing architecture that minimizes routing updates and overheads within the ground ATN infrastructure for both ground-ground and air-ground services and applications.

The ATN addressing convention must allow for an addressing scheme that is:

- Practical - to provide autonomous administration of ATN addresses for States and Organizations, and
- Flexible - to allow for future expansion and/or routing re-configuration of the ground ATN infrastructure with minimal re-assigning of ATN addresses.

The recommendations made in the Asia/Pacific Regional ATN Addressing Plan are based on the work performed by the European ACCESS[1] Project (Reference 3).

4.2 NSAP Address Format

The NSAP address format is defined in ICAO Doc. 9705 (Reference 1), Sub-Volume 5. The format is based upon the requirements specified in the base standard (ISO/IEC 8348) and incorporates the specific ATN requirements for addressing both ground and mobile systems.

The structure of the Network Service Access Point (NSAP) address is depicted in Figure 4.2-1.

20 Octets

AFI	**IDI**	**VER**	**ADM**	**RDF**	**ARS**	**LOC**	**SYS**	**SEL**

Figure 4.2-1 NSAP Address Format

The NSAP address structure contains 9 fields, which are described in Table 4.2-1.

Field Name	Field Description	Size	Syntax	Number of Characters/ Digits	Field Encoding
AFI	Authority and format Identifier	1 Octet	Decimal	2 Digits	BCD
IDI	Initial domain Identifier	2 Octets	Decimal	4 Digits	BCD
VER	Version	1 Octet	Hex	2 Digits	Binary
ADM	Administration Identifier	3 Octets	Alpha or Hex/Alpha	3 Characters 2 Digits character	IA-5 Binary/ IA-5
RDF	Routing Domain Format	1 Octet	Hex	2 Digits	Binary
ARS	Administration Region Selector	3 Octets	Hex	6 Digits	Binary
LOC	Location	2 Octets	Hex	4 Digits	Binary
SYS	System Identifier	6 Octets	Hex	12 Digits	Binary
SEL	NSAP Selector	1 Octet	Hex	2 Digits	Binary

Table 4.2-1 – Encoding Rules for the ATN NSAP

4.3 Recommended values for NSAP Address Fields assignment

4.3.1 The AFI and IDI Fields

The ATN Internet SARPs (Reference 1) require allocation of the following values:

- Decimal for the AFI field to indicate the type of NSAP being used. This value has been assigned the character sequence “47”.

[1] ACCESS (ATN Compliant Communications European Strategy Study) is a project funded by the European Commission and jointly produced by the following companies and administrations: National Air Traffic Services (NATS), Deutsche Flugsicherung (DFS) and Service Technique de la Navigation Aerienne (STNA).

- Decimal for the IDI field to designate ICAO. This value has been assigned the character sequence "0027".

As recommended in Reference ATN NSAP addresses and NETs will be written as the character sequence "470027+" where the "+" is used to separate the Binary Coded Decimal (BCD) fields from subsequent Hexadecimal fields. Hence the AFI and IDI fields will be set to 470027.

4.3.2 The VER Field

The VER field is used to partition the ATN Network Addressing domain into a number of sub-ordinate Addressing Domains.

The values currently specified in Reference for the VER field are summarized in Table 4.3.2-1.

VER Field Value	Network Addressing Domain	Common NSAP Address Prefix for Domain	Values to be used by States of Asia/Pacific Region
[0000 0001]	Fixed AINSC	470027+01	
[0100 0001]	Mobile AINSC	470027+41	
[1000 0001]	Fixed ATSC	470027+81	470027+81 (ATSO ISs and ESs)
[1100 0001]	Mobile ATSC	470027+C1	470027+C1 (General Aviation)

Table 4.3.2-1 – Defined Values for the VER Field

4.3.3 The ADM Field

The ADM field is used to further partition the ATN Network Addressing Domain. The field designates a single State or Organization. Depending on what the VER field is set to will determine what values should be used in the ADM field.

When the VER field is set to "01" (Fixed AINSC) or "41" (Mobile AINSC), three alphanumeric characters derived from Doc. 8585 should be used.

When the VER field is set to "81" (Fixed ATSC) or "C1" (Mobile ATSC), the ATN SARPs permits two possible ways for encoding the ADM field.

The first method recommends that the State's three character alphanumeric ISO country code is used, as defined in ISO 3166. States may choose this method, however it will provide less flexibility than the second method for the addressing of regional entities (e.g. regional RDCs or regional organizations that are not country specific).

The second method that is recommended for use in the Asia/Pacific Region is to use the first octet of the field to define the ICAO region. Individual regions may be indicated or a combined Asia, Pacific, North America (NAM) region may be used. This would permit the reduction of the routing information that would otherwise be generated. It is recommended that the remaining two octets of the field will further identify the country, RDCs and the regional organizations that are not country specific as follows:

- For the identification of a country, it is recommended that States use the ICAO two letter location indicator (Reference 4) instead of the two character alphanumeric ISO 3166 country code. The structure of the ICAO two letter location indicator allows for a more efficient identification of a location. For example, indicators starting with the same letter "V" designate several countries in the same local region (e.g. Thailand, Sri Lanka, India, Cambodia etc). The second letter will actually define the specific country within this local region (e.g. "VT" for Thailand, "VC" for Sri Lanka etc.). Where a country has several ICAO two letter location indicators allocated to it, the assigning authority of the ADM field will be responsible in determining the preferred location indicator to represent that country. For example, the indicators "VA", "VI", "VO", "VE" are assigned to India and one of these indicators will be selected to represent India. The encoding of the ICAO two letter location indicators will be upper case alphanumeric values.

- For regional organizations that are not country specific, it is recommended to allocate a lower case alphanumeric value so as there will be no conflict with the ICAO two letter location indicators.

- For the addressing of RDCs (e.g. Island RDCs, Backbone RDCs), in particular for those that are not country specific, it is recommended to allocate codes with the most significant bit set to 1 in the second octet. Valid values would be in the hexadecimal range [8000 – FFFF].

ICAO Asia/Pacific Regional Office would be the allocation authority of the ADM field. In summary, the values allocated for the ADM field is indicated in Table 4.3.3-1.

VER Field Network Addressing Domain	**ADM Field Values**
Fixed AINSC	Derived from the set of three-character alphanumeric characters from Doc. 8585 (Reference 5).
Mobile AINSC	Derived from the set of three-character alphanumeric characters from Doc. 8585.
Fixed ATSC	To allow for efficient routing information to be exchanged, it is proposed that the ICAO Regional code be used in the first octet of the ADM field followed by the ICAO two-letter location indicator for countries. The Regional codes are shown below. Regional Codes: [1000 0000] Africa [1000 0001] Asia [1000 0010] Caribbean [1000 0011] Europe [1000 0100] Middle East [1000 0101] North America [1000 0110] North Atlantic [1000 0111] Pacific [1000 1000] South America [1001 0001] Asia/Pacific/NAM For example Thailand would be represented as part of the Asia region by the hexadecimal sequence "815654" or as part of the combined Asia/Pacific/NAM region by the hexadecimal sequence "915654". Table 4.3.3-2 provides further examples

	for a selected number of countries. Where a two letter country code is not applicable, the following rules would apply: ICAO would assign lower case alphanumeric characters using a two letter value to organizations that wish to be based in a particular region. For example, if an organization is to be based in the Pacific region and wanted to be represented by the characters ‘sa’, this would be represented by the following hexadecimal sequence: 877361. ICAO would assign regional codes for RDCs where a country code or organization code is not applicable. Values would be assigned with the most significant bit set to 1 in the second octet. For example a RDC established in the Pacific region would be represented by the following hexadecimal sequence: 878100.
Mobile ATSC	Same for Fixed ATSC

Table 4.3.3-1 – Defined Values for the ADM Field

Fixed or Mobile Asia/Pacific ATSC Addressing Domain	Hexadecimal Code of the ADM Field	Comment
Australia	915942	Asia/Pacific/NAM Region + ‘YB’
China	915A42	Asia/Pacific/NAM Region + ‘ZB’
India	915649	Asia/Pacific/NAM Region + ‘VA’
Fiji	914E46	Asia/Pacific/NAM Region + ‘NF’
Japan	91524A	Asia/Pacific/NAM Region + ‘RJ’
New Zealand	914E5A	Asia/Pacific/NAM Region + ‘NZ’
Singapore	915753	Asia/Pacific/NAM Region + ‘WS’
Thailand	915654	Asia/Pacific/NAM Region + ‘VT’
United States	915553	Asia/Pacific/NAM Region + ‘US’
Viet Nam	915656	Asia/Pacific/NAM Region + ‘VV’

Table 4.3.3-2 – Example of Proposed ADM Value Assignment for Selected Asia, Pacific, and North America Entities

4.3.4 The RDF Field

The RDF field is historical and is not used. Therefore the RDF field shall be set to [0000 0000].

4.3.5 The ARS Field

The ARS field is used to:

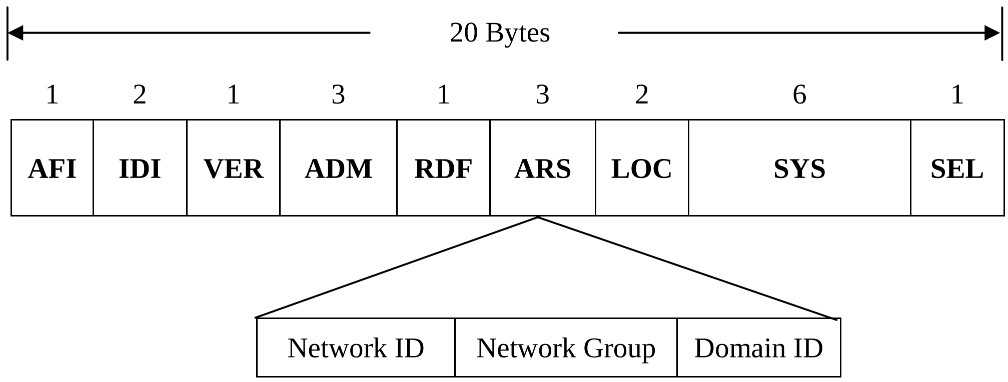
- Distinguish Routing Domains operated by the same State or Organization (in Fixed Network Addressing domains); and
- Identify the aircraft on which the addressed system is located (in Mobile Network Addressing Domains).

Each State or Organization identified in the ADM field will be responsible for assigning the values for the ARS field.
In accordance with the SARPs, for a Mobile Network Addressing Domain, the 24-bit ICAO Aircraft Identifier is inserted in the ARS field. However, no specific values have been specified for Fixed Network Addressing Domains.

The ARS field shall be assigned in a manner that simplifies the routing of data and makes provision for any potential lower level organizational units that could, in the future, operate an ATN Routing Domain.

The Asia/Pacific Regional ATN Addressing Plan recommends the ARS field be decomposed into three subfields as shown in Figure 4.3.5-1: Network ID, Network Group ID and Domain ID.

Figure 4.3.5-1 Recommended structure for ARS field



4.3.5.1 Network ID

Potential future operators of an ATN Routing Domain could be:

- A national Air Traffic Service Organization(s) (ATSO);
- A national military organization;
- A national meteorological organization; and
- An airport operator.

At present it is assumed that military organizations and meteorological organizations will not start up their own ATN Routing Domains and will be located within a national ATSO ATN Routing Domain. The same may apply to airport operators.

However in planning for the long term it is deemed necessary that provision is made available for these future possibilities.

In allowing for this possible expansion, it is recommended that the different ranges of values for the Network ID sub-field be allocated to the different national organizations as follows:

- Hexadecimal values [00 – 1F] of the first octet of the ARS field be reserved for the addressing of domains and systems operated by the national ATSO.
- Hexadecimal values [20 – 3F] of the first octet of the ARS field be reserved for the addressing of domains and systems operated by the national military organization.
- Hexadecimal values [40 – 5F] of the first octet of the ARS field be reserved for the addressing of domains and systems operated by the national airport operators. (Note: this range matches the ASCII range of alphabetical upper case characters).
- Hexadecimal values [60 – 7F] of the first octet of the ARS field is reserved for the addressing of domains and systems operated by the national meteorological organization.
- Hexadecimal values [80 – FF] are reserved.

A national organization would then be able to register one or several values for the Network ID sub-field within the range that has been reserved for its organization category.

In addition to the Network ID sub-field being used for distinguishing the different national organizations, it is proposed that this sub-field also be used for the identification of the particular role of the addressed domain. For example, setting the Network ID sub-field to the hexadecimal value “01” would represent the set of operational Routing Domains of the national ATSO. Setting the Network ID sub-field to hexadecimal “11” would represent the set of non-operational Routing Domains of the national ATSO. In using the Network ID sub-field in this manner, allow national ATSOs to provide for a duplicate non-operational network to be used for trials and pre-operational testing. Similar arrangements could be used for the other national organizations.

4.3.5.2 Network Group ID

This sub-field can be used to subdivide a ground ATN network into smaller groups. This field is unique within a particular network. This may be useful for future expansion by allowing regions to be formed within a particular network as defined by the Network ID. The formation of regions may be useful for the routing traffic exchanged within the network.

This sub-field is also used to designate an RDC. RDCs can also be used to assist in the formation of regions within an Administrative Domain and they offer an additional level of flexibility when used to combine RDs into a confederation. RDCs are designated by setting the uppermost bit of this sub-field to “1”.

4.3.5.3 Domain ID

This sub-field is a unique identifier assigned to each Routing Domain in the Network Group.

Table 4.3.5.3-1 shows possible examples on how the ARS field could be used. In the table two Network Groups "01" and "02" are defined. These two Network Groups can, for example, represent two FIRs in a country. One of the two Network Group contains two RDs and the other one contains three RDs. These two Network Groups can also address the initial RDs in a country (i.e. two RDs) with a planned expansion towards five RDs.

Network ID	Network Group ID	Domain ID	Comment
01	01 02	01 02 01 02 03	Network ID "01" indicates an ATSO operational network that contains two Network Groups "01" and "02". Network Group "01" contains two RDs "01" and "02". Network Group "02" contains three RDs "01", "02" and "03".

Table 4.3.5.3-1 – Example of ARS Value Assignment

4.3.5.4 Addressing RDCs in the ARS field

The Network Group ID sub-field is used to segregate the addressing space of actual RDs and RDCs. When the uppermost bit of the Network Group ID sub-field is set to "1" the second and third octets of the ARS field are assigned from the RDC addressing space (i.e., 8000-FFFF) and must be unique within that addressing domain. Otherwise, the sub-fields are assigned from the NSAP Address Space as described above for the Network Group ID and Domain ID sub-fields.
Similar principles as explained in sections 4.3.5.2 and 4.3.5.3 for the addressing of RDs can be applied to the addressing of RDCs, as required:

- The second octet of the ARS field may identify a group of RDCs.
- The third octet of the ARS field identifies RDCs.

4.3.6 The LOC Field

The LOC field is used to:
- Distinguish Routing Areas within Fixed Routing Domains, identified by the ARS field; and
- Distinguish Routing Areas and Routing domains within aircraft identified by the ARS field.

The assignment of the LOC field value is the responsibility of the State or organization that is the addressing authority for the routing domain in which the identified routing area is contained.
To assist States or organizations, it is recommended that the LOC field be divided into two sub-fields as shown in Figure 4.3.6-1: Sub-domain Group ID and Sub-domain ID.

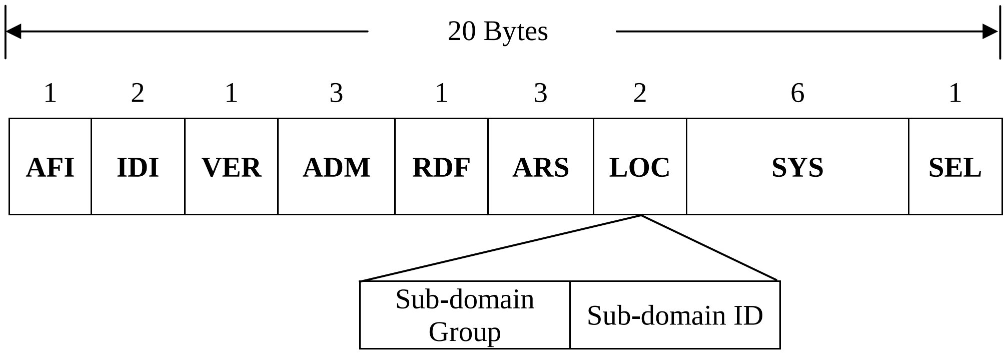


Figure 4.3.6-1 Proposed LOC Field Format

4.3.6.1 Sub-domain Group ID

This sub-field can be used to subdivide a domain into separate groups. For example, each control centre could define as a routing domain. A control centre may contain an En-Route facility, Terminal facilities, and Tower facilities. Each of these facilities can be classified as a different Sub-domain Group allowing addressing to be delegated to each facility, if desired. For this example, this sub-field can be assigned as shown in the Table 4.3.6.1-1.

Value (hex)	Description
00	Reserved
01	No specific group. Used for RDs that do not require subdivision
02	En-Route Sub-domain
03 – FF	Assigned as required

Table 4.3.6.1-1 – Example of Sub-domain Group ID Value Assignment

4.3.6.2 Sub-domain ID

This sub-field is a unique identifier assigned to each routing area within a Sub-domain Group. This sub-field allows multiple areas to exist within a sub-domain group and must be unique within the sub-domain. This subfield could be assigned as shown in the Table 4.3.6.2-1.

Value (hex)	Description
00	Reserved
01	No specific area. Used for Sub-domains that do not require subdivision
02 – FF	Assigned as required by the Sub-domain Group Addressing Authority

Table 4.3.6.2.1 – Example of Sub-domain ID Value Assignment

4.3.7 The SYS Field

The SYS field is used to uniquely identify an End-System or Intermediate-System. The allocation of the SYS field value is the responsibility of the organization that is the addressing authority for the routing area that contains the identified ATN End-System or Intermediate-System.

The type of values or structure for the SYS field is for individual authorities to choose, as appropriate.

It has been suggested that the 48-bit LAN address of a device attached to an IEEE 802 local area network that is being used as an ATN ES or IS, could be used in this field. However, this may have ramification if the SYS field is tied to a sub-network dependent information such as the physical network address (e.g. 48-bit LAN address) that is associated with a particular device. The problem will occur when the device is replaced by another device which will use a different 48-bit LAN address, requiring the NSAP address of the ATN ES or IS to be changed.

It is therefore recommended that the SYS field be used to identify the system without any dependency on physical information. Possible examples of this is to define whether the system is an IS or an ES, the type of function or role the system is used for (e.g. primary system, hot standby system, cold standby system, etc.), or the type of applications that are running on the system (e.g. AMHS, AIDC, ADS, CPDLC, Network Management, etc.).

A requirement found in Section 7.1.4.b.1 of ISO 10589 IS-IS states that all Level 2 ISs within a Routing Domain must have a unique SYS field value. In order to enforce this requirement related to IS-IS Level 2 addressing, it is recommended that the values assigned to the LOC sub-fields also be assigned to the upper two octets of the SYS field. Using this approach enables the addressing authority for each Sub-domain Group the flexibility to assign addresses without conflicting with addresses of other groups within the same Routing Domain.

4.3.8 The SEL Field

The SEL field is used to identify the End-System or Intermediate-System network entity or network service user process responsible for originating or receiving Network Service Data Units (NSDUs).

Table 4.3.8-1 identifies the defined values that shall be used in this field in accordance with Reference.

SEL Field Value	Usage
[0000 0000]	Used for an IS network entity except in the case of an airborne IS implementing the procedures for the optional non-use of IDRP.
[0000 0001]	Used for the ISO 8073 COTP protocol in the Ground or Airborne End-systems.
[0000 0010]	Used for the ISO 8602 CLTP protocol in the Ground or Airborne End-systems.
[1111 1110]	Used for an IS network entity belonging to an airborne IS implementing the procedures for the optional non-use of IDRP.
[1111 1111]	Reserved

Table 4.3.8-1 – Defined Values for the SEL field

4.4 Authority Responsible for NSAP Field Assignments

The responsibility for the assignment of values to each of the NSAP address fields is held by only one organization. This is to ensure that each NSAP address is unique within the ATN. Table 4.4-1 identifies which organization is responsible for the assignment of each field.

NSAP Field	Assignment Authority
AFI	ITU-T and ISO
IDI	ITU-T and ISO
VER	ICAO – defined in Doc. 9705
ADM	States or Organizations identified by the VER field and according to rules found in Doc. 9705 – Recommended values and responsible authority are provided in this plan.
RDF	Reserved
ARS	States or Organizations at the discretion – Recommended values in this plan
LOC	States or Organizations
SYS	States or Oganizations
SEL	ITU-T and ISO for standard transport protocol, States and Organizations for other values/uses

Table 4.4-1 – NSAP Address Field Assignment Responsibility

ANNEX C

Test Procedure
for
ATN Router Connection Test

ANNEX C

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates – change of document version number	all
3.0	September 2009	Editorial updates – change of document version number	all
3.1	2010	Proposed amendments (Draft)	

Table of Contents

1. Introduction

1.1 This document describes the test procedure for the Ground-Ground (G/G) Aeronautical Telecommunication Network (ATN) router connection.

2. References

[1] Asia/Pacific Regional ATN G/G Router ICD for ISO/IEC 8202 Sub-Network.

[2] ASIA/PAC Interface Control Document (ICD) for ATN G/G Router

[3] Test Plan for AMHS Technical Trial between Hong Kong, China and Japan.

[4] "Technical Memorandum of Cooperation between Engineering & Systems Division, Civil Aviation Department, Hong Kong China and Operations and Flight Inspection Division, Civil Aviation Bureau, Ministry of Land, Infrastructure and Transport, Japan: AMHS Trials and Service between Japan and Hong Kong, China", February 2003. (Amended 24 August 2004)

3. Test Overview and Scope

3.1 A joint ATN Router Connection Test between AMHSLAND1 and AMHSLAND2 using a 9.6kbps X.25 PSDN (packet-switched data network) circuit.

3.2 An ATN Router Connection Test is scheduled to verify the connectivity, interoperability, data relaying/routing and redundancy capabilities (where applicable) of the ATN Ground-Ground routers in AMHSLAND1 and AMHSLAND2.

3.3 The ATN Router Connection Test will also confirm that the functions of the AMHSLAND1 and AMHSLAND2 ATN routers were configured in preparation for more than 2 routers tests.

3.4 The system configuration for the test is shown in Figure 1. Routers in AMHSLAND1 and AMHSLAND2 are linked by an X.25 virtual circuit (VC) over a leased line connection (e.g.64 kbps).

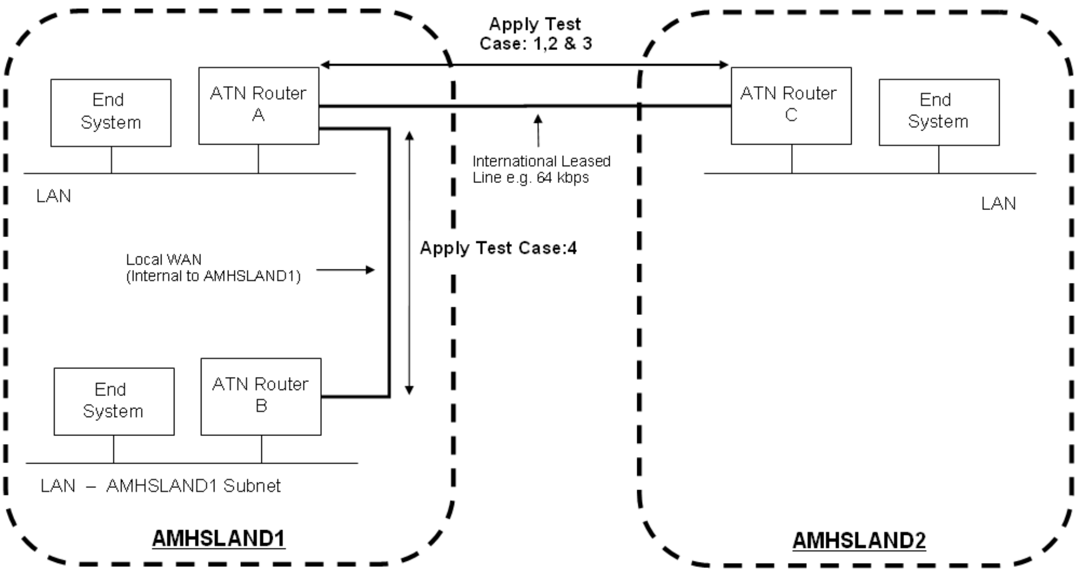


Figure 1 ATN Router Connection Test Configuration

3.5 To test data relay and routing functions, CLNP Echo Request (ERQ) Network Protocol Data Units (NPDU) will be generated by the routers and End Systems. To support these tests, all Intermediate Systems shall be capable of generating CLNP ERQ PDUs, and all Intermediate Systems and End Systems shall be capable of transmitting CLNP Echo Response (ERP) PDUs in response to the receipt of ERQ PDUs. Further, it is desirable that End Systems be capable of generating CLNP ERQ PDUs. Execution of some test items is contingent on End Systems' capabilities.

3.6 Since both AMHSLAND1 and AMHSLAND2 are ATN backbone sites, the proper updating of their routing tables should be tested in detail. This will ensure that the router could relay the data received from its counterpart to another router either within or outside its own domain/ATN site.

3.7 The ATN router network test is to verify the connectivity, interoperability, data relaying/routing and redundancy capabilities (where applicable) of the ATN Ground-Ground routers when expanded to a three and then four domains configuration. The system test configuration is as shown in Figure 2.

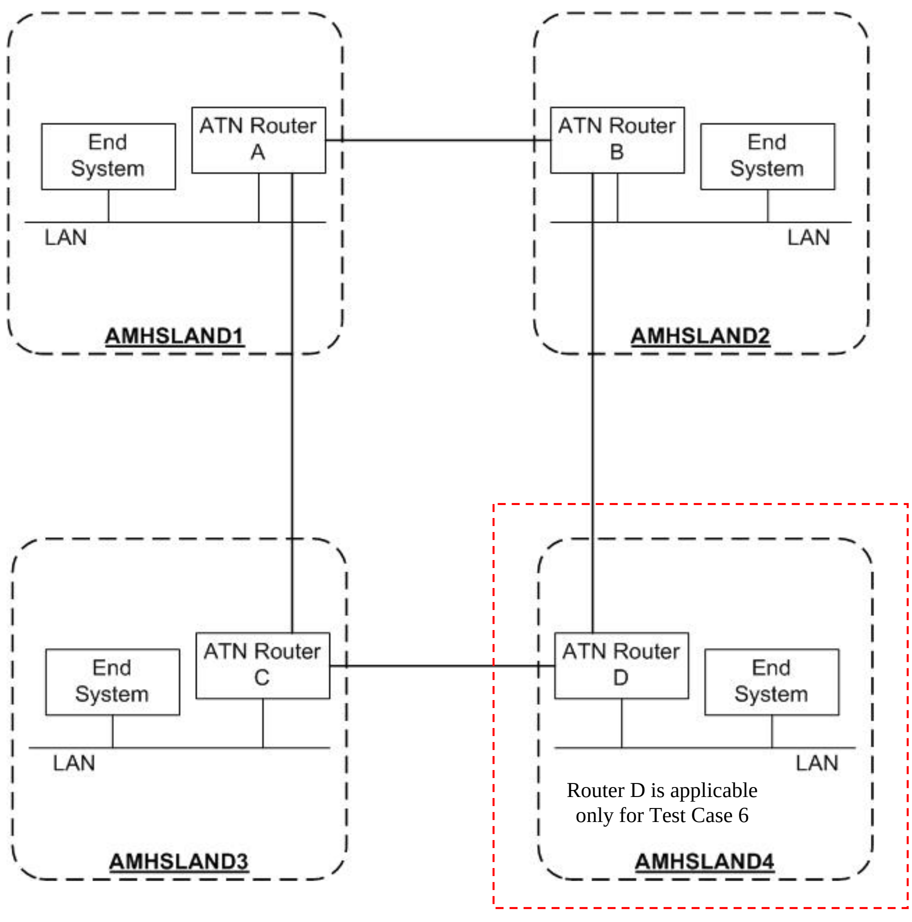


Figure 2 ATN Routers Connection (Multiple Domains) Test Configuration

3.8 A summary of test items for the ATN Router Connection Test is shown in Table 1.

Table 1 Summary of Test Items for ATN Router Connection Test

No.	Test Item	Details
1	Router Connection Establishment and Maintenance	Establish LAPB, X.25 VC and IDRP connections between routers. Exchange of KEEPALIVE PDUs to maintain IDRP connection.
2	NPDU Relay	Tests to confirm CLNP Echo function of routers, correct NPDU relay, and validation of handling of PDUs with invalid security option parameter.
3	Router end-to-end tests	IDRP route addition/deletion, carrier medium failure/restoration and router failure/recovery.
4	ATN router environment tests	Multiple router route addition/deletion, carrier medium failure/restoration and router failure/recovery.
5	ATN router network tests	Multiple router route addition/deletion, carrier medium failure/restoration and router failure/recovery in three-domain configurations. Confirm routing table updates and automatic re-route.
6	ATN router network tests	Multiple router route addition/deletion, carrier medium failure/restoration and router failure/recovery in four-domain configurations. Confirm routing table updates and automatic re-route.

4. Communication Parameters

4.1 The proposed communication parameters for the connection between the routers of AMHSLAND1 and AMHSLAND2 for test case 1 to 4 are listed in Table 2.

4.2 The proposed CLNP communication parameters for the End Systems are listed in Table 5. It is proposed to use the NSAP addresses of the AMHS systems that will be used in actual operation for the ES NSAP addresses.

4.3 The proposed communications parameters for the connection between the routers of AMHSLAND1, AMHSLAND2, AMHSLAND3 and AMHSLAND4 for test case 5 and 6 are listed in Table 6.

5. Schedule and Test Item Overview

5.1 The test items and planned schedule are shown in Table 7.

Table 2Router Communication Parameters

Protocol	Item No.	Item	Parameter		Note
			Router (AMHSLAND1)	**Router (AMHSLAND2)**	
	1.1	NSAP/NET	ROUTER A: 47.0027.81.91524A.00.010101.0302.000000000000.00 ROUTER B (simulated third domain): 47.0027.81.914b00.00.010101.0302.000000000000.00	ROUTER C: 47.0027.81.915648.00.010101.0202.0202.012A.0100.00	1
CLNP (RPDU)	2.1	Priority	14	14	2
IDRP	3.1	NLRI	ROUTER A: 47.0027.81.91524A.00.010101 ROUTER B: 47.0027.81.914b00.00.010101	ROUTER C: 47.0027.81.915648.00.010101	
	3.2	RDI	ROUTER A: 47.0027.81.91524A.00.010101 ROUTER B: 47.0027.81.914b00.00.010101	ROUTER C: 47.0027.81.915648.00.010101	
	3.3	SecurityRegistrationID	06 04 2B 1B 00 00	06 04 2B 1B 00 00	2
	3.4	Tag Set Name	07 (ATSC Class Security Tag Set)	07 (ATSC Class Security Tag Set)	2
	3.5	ATSC Class	Class C	Class C	2
	3.6	Holding Time	180 sec	180 sec	2
	3.7	KEEPALIVE Send Timer	60 sec	60 sec	2, 3
	3.8	OPEN PDU Transmission	ROUTER A: AMHSLAND1-AMHSLAND2 : OPEN-PDU send ROUTER A: local circuit: OPEN-PDU send ROUTER B: OPEN-PDU receive	ROUTER C: AMHSLAND2 -AMHSLAND1: OPEN-PDU receive ROUTER C: local circuit: OPEN-PDU send	

Note 1: Compliant with Asia/Pacific ATN addressing plan.

Note 2: For all routers used in tests.

Note 3: The value of the KEEPALIVE send timer is the holding timer value divided by 3.

Table 3Router Communication Parameters (continued)

Protocol	Item No.	Item	Parameter		Note
			Router (AMHSLAND1)	Router (AMHSLAND2)	
X.25	4.1	DTE Address	ROUTER A AMHSLAND1-AMHSLAND2 : 44442000023903 ROUTER A local circuit: 44442000023903 ROUTER B local circuit: 44440110110202	ROUTER C AMHSLAND1-AMHSLAND2 : 48404701021800 ROUTER C local circuit: local matter	
	4.2	LCGN	0	0	4
	4.3	LCN	10	10	4
	4.4	Packet Size	1024	1024	4
	4.5	Window Size	7	7	4
	4.6	Window Size Negotiation	Yes	Yes	4
	4.7	CR Packet Transmission	ROUTER A AMHSLAND1-AMHSLAND2 : Caller (CR send) ROUTER A local circuit: Caller (CR send) ROUTER B local circuit: Called (CR receive)	ROUTER C AMHSLAND1-AMHSLAND2 : Called (CR receive) ROUTER C local circuit: Caller (CR send)	
	4.8	Use of SQ	Yes	Yes	4
	4.9	Packet Sequence	Modulo 8	Modulo 8	4
	4.10	Packet Negotiation	Yes	Yes	4
	4.11	D Bit	OFF	OFF	4
	4.12	M Bit	Yes	Yes	4
	4.13	Restart Request Retransmission Count (R20)	1	1	4
	4.14	Reset Request Retransmission (R22)	1	1	4
	4.15	Clear Request Retransmission Count (R23)	1	1	4
	4.16	Restart Request Timer (T20)	180 sec	180 sec	4
	4.17	DTE Call Request timer (T21)	200 sec	200 sec	4
	4.18	Reset Confirmation Timer (T22)	180 sec	180 sec	4
	4.19	DTE Clear Confirmation Timer (T23)	180 sec	180 sec	4

Note 4: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Table 4Router Communication Parameter (continued)

Protocol	**Item No.**	**Item**	**Parameter**		**Note**
			Router (AMHSLAND1)	**Router (AMHSLAND2)**	
LAPB	5.1	Address	ROUTER A AMHSLAND1-AMHSLAND2 : 03 ROUTER A local circuit: 03 ROUTER B local circuit: 01	ROUTER C AMHSLAND1-AMHSLAND2 : 01 ROUTER C local circuit: local matter	
	5.2	Max Outstanding Number	7	7	5
	5.3	Idle Channel State Timer (T3)	60 sec	60 sec	5, 6
	5.4	ACK Receipt Timer (T1)	3 sec	3 sec	5, 7
	5.5	Frame Retransmission Count	5	5	5
	5.6	Maximum Number of bits in I-Frame (N1)	8248	8248	5, 8
	5.7	Frame Sequence	Modulo 8	Modulo 8	5
Physical	6.1	Interface	X.21/V.11 (Line Speed: 64 kbps)	V.11 (Line Speed: 64 kbps)	5
	6.2	Clock	Local Matter	Local Matter	5

Note 5: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Note 6: APAC ROUTER ICD (ref. [1]) specifies router A: 18–60 seconds, router B: 12–60 seconds.

Note 7: APAC ROUTER ICD (ref. [1]) specifies 6 sec, based on 9,600bps line speed and 256 byte packets.

Note 8: Value depends on the max. X.25 packet size. N1 = packet header size (3) + packet size (bytes) + LAPB address part (1) + LAPB control part (1) + LAPB FCS part (2) in BITS. So if the packet size is 1024 bytes, then N1 is (3 + 1024 + 1 + 1 + 2) * 8 = 8248 bits.

Table 5 End System CLNP Communication Parameters

Protocol	**Item No.**	**Item**	**Parameter**	
			Router (AMHSLAND1)	**Router (AMHSLAND2)**
	7.1	NSAP	AMHSLAND1 ES: 470027.81.91524A.00.010101.0302.128001091001.01 Third domain ES: 470027.81.914b00.00.010101.0302.000000010051.01	AMHSLAND2 ES: 47.0027.81.915648.00.010101.0202.0202.8002.0100.01
CLNP	7.1	Traffic Type	1 (ATSC/No Traffic Type Policy Preference)	1 (ATSC/No Traffic Type Policy Preference)
	7.2	Security Class	1 (Unclassified)	1 (Unclassified)
	7.3	Priority	8	8
	7.4	Partial Route Recording	No	No

Table 6 Router Communication Parameters (continued)

Protocol	**Item No.**	**Item**	**Parameter**		**Note**
			Router (AMHSLAND1 & AMHSLAND3)	**Router (AMHSLAND2 & AMHSLAND4)**	
	8.1	NSAP/NET	ROUTER A (AMHSLAND1): 47.0027.81.91524A.00.010101.0302.000000000000.00 ROUTER C (AMHSLAND3): 47.0027.81.915654.00.010101.0302.000000000000.00	ROUTER B (AMHSLAND2): 47.0027.81.915648.00.010101.0202.0202.012A.0100.00 ROUTER D (AMHSLAND4): 47.0027.81.915753.00.010101.0202.0202.012A.0100.00	1
CLNP (RPDU)	9.1	Priority	14	14	2
IDRP	10.1	NLRI	ROUTER A: 47.0027.81.91524A.00.010101 ROUTER C: 47.0027.81.915654.00.010101	ROUTER B: 47.0027.81.915648.00.010101 ROUTER D: 47.0027.81.915753.00.010101	
	10.2	RDI	ROUTER A: 47.0027.81.91524A.00.010101 ROUTER C: 47.0027.81.915654.00.010101	ROUTER B: 47.0027.81.915648.00.010101 ROUTER D: 47.0027.81.915753.00.010101	
	10.3	SecurityRegistrationID	06 04 2B 1B 00 00	06 04 2B 1B 00 00	2
	10.4	Tag Set Name	07 (ATSC Class Security Tag Set)	07 (ATSC Class Security Tag Set)	2
	10.5	ATSC Class	Class C	Class C	2
	10.6	Holding Time	180 sec	180 sec	2
	10.7	KEEPALIVE Send Timer	60 sec	60 sec	2, 3
	11.1	NSAP	AMHSLAND1 ES: 470027.81.91524A.00.010101.0302.128001091001.01 AMHSLAND3 ES: 470027.81.915654.00.010102.0302.000000010051.01	AMHSLAND2 ES: 47.0027.81.915648.00.010101.0202.0202.8002.0100.01 AMHSLAND4 ES: 47.0027.81.915753.00.010101.0202.0202.8002.0100.01	

Note 1: Compliant with Asia/Pacific ATN addressing plan.

Note 2: For all routers used in tests.

Note 3: The value of the KEEPALIVE send timer is the holding timer value divided by 3.

Table 7 Test Items and Schedule

Schedule (UTC)		Test Item No.			Description
Day	**Time**				
		1			**Router Connection Establishment and Maintenance**
			1	1～2	Data link establishment
			2	1～4	X.25 VC establishment
			3	1～2	IDRP connection establishment
			4	1～2	Exchange of routing information (UPDATE PDU transmission)
			5	1～2	Maintenance of IDRP connection (KEEPALIVE PDU transmission)
		2			**NPDU Relay**
			1	1～3	ERQ/ERP NPDU transmission /reply from AMHSLAND1 router to AMHSLAND2 router
			2	1～3	ERQ/ERP NPDU transmission /reply from AMHSLAND2 router to AMHSLAND1 router
			3	1～3	ERQ/ERP NPDU transmission/reply from AMHSLAND1 ES to valid destination in AMHSLAND2 domain
			4	1～3	ERQ/ERP NPDU transmission from AMHSLAND2 ES to valid destination in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
			5	1～2	ERQ NPDU transmission from AMHSLAND1 ES to unreachable ES in AMHSLAND2 domain
			6	1～2	ERQ NPDU transmission from AMHSLAND2 ES to unreachable ES in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
			7	1～2	Routing process in AMHSLAND1 router for NPDU with invalid security option parameter
			8	1～2	Routing process in AMHSLAND2 router for NPDU with invalid security option parameter (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
		3			**Router end-to-end tests**
			1	1～5	Manual router disconnection at AMHSLAND1 router and route deletion
			2	1	Route activation from AMHSLAND1 router
			3	1～5	Manual router disconnection at AMHSLAND2 router and route deletion
			4	1	Route activation from AMHSLAND2 router
			5	1～3	Carrier medium failure and route deletion at AMHSLAND1 router
			6	1	Carrier medium restoration and route addition at AMHSLAND1 router

Schedule (UTC)		Test Item No.			Description
Day	Time				
			7	1～3	Carrier medium failure and route deletion at AMHSLAND2 router
			8	1	Carrier medium restoration and route addition at AMHSLAND2 router
			9	1～2	Failure and recovery of AMHSLAND1 router (redundant configuration)
			10	1～2	Failure and recovery of AMHSLAND2 router
		4			**ATN Router Tests: Third Domain connected to AMHSLAND1**
			1	1 ~ 5	Router connection of ROUTER B to ROUTER A (ROUTER A–ROUTER C connection already established)
			2	1 ~ 5	Manual router disconnection at ROUTER A of ROUTER A–ROUTER B route
			3	1 ~ 4	Re-activation at ROUTER A of ROUTER A-ROUTER B route
			4	1 ~ 5	Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route
			5	1 ~ 4	Re-activation at ROUTER B of ROUTER A–ROUTER B route
			6	1 ~ 5	Router connection of ROUTER C to ROUTER A (ROUTER A-ROUTER B connection already established)
			7	1 ~ 5	Manual router disconnection at ROUTER C of ROUTER C–ROUTER A route
			8	1 ~ 4	Re-activation at ROUTER C of ROUTER C-ROUTER A route
			9	1 ~ 5	Manual router disconnection at ROUTER A of ROUTER C–ROUTER A route
			10	1 ~ 4	Re-activation at ROUTER A of ROUTER C–ROUTER A route
			11	1 ~ 3	Carrier medium failure of ROUTER A–ROUTER B circuit
			12	1 ~ 4	Carrier medium recovery of ROUTER A–ROUTER B circuit
			13	1 ~ 3	Carrier medium failure of ROUTER C–ROUTER A circuit
			14	1 ~ 4	Carrier medium recovery of ROUTER C–ROUTER A circuit
			15	1 ~ 2	Failure and recovery of ROUTER C
			16	1 ~ 2	Failure and recovery of ROUTER A
			17	1 ~ 2	Failure and recovery of ROUTER B
			18	1～6	End-to-End CLNP Echo Test between end systems in ROUTER C and ROUTER B domains (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)

Schedule (UTC)		Test Item No.			Description
Day	**Time**				
		5			**ATN Router Network Test: Three Domain Configuration**
			1	1〜4	Router Connection of ROUTER A to ROUTER B (ROUTER A – ROUTER C and ROUTER B – ROUTER C established)
			2	1〜3	CLNP echo test between routers
			3	1〜6	Manual router disconnection at ROUTER A of ROUTER A – ROUTER B route
			4	1 ~ 3	Router re-activation from ROUTER A
			5	1 ~ 6	ROUTER B – ROUTER C route
			6	1 ~ 3	Route re-activation from ROUTER B
			7	1 ~ 6	Manual router disconnection at ROUTER C of ROUTER C – ROUTER A route
			8	1 ~ 3	Route re-activation from ROUTER C
			9	1 ~ 4	Carrier media failure of ROUTER A – ROUTER B circuit and route deletion
			10	1 ~ 3	Carrier media restoration of ROUTER A – ROUTER B circuit and router addition
			11	1 ~ 4	Carrier media failure of ROUTER B – ROUTER C circuit and route deletion
			12	1 ~ 3	Carrier media restoration of ROUTER B – ROUTER C circuit and router addition
			13	1 ~ 4	Carrier media failure of ROUTER C – ROUTER A circuit and route deletion
			14	1 ~ 3	Carrier media restoration of ROUTER C – ROUTER A circuit and router addition
			15	1 ~ 2	Failure and recovery of ROUTER A
			16	1 ~ 2	Failure and recovery of ROUTER B
			17	1 ~ 2	Failure and recovery of ROUTER C
			18	1 ~ 3	CLNP echo test between routers

Schedule (UTC)		Test Item No.			Description
Day	Time				
		6			**ATN Router Network Test: Four Domain Configuration**
			1	1～6	Router Connection of ROUTER A to ROUTER B (ROUTER A – ROUTER C and ROUTER B – ROUTER D established)
			2	1～3	Router connection of ROUTER C to ROUTER D
			3	1～4	CLNP echo test between routers
			4	1 ~ 4	Manual router disconnection at ROUTER A of ROUTER A – ROUTER B route
			5	1 ~ 3	Route re-activation from ROUTER A
			6	1 ~ 4	Manual router disconnection at ROUTER B of ROUTER B – ROUTER D route
			7	1 ~ 3	Route re-activation from ROUTER B
			8	1 ~ 4	Manual router disconnection at ROUTER D of ROUTER D – ROUTER C route
			9	1 ~ 3	Route re-activation from ROUTER D
			10	1 ~ 4	Manual router disconnection at ROUTER C of ROUTER C – ROUTER A route
			11	1 ~ 3	Route re-activation from ROUTER C
			12	1 ~ 4	Carrier media failure of ROUTER A – ROUTER B circuit
			13	1 ~ 3	Carrier media restoration of ROUTER A – ROUTER B circuit and router addition
			14	1 ~ 4	Carrier media failure of ROUTER B – ROUTER D circuit
			15	1 ~ 3	Carrier media restoration of ROUTER B – ROUTER D circuit and router addition
			16	1 ~ 4	Carrier media failure of ROUTER D – ROUTER C circuit
			17	1 ~ 3	Carrier media restoration of ROUTER D – ROUTER C circuit and router addition
			18	1 ~ 4	Carrier media failure of ROUTER C – ROUTER A circuit
			19	1 ~ 3	Carrier media restoration of ROUTER C – ROUTER A circuit and router addition
			20	1 ~ 2	Failure and recovery of ROUTER A
			21	1 ~ 2	Failure and recovery of ROUTER B
			22	1 ~ 2	Failure and recovery of ROUTER C
			23	1 ~ 2	Failure and recovery of ROUTER D
			24	1 ~ 3	CLNP echo test between routers

6. Test Cases

The table below shows the protocol abbreviations used in sequence diagrams.

Table 8 Protocol Abbreviations

Abbreviation	Protocol	Name
SABM	LAPB	Set Asynchronous Balanced Mode
UA	LAPB	Acknowledgement frame
SQ	X.25	Restart Request
SI	X.25	Restart Indication
SF	X.25	Restart Confirmation
CR	X.25	Call Request
CC	X.25	Call Connected
CQ	X.25	Clear Request
CF	X.25	Clear Confirmation
OPEN PDU	IDRP	OPEN Protocol Data Unit
UPDATE PDU	IDRP	UPDATE Protocol Data Unit
KEEPALIVE PDU	IDRP	KEEPALIVE Protocol Data Unit
CEASE PDU	IDRP	CEASE Protocol Data Unit
ERQ NPDU	CLNP	Echo request Network PDU
ERP NPDU	CLNP	Echo response Network PDU
ER NPDU	CLNP	Error report Network PDU

6.1. Test Case 1: Router Connection Establishment and Maintenance

a) **Objective**

This test is to verify the establishment of LAPB data link, X.25 Virtual Circuit and IDRP connections between the AMHSLAND2 and AMHSLAND1 routers, the exchange of routing information by UPDATE PDUs, and the maintenance of the IDRP connection by the periodic exchange of KEEPALIVE PDUs. The test configuration is shown in Figure 3.

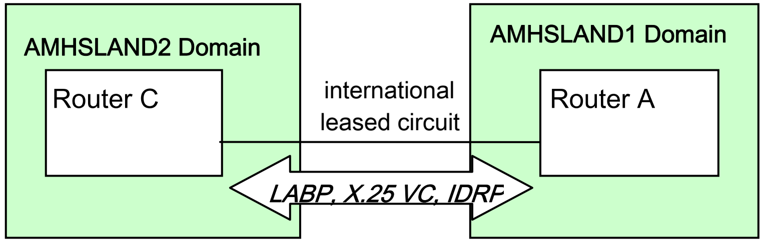


Figure 3 Configuration for router Connection & Maintenance Test

b) **Test Items**

- 1-1: Data link (LAPB) establishment
- 1-2: X.25 Virtual Circuit establishment
- 1-3: IDRP connection establishment (exchange of OPEN PDUs)
- 1-4: Exchange of routing information (exchange of UPDATE PDUs)
- 1-5: Maintenance of IDRP connection (exchange of KEEPALIVE PDUs)

Table 9 Router Connection Establishment & Maintenance Test Procedure

1. Router Connection Establishment & Maintenance		**Test Item**	**Procedure**	**Result**	**Date/Time**
Data link establishment	SABM transmission	1-1-1	Send SABM frame (address: 01) from ROUTER A and confirm ROUTER C receives it.	OK / NG	/ /
	UA transmission	1-1-2	Send UA frame (address: 03) from ROUTER C and confirm ROUTER A receives it and data link is established.	OK / NG	/ /
VC establishment	SQ transmission	1-2-1	Confirm ROUTER A sends SQ packet and ROUTER C receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	SI transmission	1-2-2	After receiving SQ packet from ROUTER A, confirm ROUTER C sends SI packet and ROUTER A receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	CR transmission	1-2-3	Confirm ROUTER A sends CR packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER C receives it.	OK / NG	/ /
	CC transmission	1-2-4	Confirm ROUTER C sends CC packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER A receives it, and VC is established.	OK / NG	/ /
IDRP connection establishment	OPEN PDU transmission from ROUTER A	1-3-1	After VC establishment, confirm ROUTER A sends an OPEN PDU. Confirm ROUTER C receives it.	OK / NG	/ /
	OPEN PDU transmission from ROUTER C	1-3-2	After receiving OPEN PDU from ROUTER A, confirm ROUTER C sends an OPEN PDU. Confirm that ROUTER A receives it, and IDRP connection is established.	OK / NG	/ /

1. Router Connection Establishment & Maintenance		**Test Item**	**Procedure**	**Result**	**Date/Time**
UPDATE PDU transmission	UPDATE PDU transmission from ROUTER A	1-4-1	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and routing information for ROUTER A is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C	1-4-2	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and routing information for ROUTER C is added.	OK / NG	/ /
IDRP connection maintenance	KEEPALIVE PDU transmission from ROUTER A	1-5-1	After IDRP connection established, confirm ROUTER A sends a KEEPALIVE PDU to ROUTER C every 60 seconds. At ROUTER C, confirm routing information received from ROUTER A is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /
	KEEPALIVE PDU transmission from ROUTER C	1-5-2	After IDRP connection established, confirm ROUTER C sends a KEEPALIVE PDU to ROUTER A every 60 seconds. At ROUTER A, confirm routing information received from ROUTER C is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /

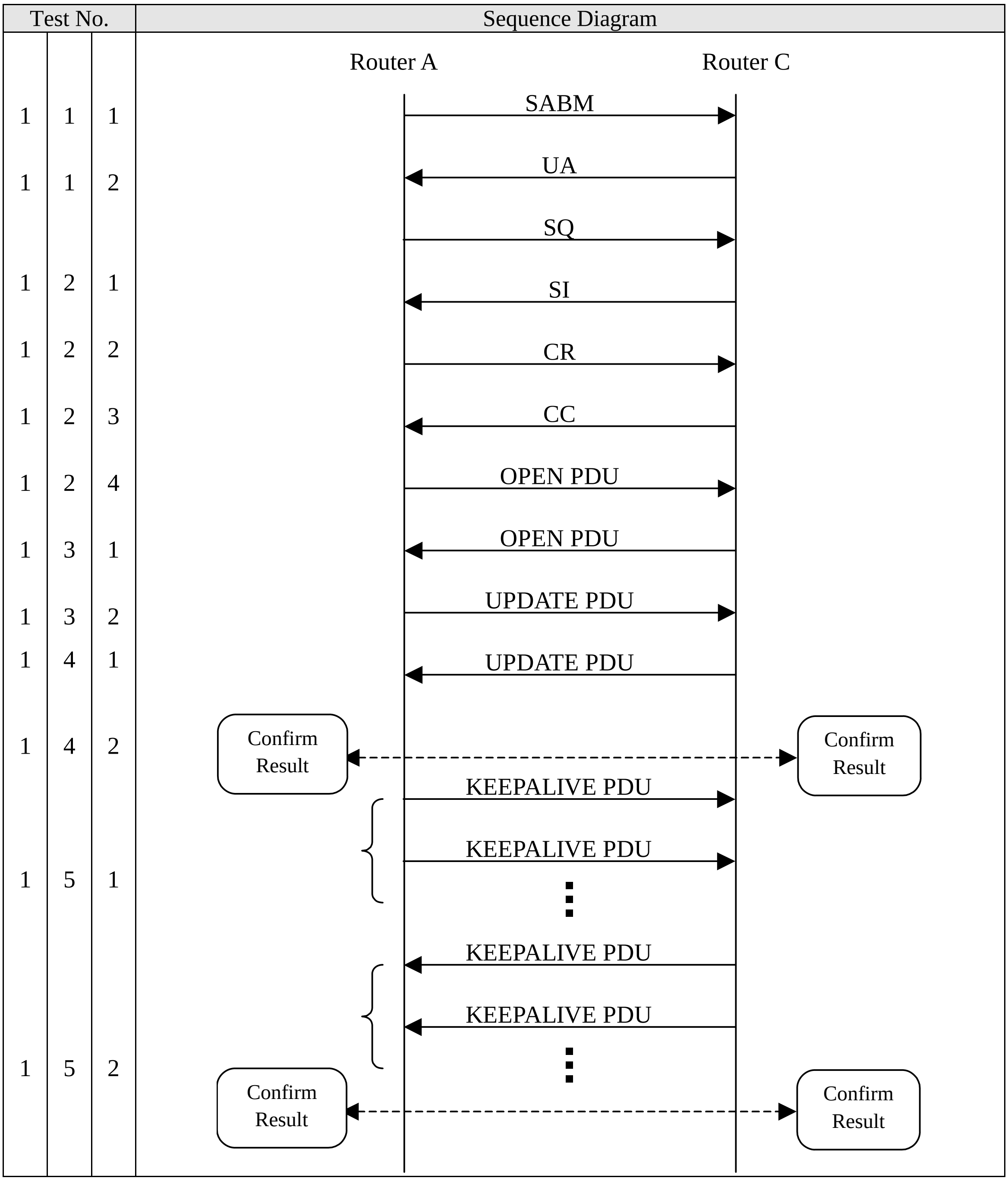


Figure 4 Sequence: Router Connection Establishment and Maintenance

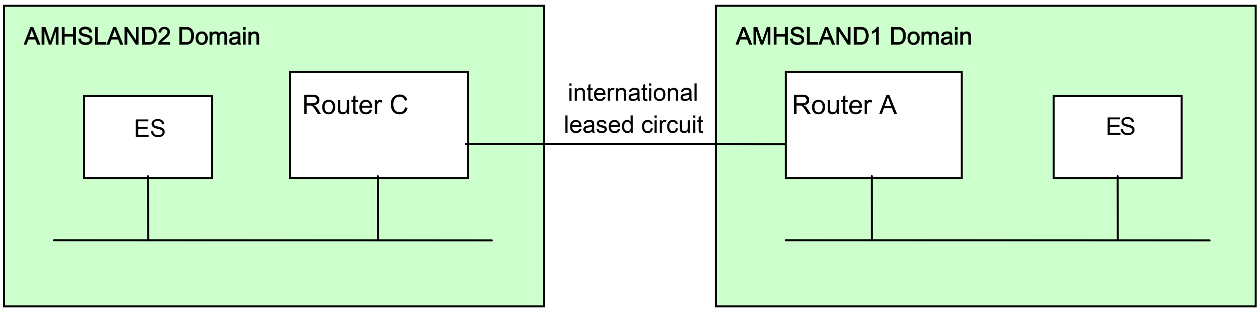
6.2. Test Case 2 : NPDU Relay

a) **Overview**

This test uses the CLNP Echo function to test correct relay and routing of CLNP NPDUs by the AMHSLAND2 and AMHSLAND1 routers. End Systems in both domains are used to verify end-to-end transmission of CLNP PDUs via the routers. The test configuration is shown in Figure 5. The test verifies the following:

(i) CLNP Echo Request/Echo Response function of both routers.
(ii) Relay of CLNP NPDUs by routers to the peer domain.
(iii) ER-PDU returned by peer router when sending a CLNP NPDU to an unknown address in the peer domain.
(iv) Non-relay of CLNP PDUs with incorrect security parameter by own domain router.

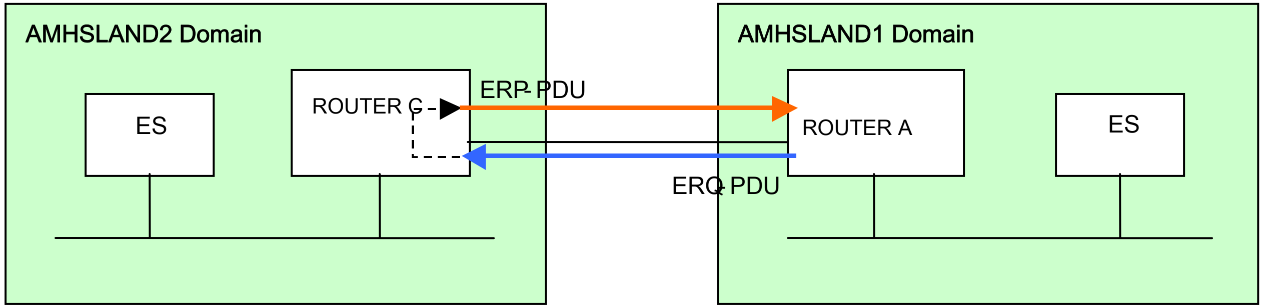
Figure 5 NPDU Transmission and Relay Test Configuration



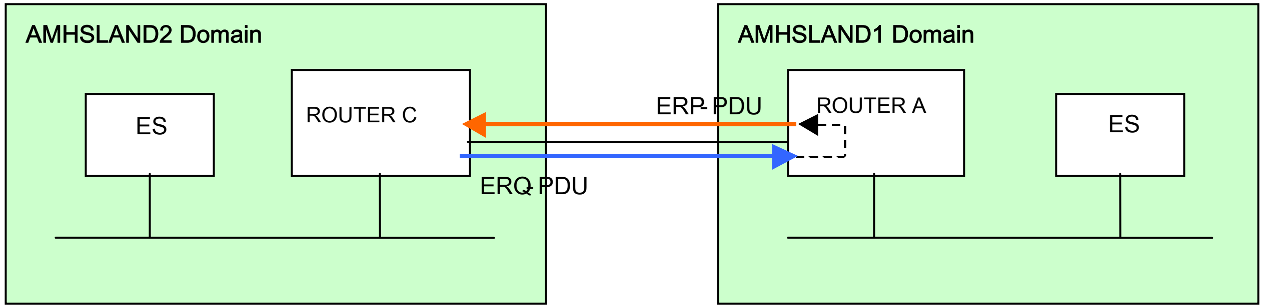
b) **Test Items**

Note: Some of these test items may not be carried out, depending on the capability of End Systems in each domain in to transmit ERQ-PDUs.

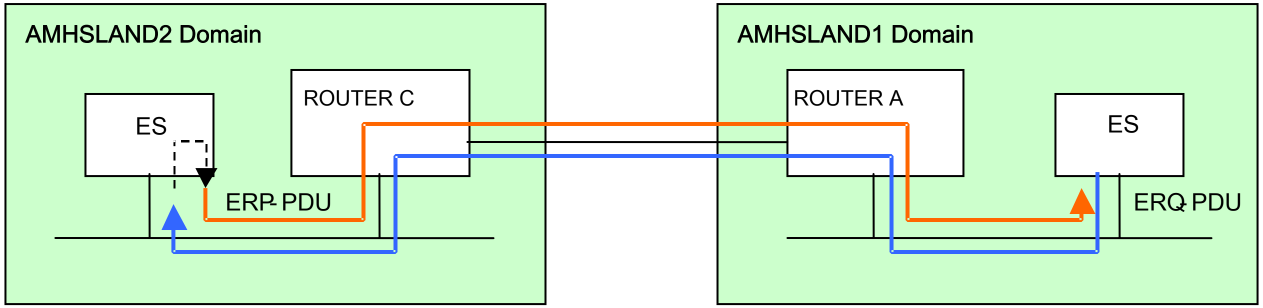
- 2-1: CLNP Echo from AMHSLAND1 router to AMHSLAND2 router.



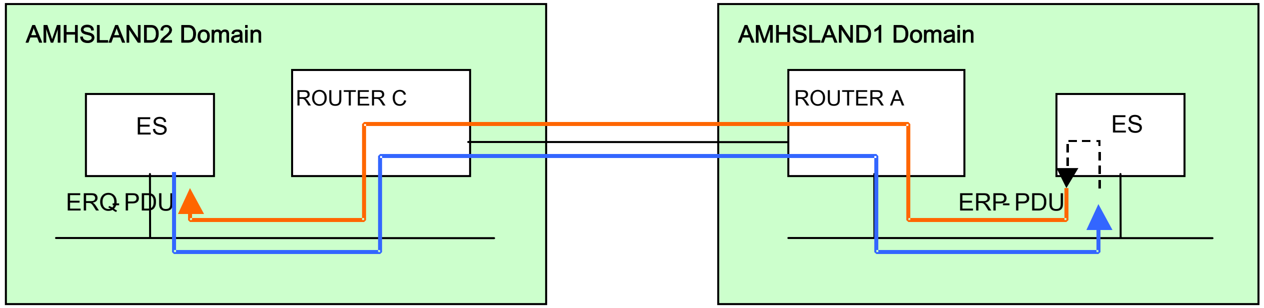
- 2-2: CLNP Echo from AMHSLAND2 router to AMHSLAND1 router.



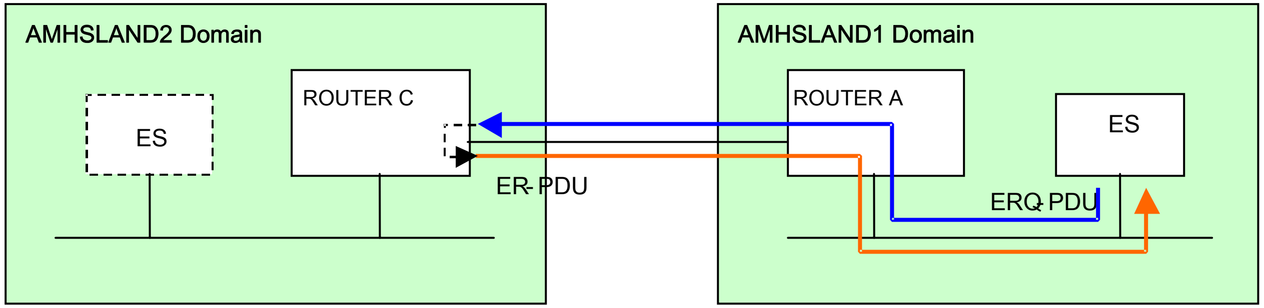
- 2-3: CLNP Echo from AMHSLAND1 End System to valid destination at AMHSLAND2.



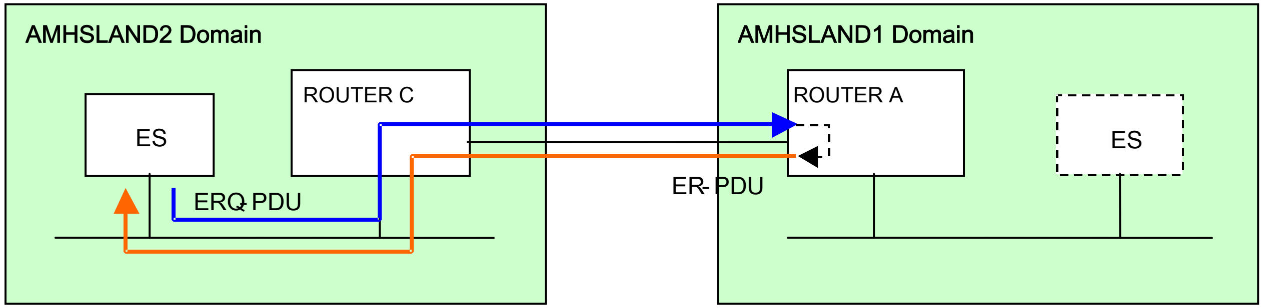
- 2-4: CLNP Echo from AMHSLAND2 End System to valid destination at AMHSLAND1.



- 2-5: CLNP Echo from AMHSLAND1 End System to unreachable AMHSLAND2 End System.

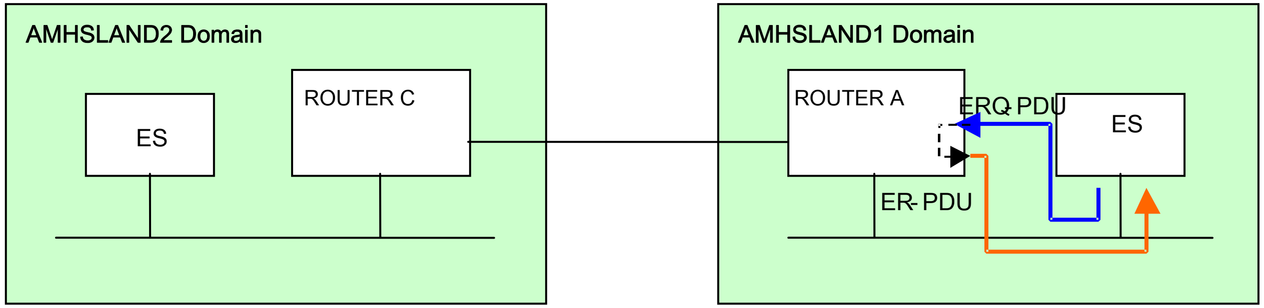


- 2-6: CLNP Echo from AMHSLAND2 End System to unreachable AMHSLAND1 End System.



- 2-7: Routing process in AMHSLAND1 router for NPDU with invalid security parameter.

Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.



- 2-8: Routing process in AMHSLAND2 router for NPDU with invalid security parameter.

Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.

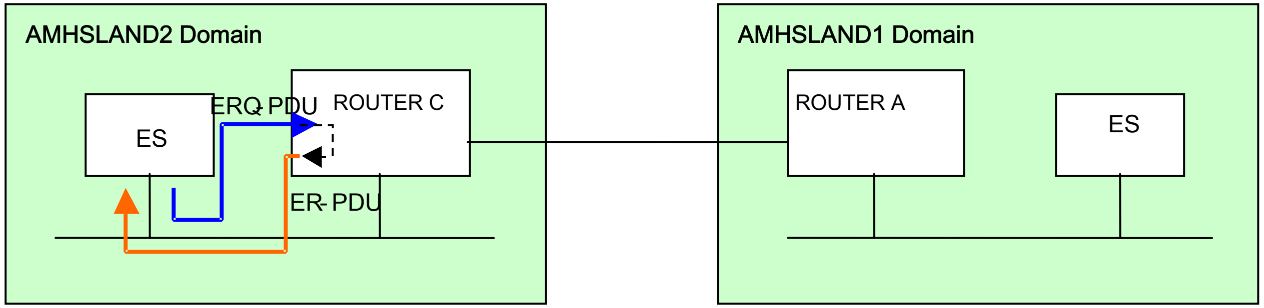


Table 10 NPDU Relay Test Procedure

2. NPDU Relay		Test Item	Procedure	Result	Date/Time
ERQ NPDU transmission from AMHSLAND1 router	ERQ NPDU transmission	2-1-1	Send ERQ NPDU from ROUTER A to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	ERP NPDU transmission	2-1-2	After receiving ERQ NPDU, ROUTER C sends ERP NPDU to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-1-3	Repeat from 2-1-1 to 2-1-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 router	ERQ NPDU transmission	2-2-1	Send ERQ NPDU from ROUTER C to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	ERP NPDU transmission	2-2-2	After receiving ERQ NPDU, ROUTER A sends an ERP NPDU to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-2-3	Repeat from 2-2-1 to 2-2-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND1 ES	ERQ NPDU transmission	2-3-1	Send ERQ NPDU from AMHSLAND1 ES to AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	ERP NPDU transmission	2-3-2	After receiving ERQ NPDU, the AMHSLAND2 ES sends an ERP NPDU to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-3-3	Repeat from 2-3-1 to 2-3-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 ES	ERQ NPDU transmission	2-4-1	Send ERQ NPDU from the AMHSLAND2 ES to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /
	ERP NPDU transmission	2-4-2	After receiving ERQ NPDU, the AMHSLAND1 ES sends an ERP NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-4-3	Repeat from 2-4-1 to 2-4-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /

2. NPDU Relay		**Test Item**	**Procedure**	**Result**	**Date/Time**
ERQ NPDU transmission from AMHSLAND1 ES to unreachable system in AMHSLAND2 domain	ERQ NPDU transmission from AMHSLAND1 ES	2-5-1	AMHSLAND1 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND2 domain. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND2 router	2-5-2	Confirm that ROUTER C discards the ERQ NPDU from AMHSLAND1 ES. Confirm that ROUTER C sends an ER NPDU to the AMHSLAND1 ES, and that the AMHSLAND1 ES receives it.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 ES to unreachable system in AMHSLAND1 domain	ERQ NPDU transmission from AMHSLAND2 ES	2-6-1	AMHSLAND2 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND1 domain. Confirm ROUTER A receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND1 router	2-6-2	Confirm that ROUTER A discards the ERQ NPDU. Confirm that ROUTER A sends an ER NPDU to the AMHSLAND2 ES, and that the AMHSLAND2 ES receives it.	OK / NG	/ /
Routing process in AMHSLAND1 router for NPDU with invalid security option parameter	ERQ NPDU transmission from AMHSLAND1 ES	2-7-1	AMHSLAND1 ES sends an ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND2 ES. Confirm ROUTER A receives it.	OK / NG	/ /
	ERQ NPDU processing in AMHSLAND1 router	2-7-2	Confirm ROUTER A discards ERQ NPDU and sends an ER NPDU to AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives the ER NPDU.	OK / NG	/ /

2. NPDU Relay		**Test Item**	**Procedure**	**Result**	**Date/Time**
Routing process in AMHSLAND2 router for NPDU with invalid security option parameter	ERQ NPDU transmission from AMHSLAND2 ES	2-8-1	AMHSLAND2 ES sends ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND1 ES. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU processing in AMHSLAND2 router	2-8-2	Confirm ROUTER C discards ERQ NPDU and ROUTER C sends an ER NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives the ER NPDU.	OK / NG	/ /

Test No.			Sequence Diagram
2	1	1	
2	1	2	
2	1	3	
2	2	1	
2	2	2	
2	2	3	

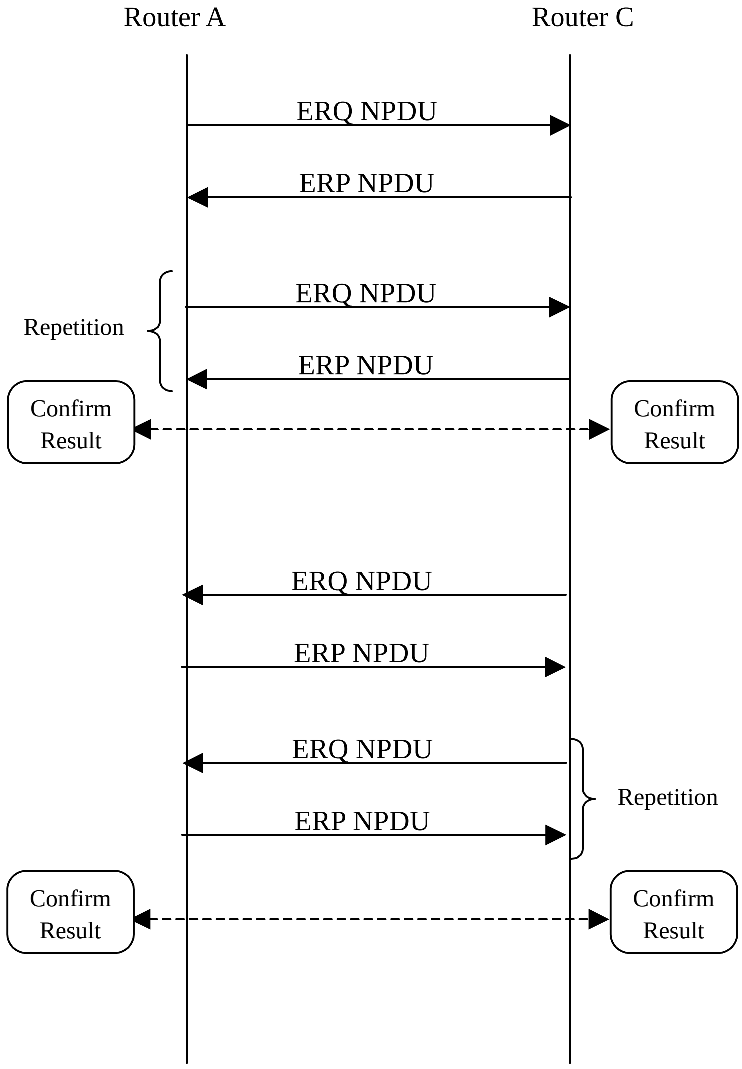


Figure 6 Sequence: NPDU Transmission between Routers

Test No.			Sequence Diagram
2	3	1	
2	3	2	
2	3	3	
2	4	1	
2	4	2	
2	4	3	

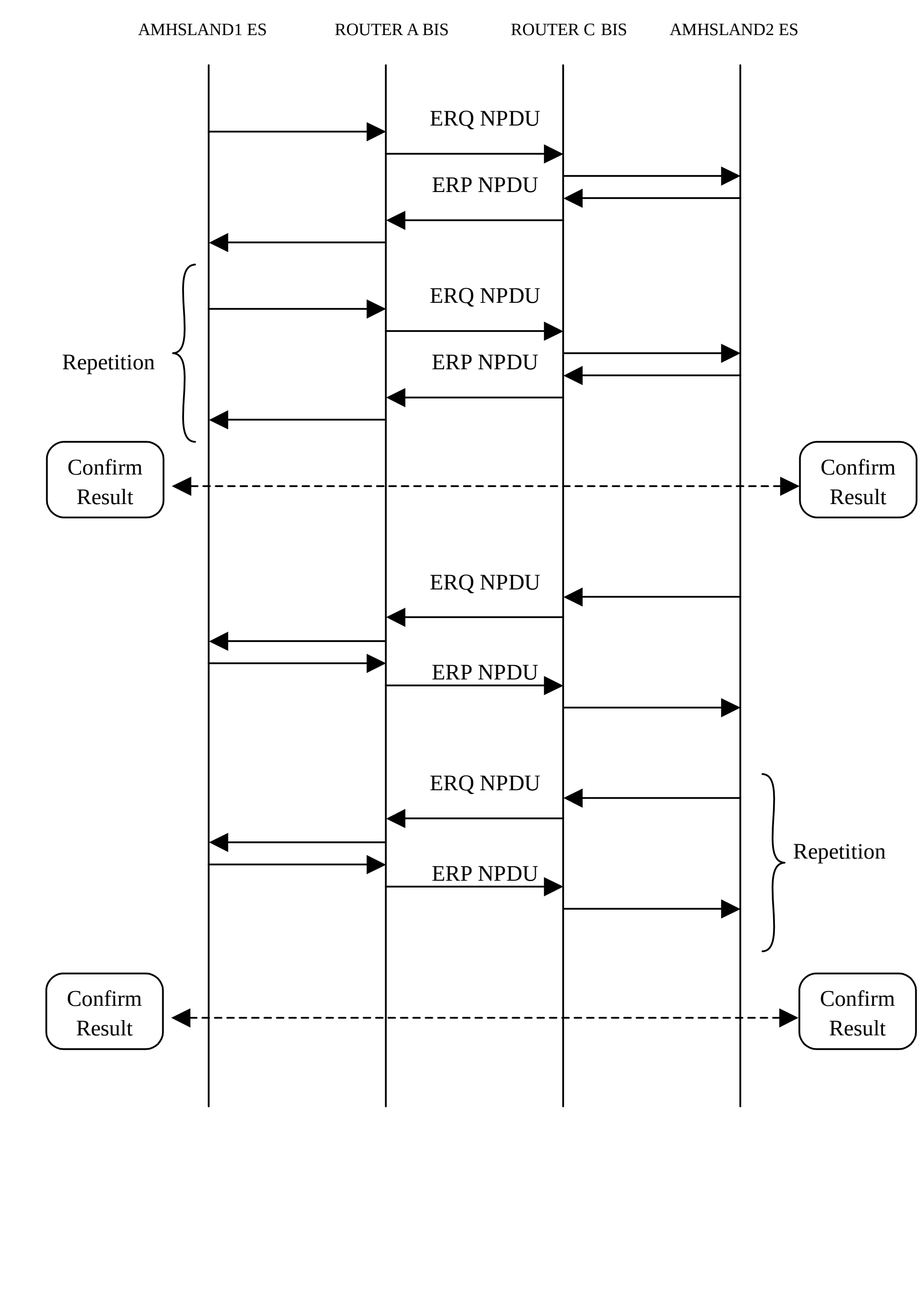


Figure 7 Sequence: NPDU Transmission between End Systems

Test No.		
2	5	1
2	5	2
2	6	1
2	6	2
2	7	1
2	7	2
2	8	1
2	8	2

Sequence Diagram

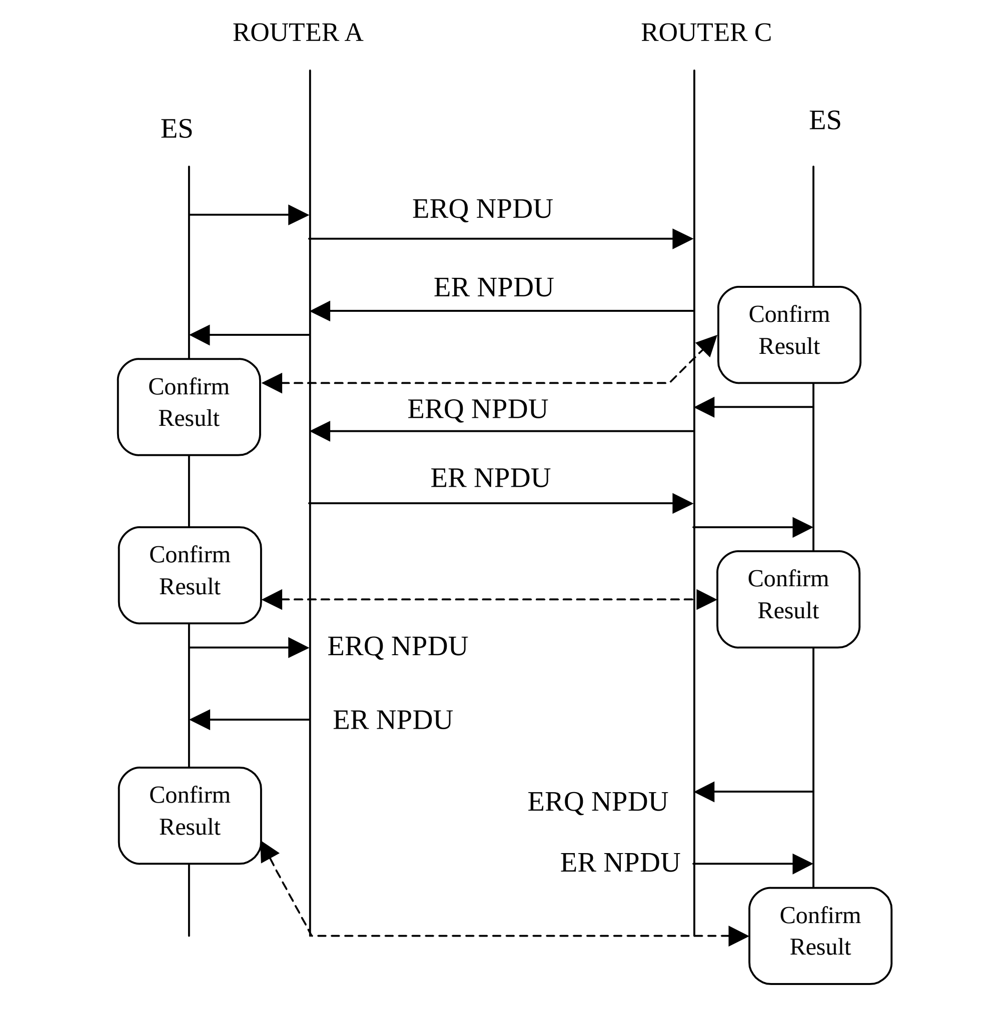


Figure 8 Sequence: NPDU Transmission to Unreachable ES and Handling of NPDU with Invalid Security Parameter

6.3. Test Case 3: Router End-to-End Tests

a) **Objective**

Technical trial to verify the automatic updating of routing tables in the ATN routers through IDRP protocol with routers connecting in end-to-end configuration between AMHSLAND1 and AMHSLAND2.

b) **Test Configuration**

The configuration for this test is shown in Figure 9.

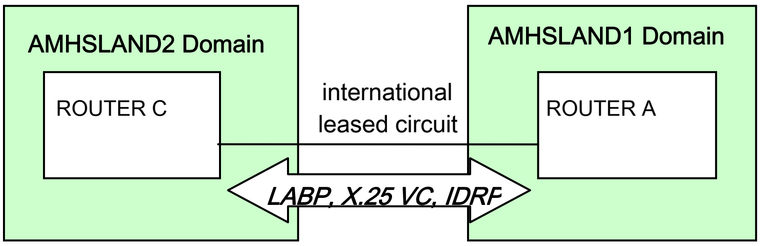


Figure 9 Router End-to-End Test Configuration

c) **Test Item Overview**

3-1: Manual router disconnection at AMHSLAND1 router and route deletion
3-2: Route addition (re-activation of connection) from AMHSLAND1 router
3-3: Manual router disconnection at AMHSLAND2 router and route deletion
3-4: Route addition (re-activation of connection) from AMHSLAND2 router
3-5: Carrier medium failure and route deletion at AMHSLAND1 router
3-6: Carrier medium restoration and route addition at AMHSLAND1 router
3-7: Carrier medium failure and route deletion at AMHSLAND2 router
3-8: Carrier medium restoration and route addition at AMHSLAND2 router
3-9: Failure and recovery of AMHSLAND1 router (redundant configuration)
3-10: Failure and recovery of AMHSLAND2 router

Note:
A detailed test of normal router connection (LAPB, X.25 VC and IDRP) is carried out in Test Items 1-1 through 1-5, and so is not repeated here.

Table 11 Router End-to-End Tests Test Procedure

3. Router End-to-End Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Manual router disconnection at AMHSLAND1 router and route deletion	CEASE PDU transmission from AMHSLAND1 router	3-1-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends CEASE PDU.	OK / NG	/ /
	CEASE PDU transmission from AMHSLAND2 router and route deletion	3-1-2	Confirm ROUTER C receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER C sends CEASE PDU to ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND1 router	3-1-3	Confirm that ROUTER A receives CEASE PDU from ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	CQ transmission	3-1-4	After IDRP disconnected, confirm ROUTER A sends CQ packet to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	CF transmission	3-1-5	After receiving CQ packet, confirm ROUTER C sends CF packet to ROUTER A. Confirm ROUTER A receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND1 router	Router connection restoration after disconnection	3-2-1	At ROUTER A, manually initiate router connection with ROUTER C. (VC call: originate, OPEN PDU: send.) Confirm the router connection is re-established.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Manual router disconnection at AMHSLAND2 router and route deletion	CEASE PDU transmission from AMHSLAND2 router	3-3-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends CEASE PDU.	OK / NG	/ /
	CEASE PDU transmission from AMHSLAND1 router and route deletion	3-3-2	Confirm ROUTER A receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER A sends CEASE PDU to ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND2 router	3-3-3	Confirm that ROUTER C receives CEASE PDU from ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	CQ transmission	3-3-4	After IDRP disconnected, confirm ROUTER C sends CQ packet to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	CF transmission	3-3-5	After receiving CQ packet, confirm ROUTER A sends CF packet to ROUTER C. Confirm ROUTER C receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND2 router	Router connection restoration after disconnection	3-4-1	At ROUTER C, manually initiate router connection to ROUTER A. (VC call: receive, OPEN PDU: receive.) Confirm the router connection is re-established.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND1 router	Data link and VC disconnection	3-5-1	At ROUTER A, simulate a circuit failure by physically disconnecting ROUTER A from the DSU/modem. Confirm that the data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-5-2	After circuit failure, confirm IDRP connection at ROUTER A is closed.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-5-3	After circuit failure, confirm IDRP connection at ROUTER C is closed when the IDRP holding timer expires.	OK / NG	/ /

3. Router End-to-End Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Carrier medium restoration and route addition at AMHSLAND1 router	Data link, VC, and router connection re-establishment	3-6-1	At ROUTER A, restore the circuit by re-connecting ROUTER A to the DSU/modem. Confirm router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND2 router	Data link and VC disconnection	3-7-1	At ROUTER C, simulate a circuit failure by disconnecting the leased line circuit from the modem. Confirm data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-7-2	After circuit failure, confirm IDRP connection at ROUTER C is closed when the IDRP holding timer expires.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-7-3	After circuit failure, confirm IDRP connection at ROUTER A is closed.	OK / NG	/ /
Carrier medium restoration and route addition at AMHSLAND2 router	Data link, VC, and router connection re-establishment	3-8-1	At ROUTER C, restore circuit. Confirm the router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Failure and recovery of AMHSLAND1 router	Failover from active to standby node	3-9-1	At ROUTER A, force failover from active node (#1) to standby node (#2) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
	Failover back to previous active node	3-9-2	At ROUTER A, force failover from active node (#2) to standby node (#1) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Failure and recovery of AMHSLAND2 router	Failover from active to standby node	3-10-1	At ROUTER C, force failover from active node (#1) to standby node (#2). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
	Failover back to previous active node	3-10-2	At ROUTER C, force failover from active node (#2) to standby node (#1). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

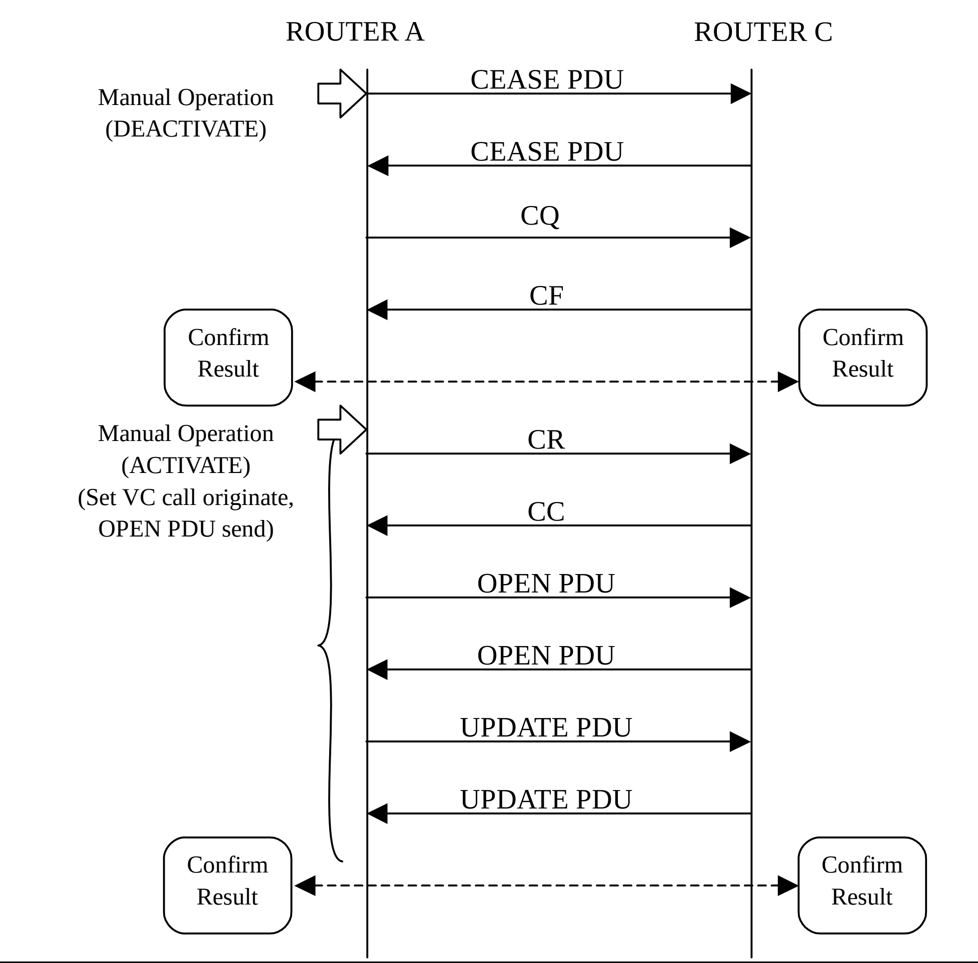
Test No.			Sequence Diagram
3	1	1	
3	1	2	
3	1	3	
3	1	4	
3	1	5	
3	2	1	

Figure 10 Sequence: Manual router Disconnection and Re-connection at AMHSLAND1 router

Test No.			Sequence Diagram
3	3	1	
3	3	2	
3	3	3	
3	3	4	
3	3	5	
3	4	1	

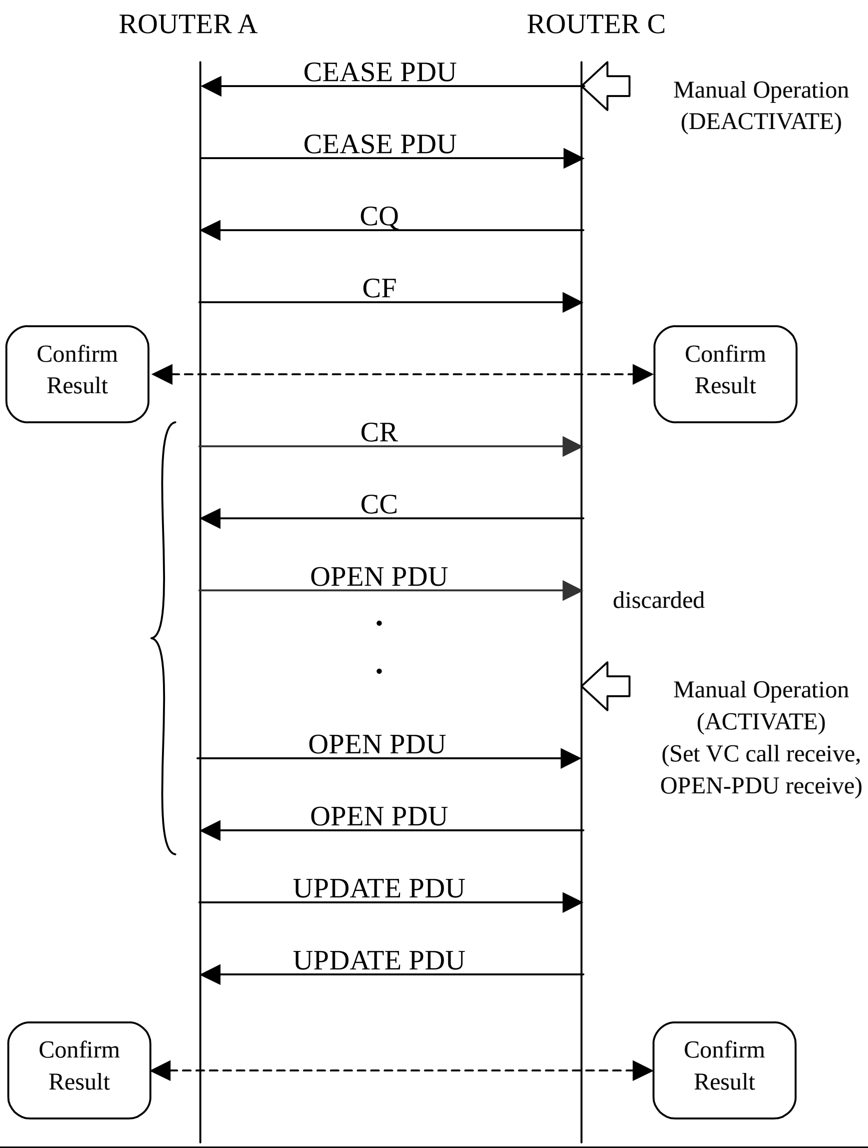


Figure 11 Sequence: Manual router Disconnection and Re-connection at AMHSLAND2 router

Test No.			Sequence Diagram
3	5	1	
3	5	2	
3	5	3	
3	6	1	

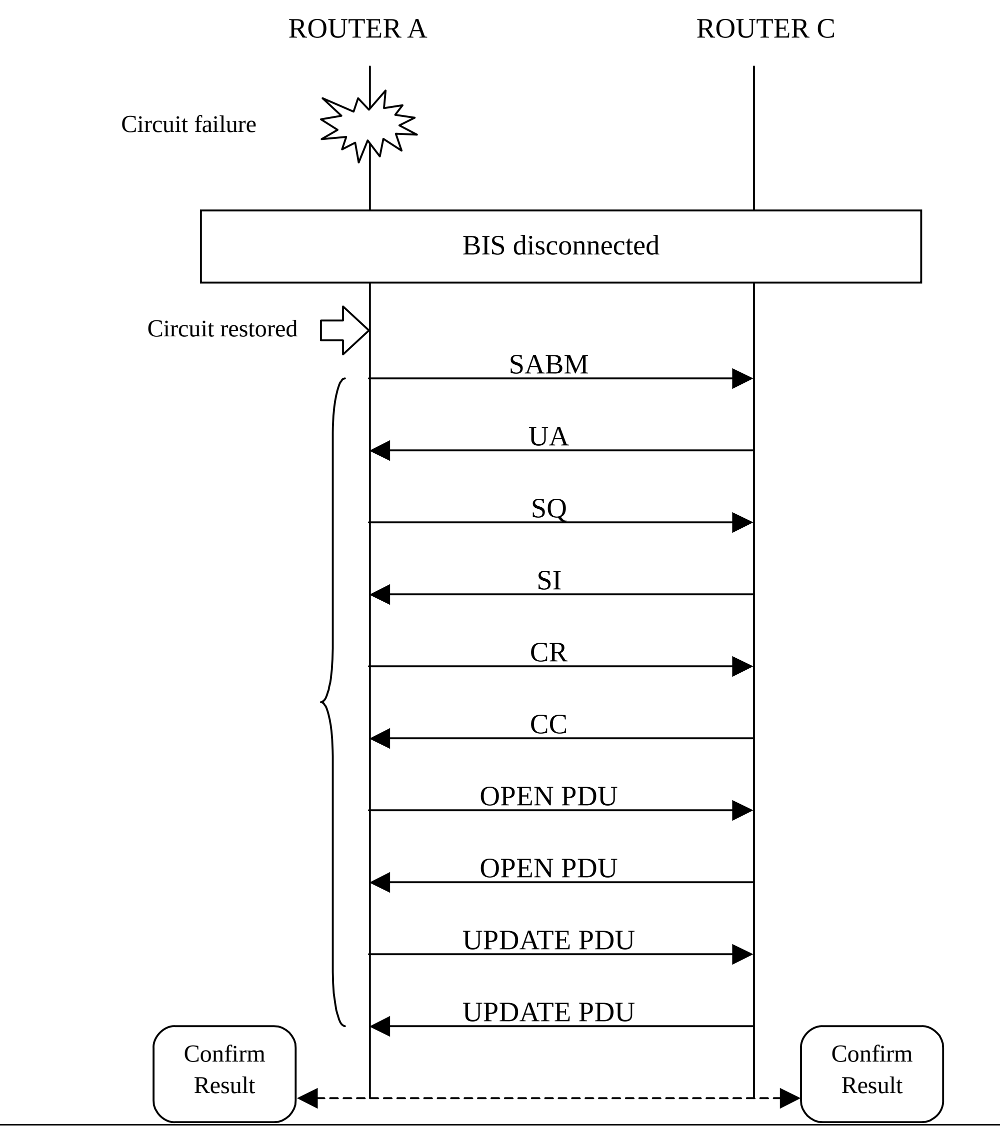


Figure 12 Sequence: Carrier medium failure and recovery at AMHSLAND1 router

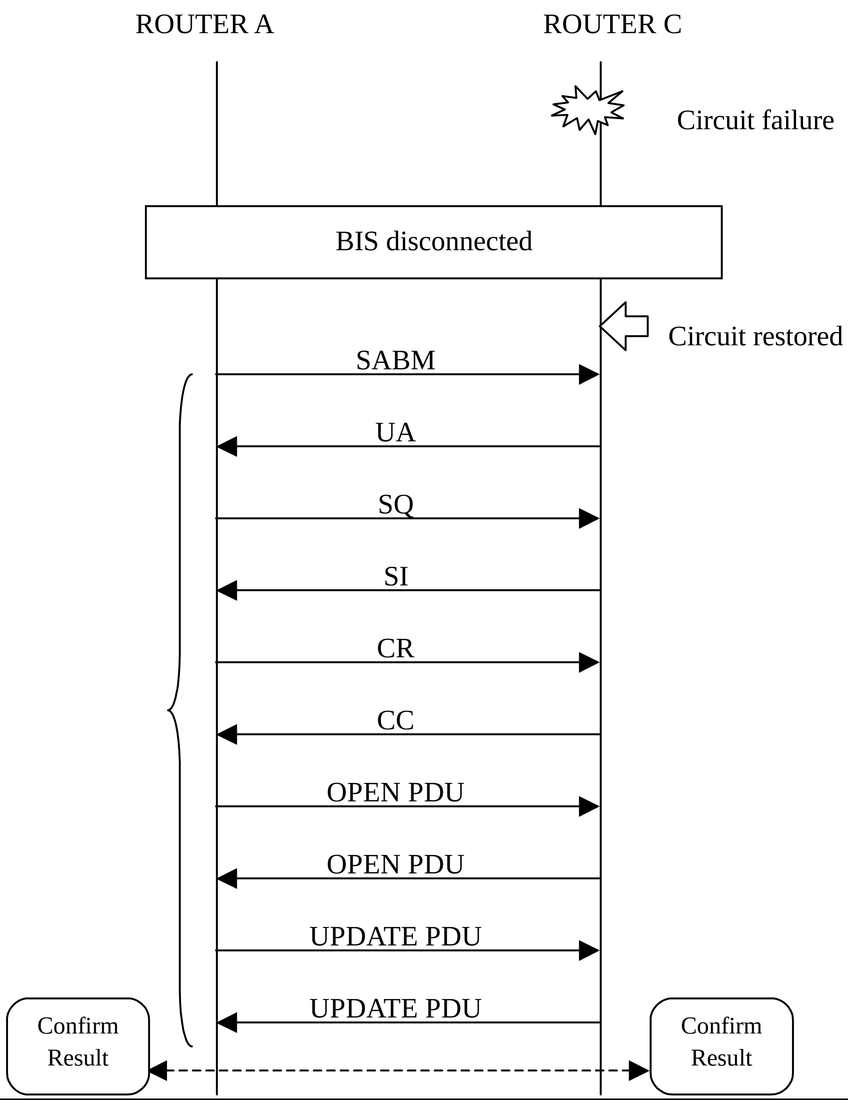
Test No.			Sequence Diagram
3	7	1	
3	7	2	
3	7	3	
3	8	1	

Figure 13 Sequence: Carrier medium failure and recovery at AMHSLAND2 router

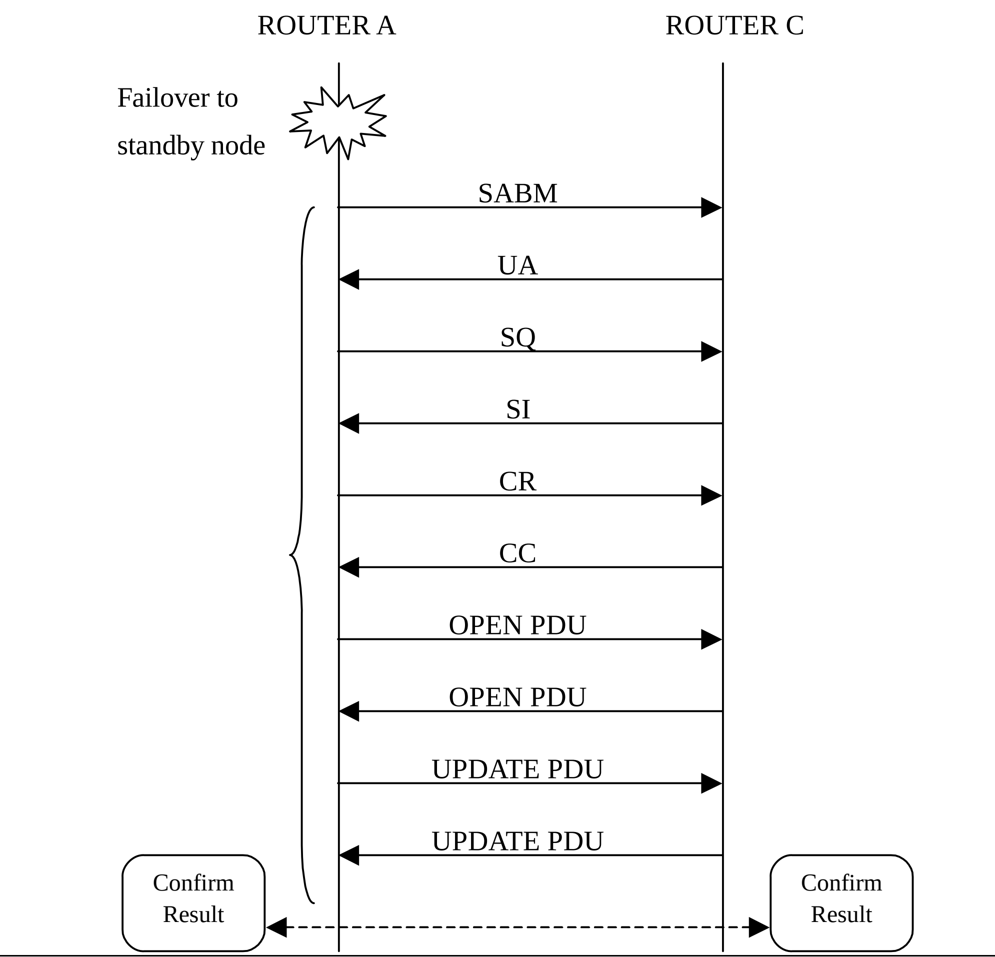
Test No.			Sequence Diagram
3 3	9 9	1 2	

Figure 14 Sequence: AMHSLAND1 router Failure and Recovery

Test No.			Sequence Diagram
3	10	1	
3	10	2	

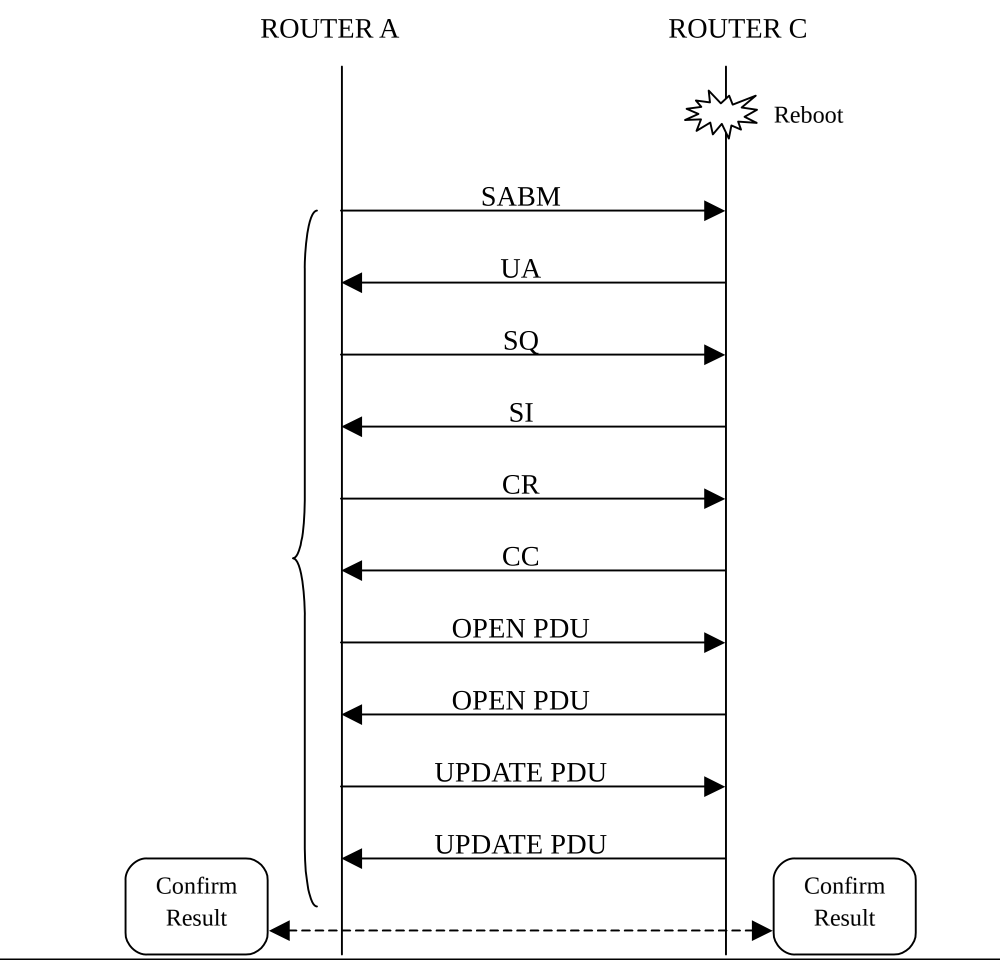


Figure 15 Sequence: AMHSLAND2 router Failure and Recovery

6.4. Test Case 4: ATN Router Tests (This cover additional tests for subnetwork)

a) **Objective**

Technical trial to verify the automatic updating of routing tables in ATN routers through the IDRP protocol with routers connected in 3routers configurations between AMHSLAND1, AMHSLAND2 and simulated third domains connected to AMHSLAND1 and AMHSLAND2. The test configurations are shown below.

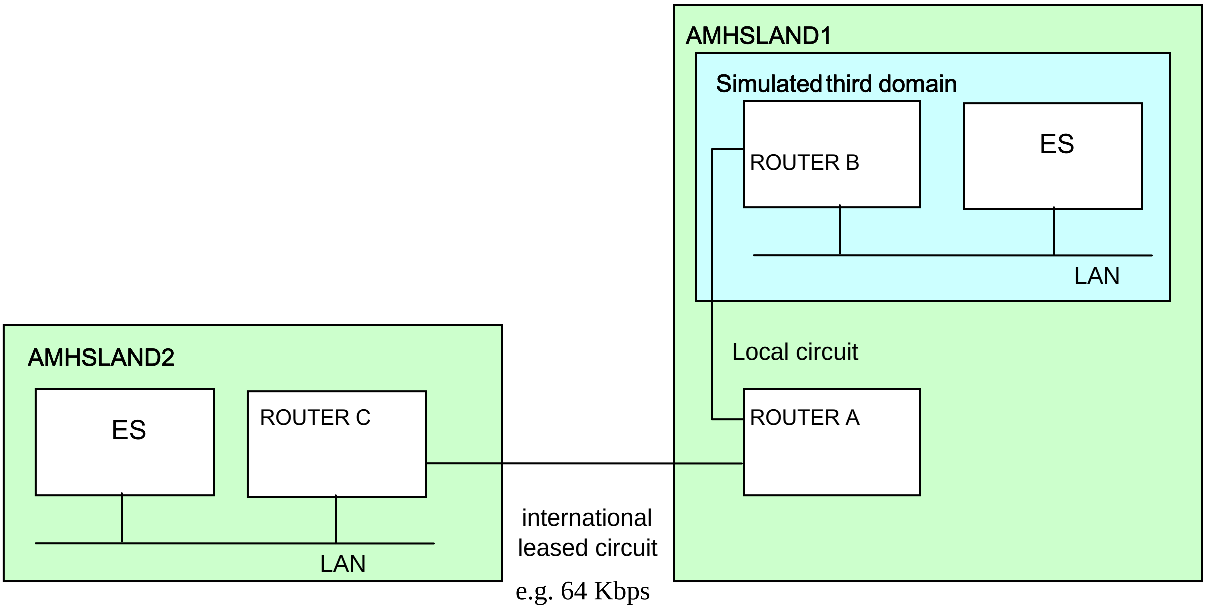


Figure 16 Test Configuration: Simulated Third Domain connected to AMHSLAND1

b) **Test Overview**

(i) Simulated third domain connected to AMHSLAND1.

ROUTER CONNECTION, DISCONNECTION AND RE-ACTIVATION

4-1:	Router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C already established).
4-2, 4-3:	Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.
4-4, 4-5:	Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.
4-6:	Router connection of ROUTER C to ROUTER A (ROUTER B-ROUTER A already established).
4-7, 4-8:	Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation.
4-9, 4-10:	Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation.

COMMUNICATION CIRCUIT FAILURE AND RECOVERY

4-11, 4-12:	Failure and recovery of ROUTER A-ROUTER B circuit.
4-13, 4-14:	Failure and recovery of ROUTER C-ROUTER A circuit.

ROUTER FAILURE AND RECOVERY

4-15:	Failure and recovery of ROUTER C.
4-16:	Failure and recovery of ROUTER A.
4-17:	Failure and recovery of ROUTER B.

END-TO-END DATA RELAY

4-18:	End-to-End CLNP Echo Test between End Systems in ROUTER C and ROUTER B domains. (Subject to End System ERQ-PDU transmission capabilities.)

Table 12 Router Connection, Disconnection and Re-activation Test Procedure: Router A – Router B

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Router connection of ROUTER B to ROUTER A	Data link establishment between ROUTER A and ROUTER B	4-1-1	With VC and IDRP connections established between ROUTER C and ROUTER A, switch on ROUTER B to initiate router connection. Check and confirm data link and VC are established between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP connection establishment between ROUTER A and ROUTER B	4-1-2	After VC establishment, check and confirm IDRP connection established between ROUTER A and ROUTER B by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-1-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-1-4	After IDRP connection established, confirm ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check and confirm route information of ROUTER B is updated correctly.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-1-5	At ROUTER A, after receiving UPDATE PDU from ROUTER B, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received, and that route information of ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER A	4-2-1	At ROUTER A, manually close the router connection to ROUTER B. Confirm ROUTER A sends a CEASE PDU to ROUTER B.	OK / NG	/ /
	CEASE PDU transmission from ROUTER B and route deletion	4-2-2	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /
	Route deletion at ROUTER A	4-2-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	VC disconnection between ROUTER A and ROUTER B	4-2-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-2-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-3-1	At ROUTER A, manually initiate router connection to ROUTER B (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-3-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-3-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, check that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-3-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that route information to ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER B	4-4-1	At ROUTER B, manually close the router connection to ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	4-4-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B. Confirm ROUTER A sends CEASE PDU to ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER B	4-4-3	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /
	VC disconnection between ROUTER A and ROUTER B	4-4-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-4-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER B	Router connection re-activation from ROUTER B	4-5-1	At ROUTER B, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-5-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-5-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-5-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /

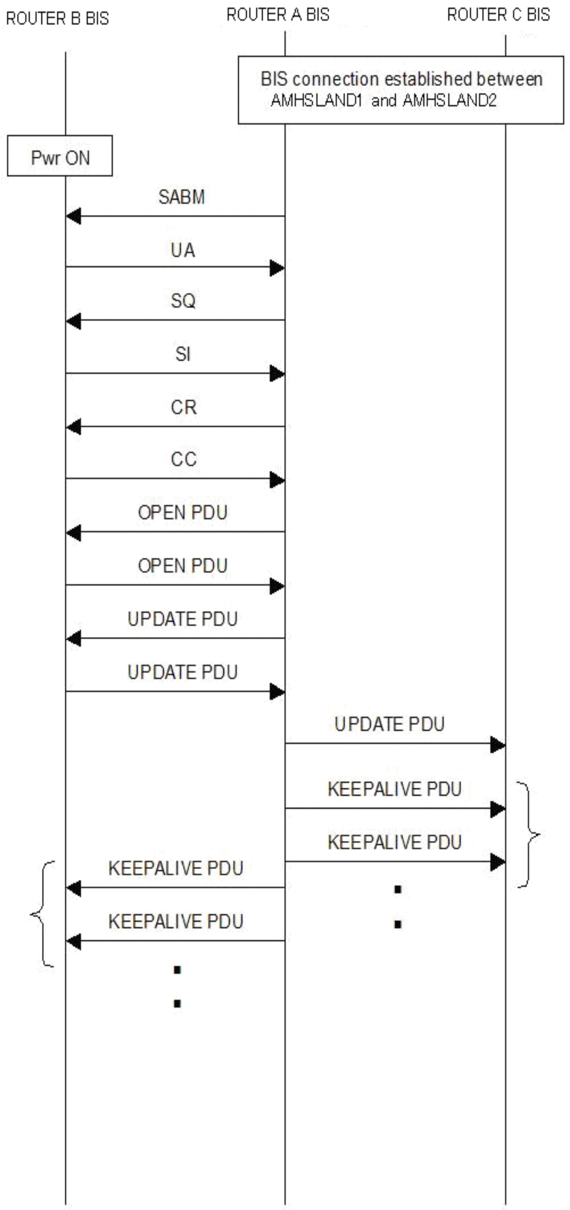
Test No.			Sequence Diagram
4	1	1	
4	1	2	
4	1	3	
4	1	4	
4	1	5	

Figure 17 Sequence: router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C already established)

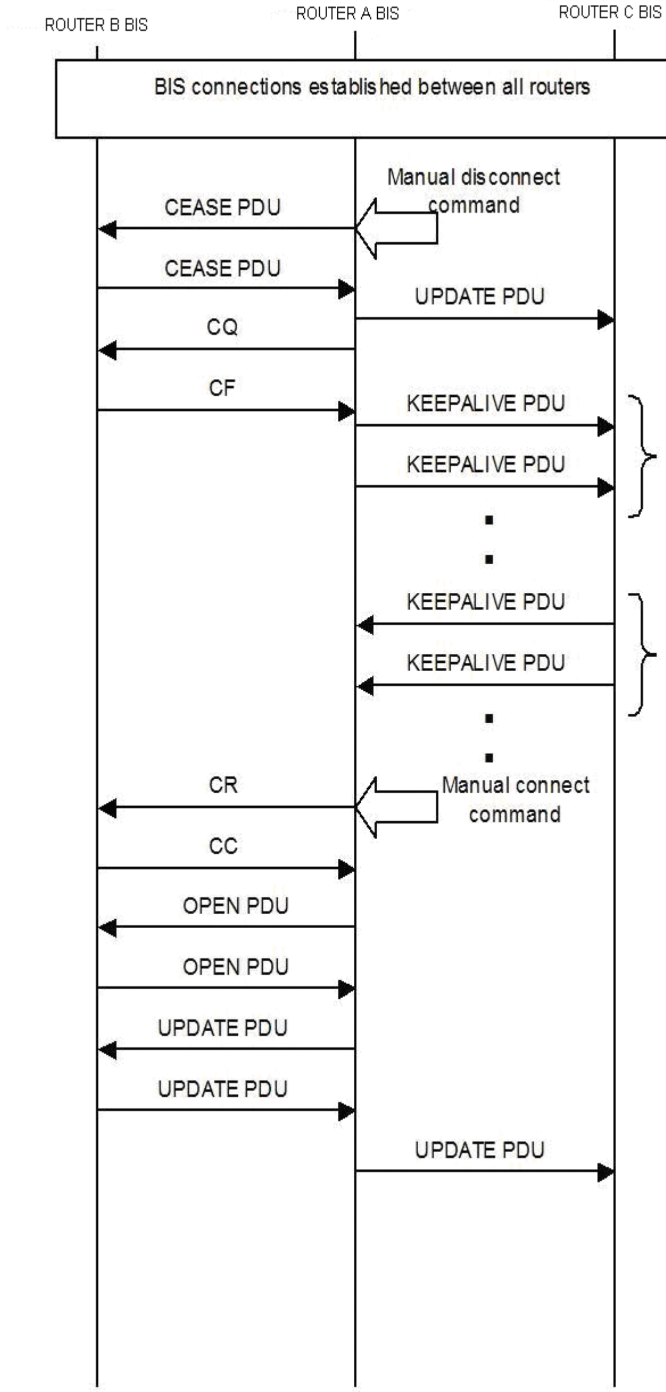
<table>
<tr><th colspan="3">Test No.</th><th>Sequence Diagram</th></tr>
<tr><td>4</td><td>2</td><td>1</td><td rowspan="9">
</td></tr>
<tr><td>4</td><td>2</td><td>2</td></tr>
<tr><td>4</td><td>2</td><td>3</td></tr>
<tr><td>4</td><td>2</td><td>4</td></tr>
<tr><td>4</td><td>2</td><td>5</td></tr>
<tr><td>4</td><td>3</td><td>1</td></tr>
<tr><td>4</td><td>3</td><td>2</td></tr>
<tr><td>4</td><td>3</td><td>3</td></tr>
<tr><td>4</td><td>3</td><td>4</td></tr>
</table>

Figure 18 Sequence: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.

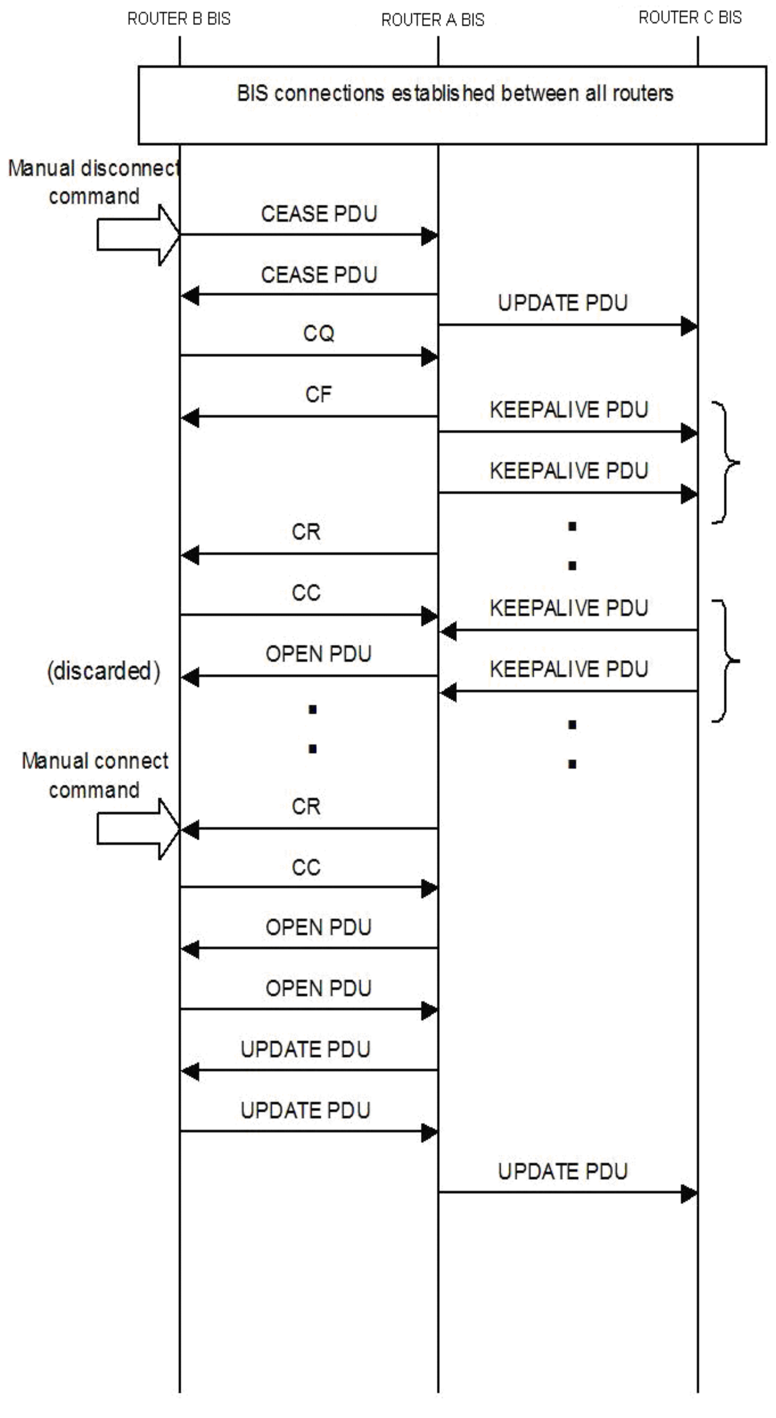
<table>
<tr><th colspan="3">Test No.</th><th>Sequence Diagram</th></tr>
<tr><td>4</td><td>4</td><td>1</td><td rowspan="9">
</td></tr>
<tr><td>4</td><td>4</td><td>2</td></tr>
<tr><td>4</td><td>4</td><td>3</td></tr>
<tr><td>4</td><td>4</td><td>4</td></tr>
<tr><td>4</td><td>4</td><td>5</td></tr>
<tr><td>4</td><td>5</td><td>1</td></tr>
<tr><td>4</td><td>5</td><td>2</td></tr>
<tr><td>4</td><td>5</td><td>3</td></tr>
<tr><td>4</td><td>5</td><td>4</td></tr>
</table>

Figure 19 Sequence: Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.

Table 13 Router Connection, Disconnection and Re-activation Test Procedure: ROUTER C-ROUTER A

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Router connection of ROUTER C to ROUTER A	Data link establishment between ROUTER C and ROUTER A	4-6-1	With VC and IDRP connections established between ROUTER A and ROUTER B, at ROUTER A, initiate router connection to ROUTER C. Check and confirm data link and VC are established between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP connection establishment between ROUTER C and ROUTER A	4-6-2	After VC establishment, check and confirm IDRP connection established between ROUTER C and ROUTER A by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-6-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-6-4	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm route information of ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-6-5	At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, confirm that route information of ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER C	4-7-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	4-7-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C. Confirm ROUTER A sends CEASE PDU to ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER C	4-7-3	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-7-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-7-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER C	Router connection re-activation from ROUTER C	4-8-1	At ROUTER C, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-8-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-8-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-8-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER A	4-9-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends a CEASE PDU to ROUTER C.	OK / NG	/ /

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
	CEASE PDU transmission from ROUTER C and route deletion	4-9-2	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	Route deletion at ROUTER A	4-9-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-9-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-9-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-10-1	At ROUTER A, manually initiate router connection to ROUTER C (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-10-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-10-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-10-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /

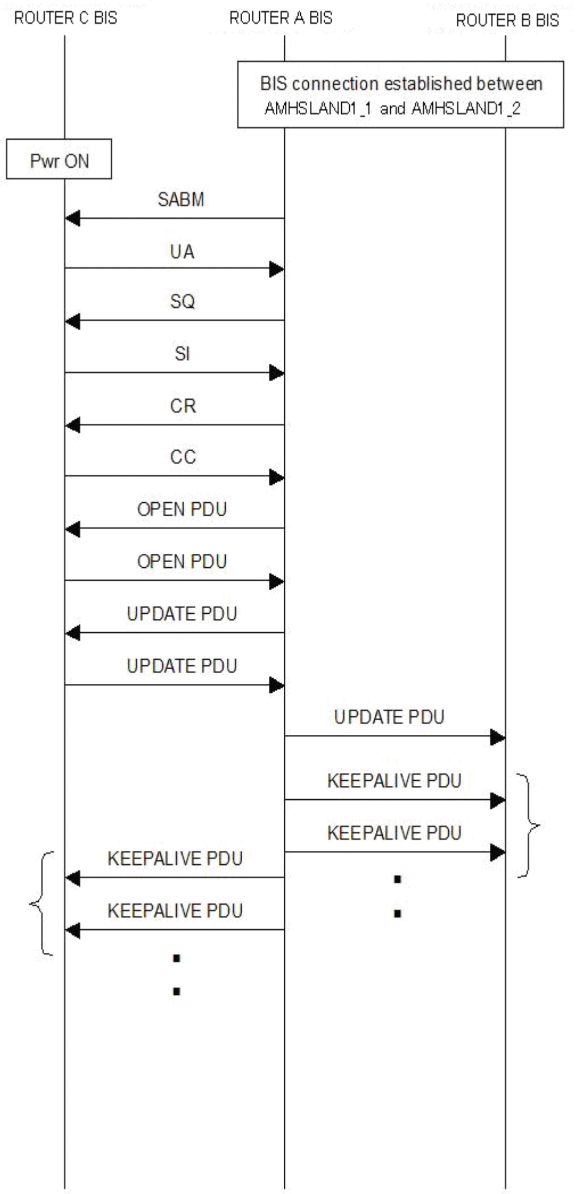
Test No.			Sequence Diagram
4	6	1	
4	6	2	
4	6	3	
4	6	4	
4	6	5	

Figure 20 Sequence: Router connection of ROUTER C to ROUTER A (ROUTER B-ROUTER A already established)

Test No.			Sequence Diagram
4	7	1	
4	7	2	
4	7	3	
4	7	4	
4	7	5	
4	8	1	
4	8	2	
4	8	3	
4	8	4	

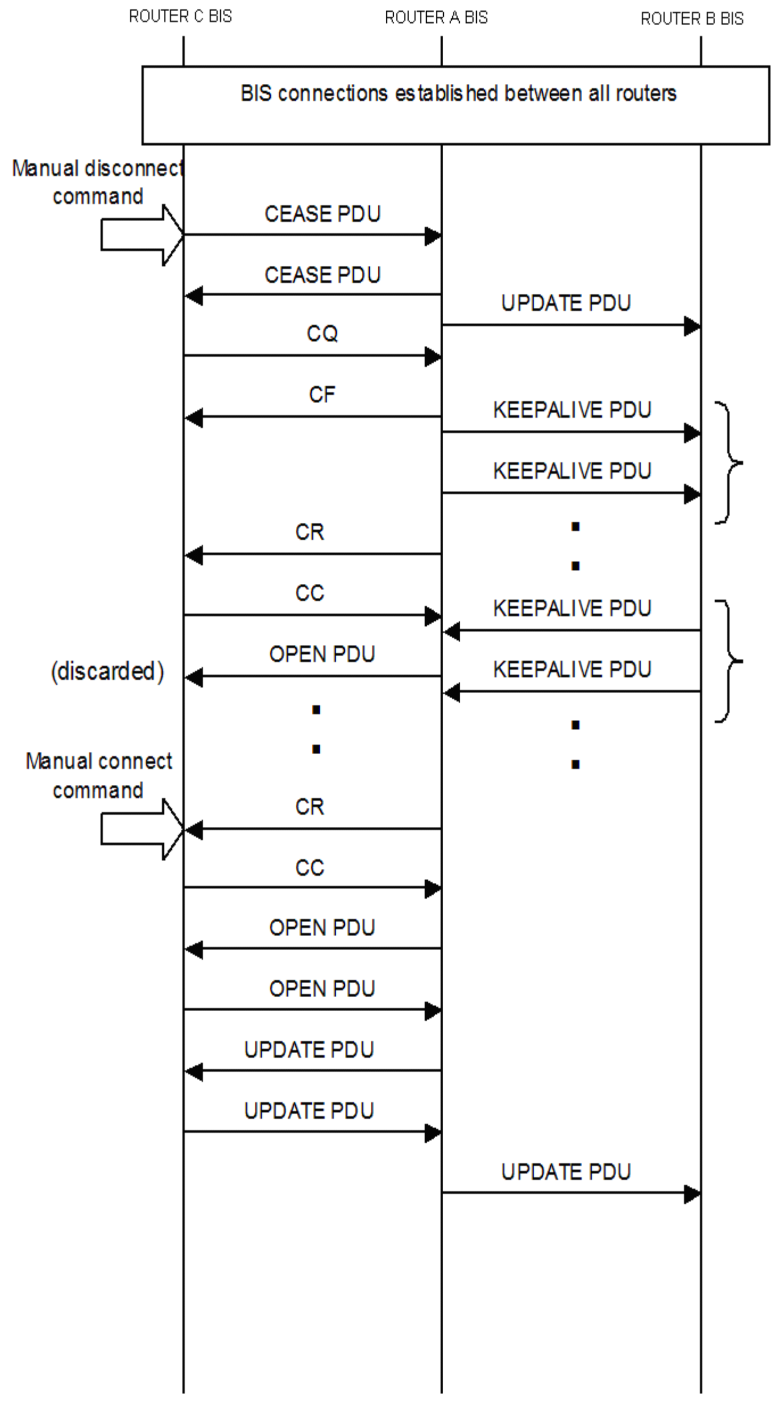


Figure 21 Sequence: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation

Test No.			Sequence Diagram
4	9	1	
4	9	2	
4	9	3	
4	9	4	
4	9	5	
4	10	1	
4	10	2	
4	10	3	
4	10	4	

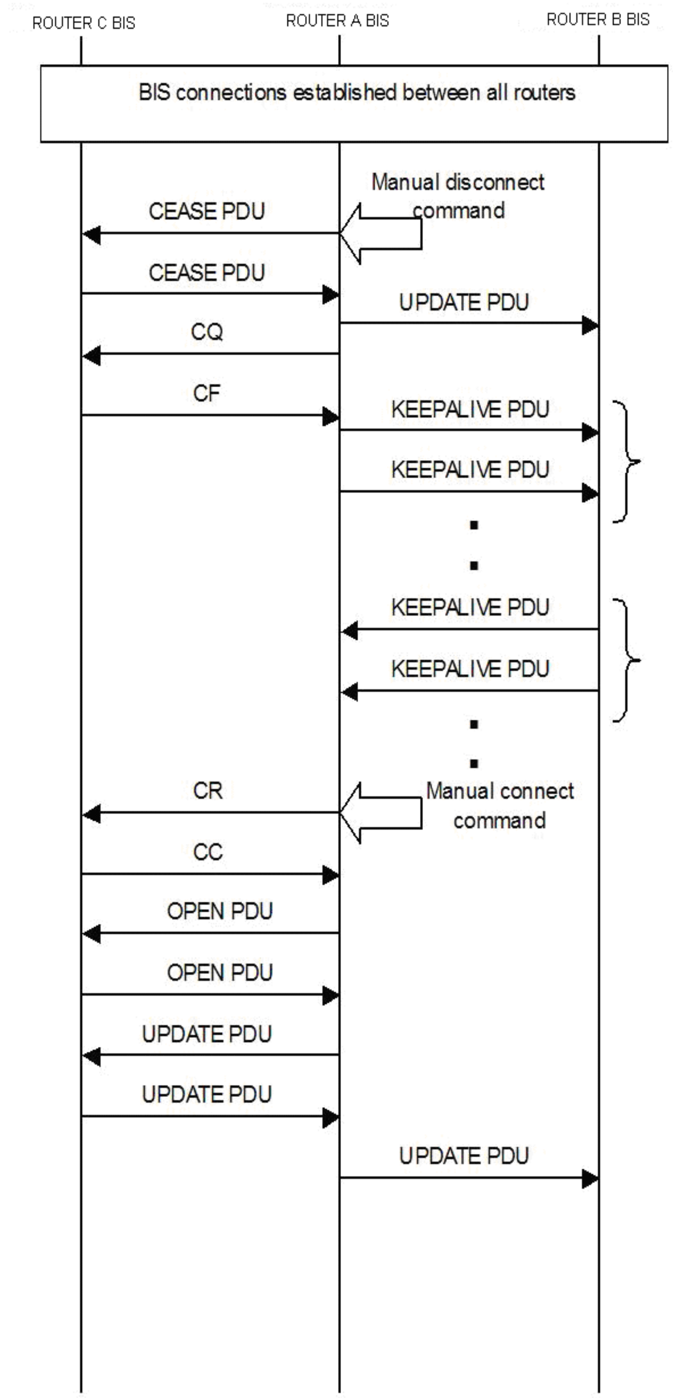


Figure 22 Sequence: Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation

Table 14 Communication Circuit Failure and Recovery Test Procedure: Third Domain connected to AMHSLAND1

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Carrier media failure of ROUTER A-ROUTER B circuit and route deletion	Data link and VC disconnection	4-11-1	Simulate carrier medium failure between ROUTER A and ROUTER B by disconnecting WAN cable from ROUTER B. Check and confirm data link and VC are disconnected between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP disconnection and route update	4-11-2	Check and confirm that IDRP connection between ROUTER A and ROUTER B is closed. At ROUTER A, check that route information for ROUTER B is deleted. At ROUTER B, check that route information for ROUTER A and ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-11-3	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER A-ROUTER B circuit and route addition	Data link, VC, and router connection re-establishment	4-12-1	Restore the ROUTER A-ROUTER B router connection. Confirm router connection is re-established between ROUTER A and ROUTER B.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-12-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B	4-12-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check that route information is added for ROUTER B.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-12-4	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER B.	OK / NG	/ /

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Carrier media failure of ROUTER C-ROUTER A circuit and route deletion	Data link and VC disconnection	4-13-1	Simulate carrier medium failure between ROUTER C and ROUTER A by disconnecting WAN cable from ROUTER C. Check and confirm data link and VC are disconnected between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP disconnection and route update	4-13-2	Check and confirm that IDRP connection between ROUTER C and ROUTER A is closed. At ROUTER C, check that route information for ROUTER A and ROUTER B are deleted. At ROUTER A, check that route information for ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-13-3	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER C-ROUTER A circuit and route addition	Data link, VC, and Router connection re-establishment	4-14-1	Restore the ROUTER C-ROUTER A router connection. Confirm router connection is re-established between ROUTER C and ROUTER A.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-14-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C	4-14-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, check that route information is added for ROUTER C.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-14-4	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER C.	OK / NG	/ /

Test No.			Sequence Diagram
4	11	1	
4	11	2	
4	11	3	
4	12	1	
4	12	2	
4	12	3	
4	12	4	

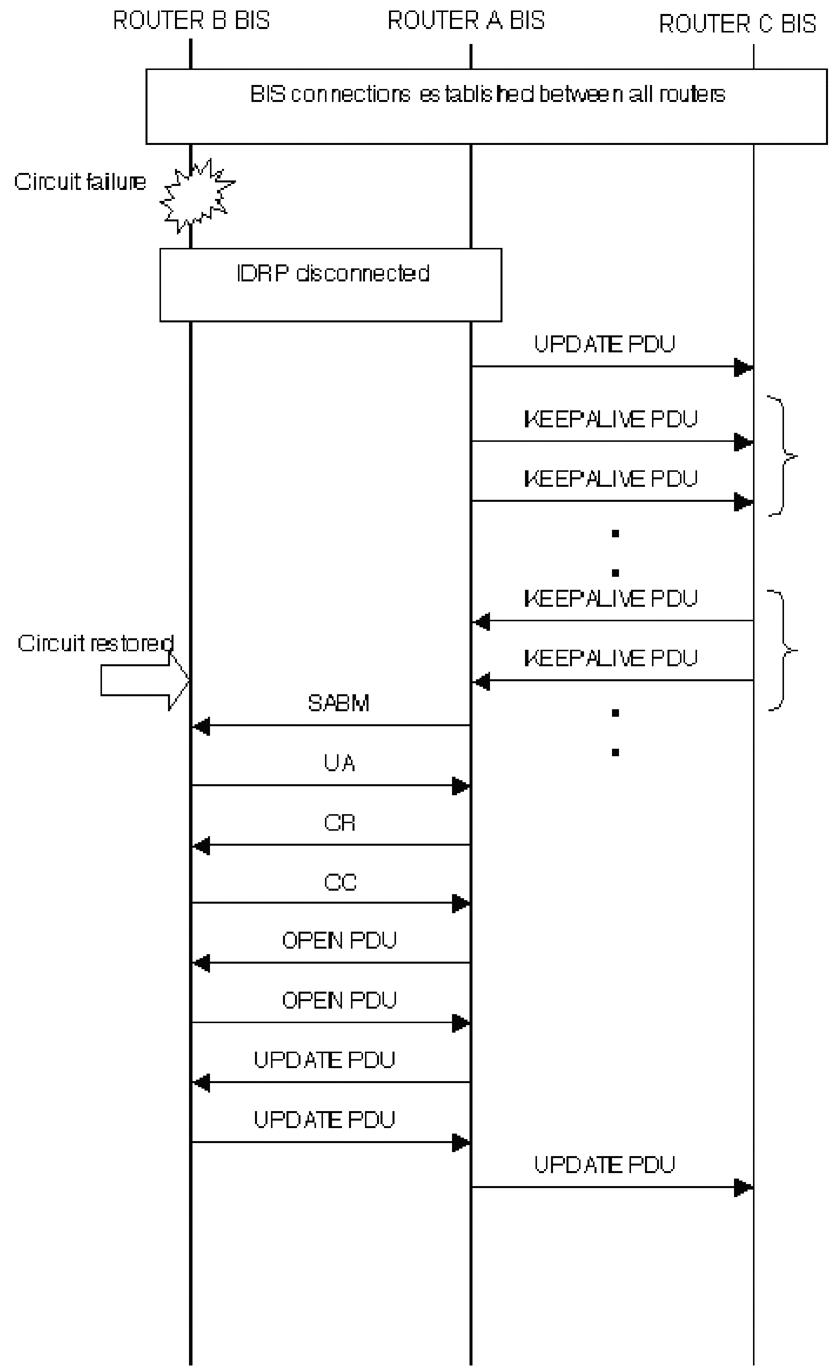


Figure 23 Sequence: Failure and recovery of ROUTER B-ROUTER A circuit

Test No.			Sequence Diagram
4	13	1	
4	13	2	
4	13	3	
4	14	1	
4	14	2	
4	14	3	
4	14	4	

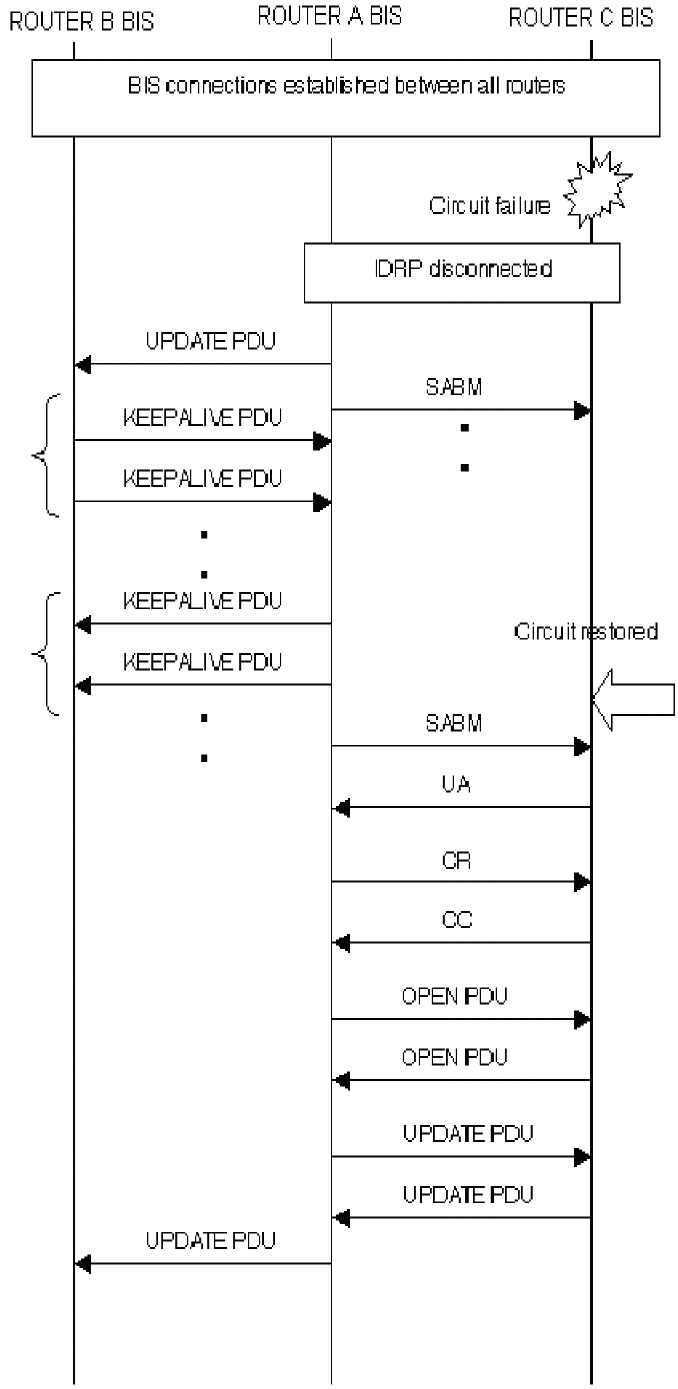


Figure 24 Sequence: Failure and recovery of ROUTER C-ROUTER A circuit

Table 15 Router Failure and Recovery Test Procedure

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Failure and recovery of ROUTER C	Failure of ROUTER C	4-15-1	Simulate failure and recovery of ROUTER C by rebooting the router. At failure: ・ At ROUTER A, check that routing information for ROUTER C is deleted. ・ At ROUTER B, check that routing information for ROUTER C is deleted.	OK / NG	/ /
	Recovery of ROUTER C	4-15-2	Check that the ROUTER C-ROUTER A router connection is automatically re-established after ROUTER C recovers. After recovery: ・At ROUTER A, check that routing information for ROUTER C is added. ・At ROUTER B, check that routing information for ROUTER C is added.	OK / NG	/ /
Failure and recovery of ROUTER A	Failure of ROUTER A	4-16-1	Simulate failure and recovery of ROUTER A by forcing failover. At failure: ・At ROUTER B, check that routing information for ROUTER A and ROUTER C are deleted ・At ROUTER C, check that routing information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
	Recovery of ROUTER A	4-16-2	Check that the ROUTER C-ROUTER A and ROUTER A-ROUTER B router connections are automatically re-established after ROUTER A recovers. After recovery: ・At ROUTER A, check that routing information is added for ROUTER C and ROUTER B. ・At ROUTER B, check that routing information for ROUTER C and ROUTER A are added. ・At ROUTER C, check that routing information for ROUTER A and ROUTER B are added.	OK / NG	/ /
Failure and recovery of ROUTER B	Failure of ROUTER B	4-17-1	Simulate failure and recovery of ROUTER B by rebooting the router. At failure: ・ At ROUTER A, check that routing information for ROUTER B is deleted. ・ At ROUTER C, check that routing information for ROUTER B is deleted.	OK / NG	/ /
	Recovery of ROUTER B	4-17-2	Check that the ROUTER A-ROUTER B router connection is automatically re-established after ROUTER B recovers. After recovery: ・ At ROUTER A, check that routing information for ROUTER B is added. ・ At ROUTER C, check that routing information for ROUTER B is added. ・ At ROUTER B, check that routing information for ROUTER A and ROUTER C are added.	OK / NG	/ /

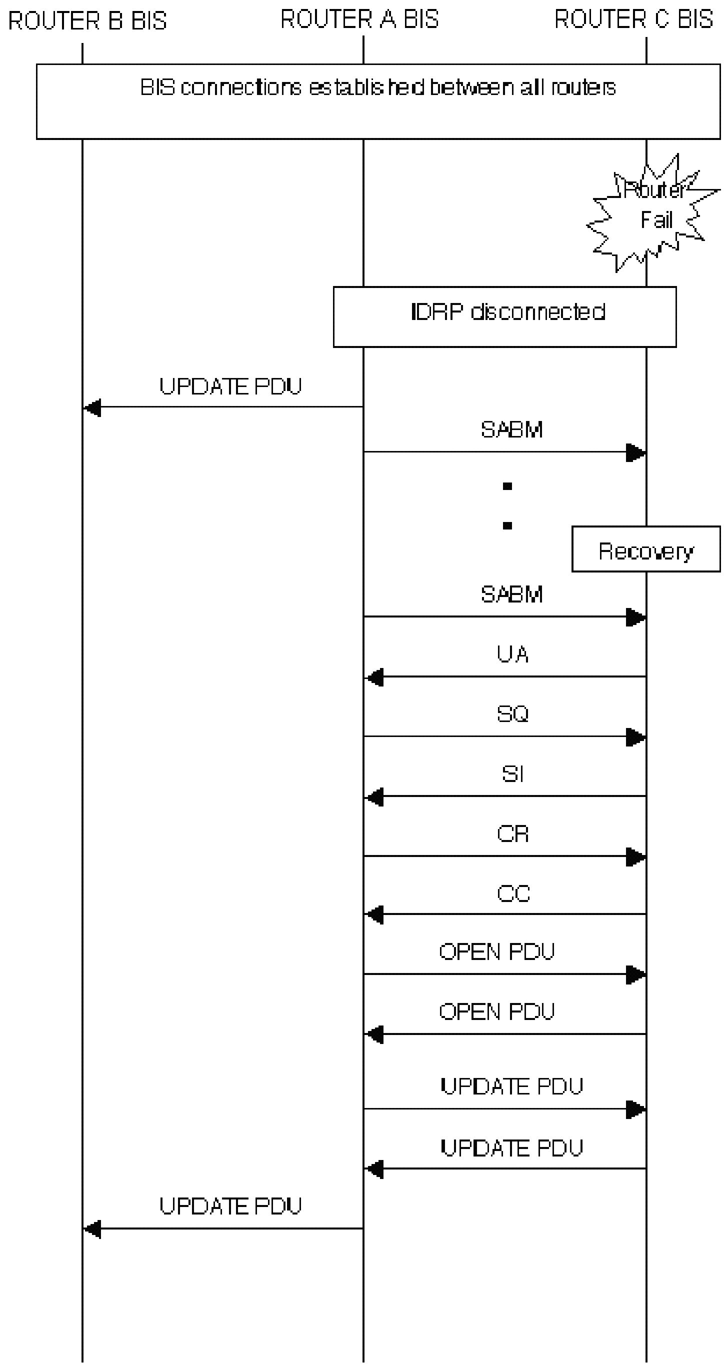
Test No.			Sequence Diagram
4	15	1	
4	15	2	

Figure 25 Sequence: Failure and Recovery of ROUTER C

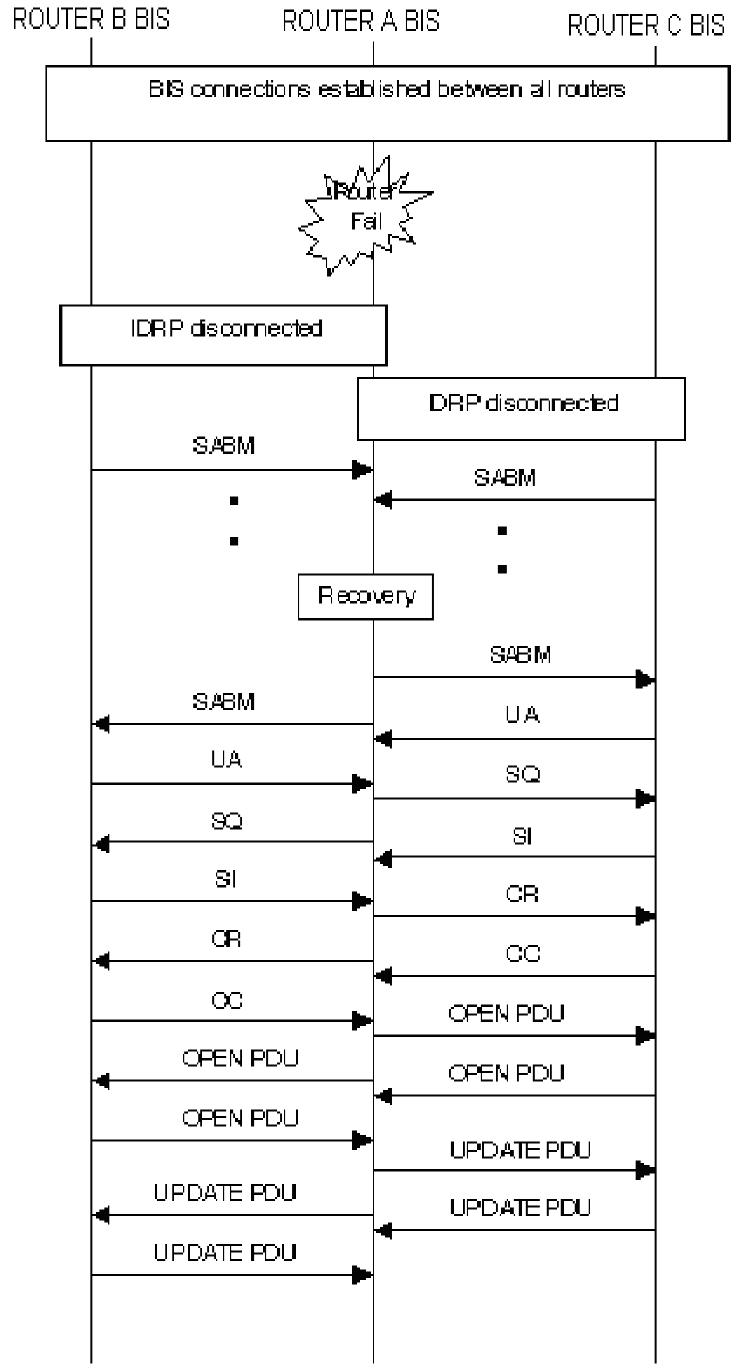
Test No.			Sequence Diagram
4	16	1	
4	16	2	

Figure 26 Sequence: Failure and Recovery of ROUTER A

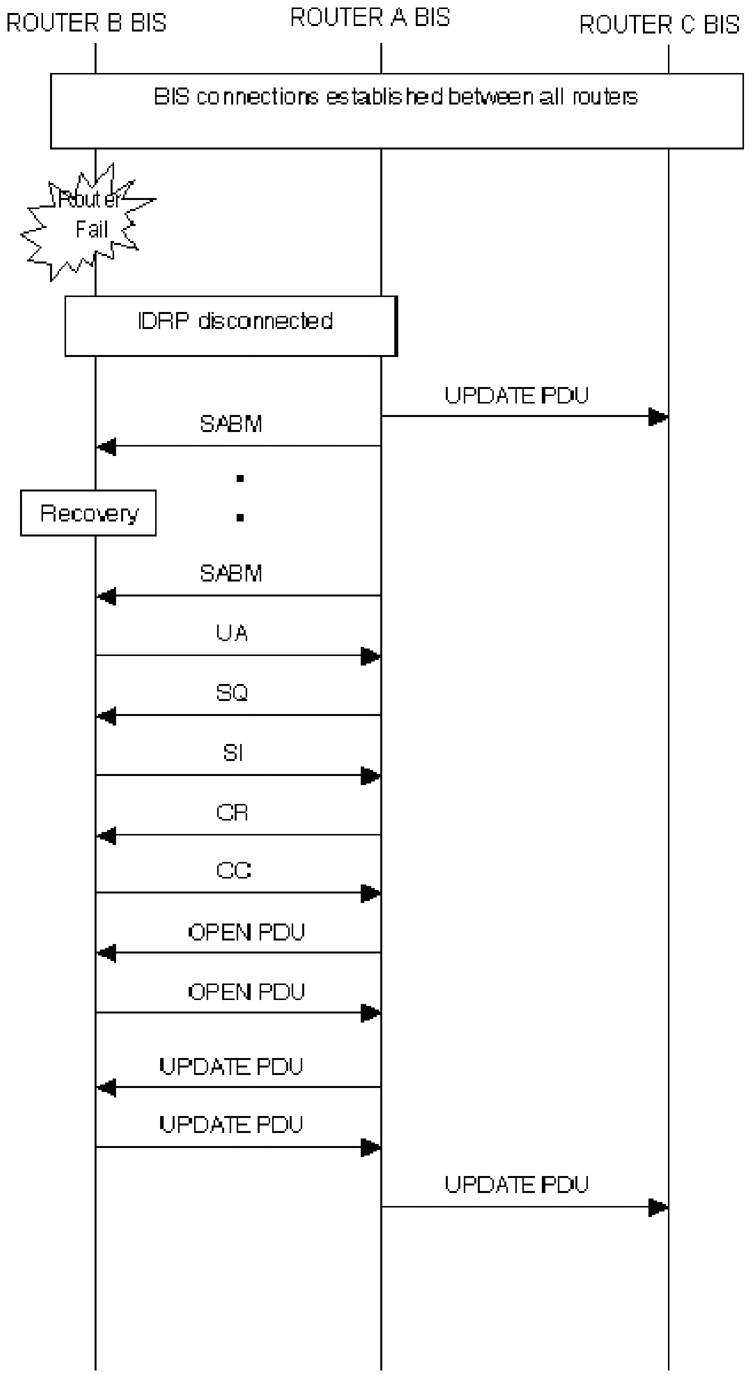
Test No.			Sequence Diagram
4	17	1	
4	17	2	

Figure 27 Sequence: Failure and Recovery of ROUTER B

Table 16 End-to-End CLNP Echo Test Procedure

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
End-to-End CLNP Echo Test between end systems in ROUTER C domain and ROUTER B domain	ERQ transmission	4-18-1	Send ERQ PDU from ES in ROUTER C domain to ES in ROUTER B domain. Confirm receipt of ERQ PDU at ES in ROUTER B domain.	OK / NG	/ /
	ERP transmission	4-18-2	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-3	Repeat 4-18-1 to 4-18-2 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /
	ERQ transmission	4-18-4	Send ERQ PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERQ PDU at ES in ROUTER C domain.	OK / NG	/ /
	ERP transmission	4-18-5	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-6	Repeat 4-18-4 to 4-18-6 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /

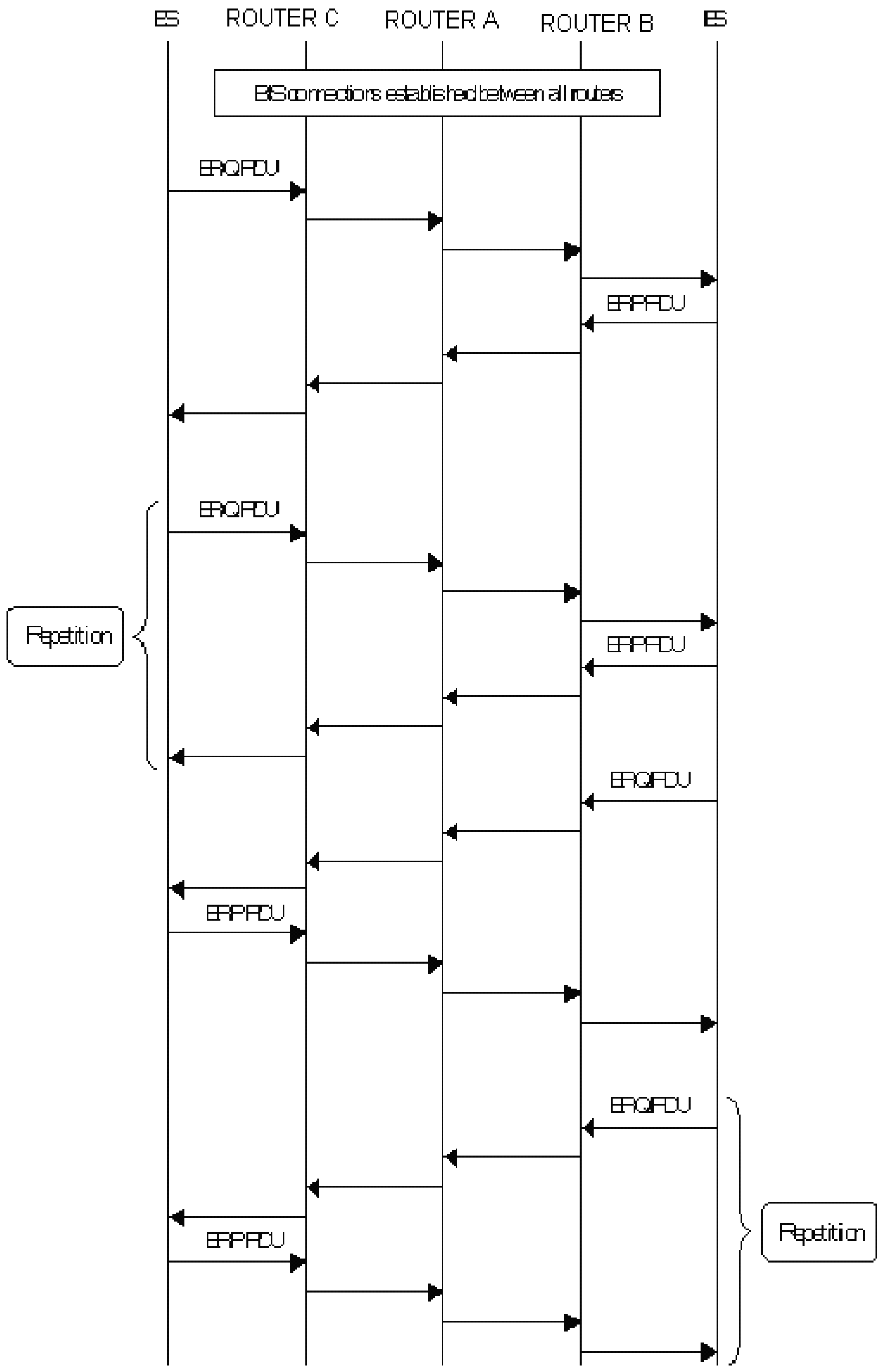
Test No.			Sequence Diagram
4	18	1	
4	18	2	
4	18	3	
4	18	4	
4	18	5	
4	18	6	

Figure 28 Sequence: End-to-End CLNP Echo Tests

6.5. Test Case 5: ATN Router Network Test

a) Objective

Technical trial to verify multiple router addition/deletion, carrier medium failure/restoration and router failure/recovery with routers connected in three-domain configurations i.e. AMHSLAND1, AMHSLAND2 and AMHSLAND3. The test will also verify routing table updates and automatic re-route. The test configurations are as shown below.

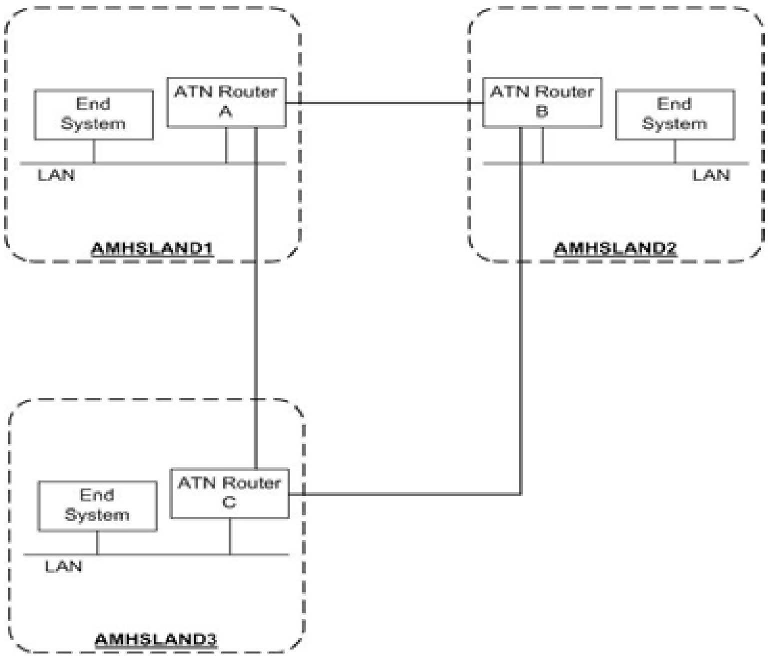


Figure 29 Test Configuration: Routers connected in three-domain configuration

b) Test Overview

(i) Router connected in three-domain configurations

ROUTER CONNECTION AND ECHO REQUEST (TABLE 17)

5-1: Router connection of ROUTER A to ROUTER B (ROUTER A-ROUTER C and ROUTER B-ROUTER C established).

5-2: Echo test between all routers.

ROUTER DISCONNECTION AND RE-ACTIVATION (TABLE 18)

5-3, 5-4: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.

5-5, 5-6: Manual router disconnection at ROUTER B of ROUTER B-ROUTER C route and re-activation.

5-7, 5-8: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation.

COMMUNICATION CIRCUIT FAILURE AND RECOVERY (TABLE 19)

5-9, 5-10: Failure and recovery of ROUTER A-ROUTER B circuit.

5-11, 5-12: Failure and recovery of ROUTER B-ROUTER C circuit.

5-13, 5-14: Failure and recovery of ROUTER C-ROUTER A circuit.

ROUTER FAILURE AND RECOVERY (TABLE 20)

5-15: Failure and recovery of ROUTER A.

5-16: Failure and recovery of ROUTER B.

5-17: Failure and recovery of ROUTER C.

ROUTER CONNECTION AND ECHO REQUEST (TABLE 21)

5-18: Echo test between all routers.

Table 17 Router Connection and Echo Test Procedure: Routers A, B, C

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Router connection of ROUTER A to ROUTER B	Data link establishment between ROUTER A and ROUTER B	5-1-1	With VC and IDRP connections established between ROUTER A and ROUTER C and also ROUTER B and ROUTER C, initiate the router connection between ROUTER A and ROUTER B. Check and confirm data link and VC are established between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP connection establishment between ROUTER A and ROUTER B	5-1-2	After VC establishment, check and confirm IDRP connection established between ROUTER A and ROUTER B by exchange of OPEN PDUs.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	5-1-3	After IDRP connection established, confirm ROUTER A sends UPDATE PDUs to ROUTER B. At ROUTER B, after receiving UPDATE PDUs from ROUTER A, check that route information on ROUTER A via one direct hop is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	5-1-4	After IDRP connection established, confirm ROUTER B sends UPDATE PDUs to ROUTER A. At ROUTER A, after receiving UPDATE PDUs from ROUTER B, check that route information on ROUTER B via one direct hop is added.	OK / NG	/ /
CLNP Echo Test between routers	ERQ transmission	5-2-1	Send ERQ PDU from ROUTER A to each of the other 2 routers (B, C). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
	ERQ transmission	5-2-2	Send ERQ PDU from ROUTER B to each of the other 2 routers (A, C). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
	ERQ transmission	5-2-3	Send ERQ PDU from ROUTER C to each of the other 2 routers (A, B). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /

Table 18 Router Disconnection and Re-activation Test Procedure: Routers A, B, C

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER A	5-3-1	At ROUTER A, manually close the router connection to ROUTER B. Confirm ROUTER A sends a CEASE PDU to ROUTER B.	OK / NG	/ /
	CEASE PDU transmission from ROUTER B and route update	5-3-2	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A and that route to ROUTER A is now via ROUTER C.	OK / NG	/ /
	Route update at ROUTER A	5-3-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B, and that route to ROUTER B is now via ROUTER C.	OK / NG	/ /
	VC disconnection between ROUTER A and ROUTER B	5-3-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	ERQ transmission	5-3-5	Send ERQ PDU from ROUTER A to ROUTER B. Confirm receipt of ERP PDU from ROUTER B.	OK / NG	/ /
	ERQ transmission	5-3-6	Send ERQ PDU from ROUTER B to ROUTER A. Confirm receipt of ERP PDU from ROUTER A.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	5-4-1	At ROUTER A, manually initiate router connection to ROUTER B (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	Routing table entries for ROUTER A	5-4-2	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for ROUTER B is updated, and that the route to ROUTER B is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER B	5-4-3	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for ROUTER A is updated, and that the route to ROUTER A is one direct hop.	OK / NG	/ /

5. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
Manual router disconnection at ROUTER B of ROUTER B-ROUTER C route	CEASE PDU transmission from ROUTER B	5-5-1	At ROUTER B, manually close the router connection to ROUTER C. Confirm ROUTER B sends a CEASE PDU to ROUTER C.	OK / NG	/ /
	CEASE PDU transmission from ROUTER C and route update	5-5-2	At ROUTER C, confirm receipt of CEASE PDU from ROUTER B. Confirm ROUTER C sends a CEASE PDU to ROUTER B and that route to ROUTER B is now via ROUTER A.	OK / NG	/ /
	Route update at ROUTER B	5-5-3	At ROUTER B, confirm receipt of CEASE PDU from ROUTER C, and that route to ROUTER C is now via ROUTER A.	OK / NG	/ /
	VC disconnection between ROUTER B and ROUTER C	5-5-4	Confirm that the VC between ROUTER B and ROUTER C is closed normally.	OK / NG	/ /
	ERQ transmission	5-5-5	Send ERQ PDU from ROUTER B to ROUTER C. Confirm receipt of ERP PDU from ROUTER C.	OK / NG	/ /
	ERQ transmission	5-5-6	Send ERQ PDU from ROUTER C to ROUTER B. Confirm receipt of ERP PDU from ROUTER B.	OK / NG	/ /
Route re-activation from ROUTER B	Router connection re-activation from ROUTER B	5-6-1	At ROUTER B, manually initiate router connection to ROUTER C (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	Routing table entries for ROUTER B	5-6-2	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for ROUTER C is updated, and that the route to ROUTER C is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER C	5-6-3	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for ROUTER B is updated, and that the route to ROUTER B is one direct hop.	OK / NG	/ /

5. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER C	5-7-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route update	5-7-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C. Confirm ROUTER A sends a CEASE PDU to ROUTER C and that route to ROUTER C is now via ROUTER B.	OK / NG	/ /
	Route update at ROUTER C	5-7-3	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route to ROUTER A is now via ROUTER B.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	5-7-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	ERQ transmission	5-7-5	Send ERQ PDU from ROUTER A to ROUTER C. Confirm receipt of ERP PDU from ROUTER C.	OK / NG	/ /
	ERQ transmission	5-7-6	Send ERQ PDU from ROUTER C to ROUTER A. Confirm receipt of ERP PDU from ROUTER A.	OK / NG	/ /
Route re-activation from ROUTER C	Router connection re-activation from ROUTER C	5-8-1	At ROUTER C, manually initiate router connection to ROUTER A (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	Routing table entries for ROUTER C	5-8-2	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for ROUTER A is updated, and that the route to ROUTER A is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER A	5-8-3	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for ROUTER C is updated, and that the route to ROUTER C is one direct hop.	OK / NG	/ /

Sequence diagram to be inserted

Table 19 Communication Circuit Failure and Recovery Test Procedure: Routers A, B, C

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Carrier media failure of ROUTER A-ROUTER B circuit and route deletion	Data link and VC disconnection	5-9-1	Simulate carrier medium failure between ROUTER A and ROUTER B by disconnecting WAN cable from ROUTER A. Check and confirm data link and VC are disconnected between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP disconnection and route update	5-9-2	Check and confirm that IDRP connection between ROUTER A and ROUTER B is closed. At ROUTER A, check that route information for ROUTER B via one direct hop is deleted. At ROUTER B, check that route information for ROUTER A via one direct hop is deleted.	OK / NG	/ /
	ERQ transmission	5-9-3	Send ERQ PDU from ROUTER A to each of the other 2 routers (B, C). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
	ERQ transmission	5-9-4	Send ERQ PDU from ROUTER B to each of the other 2 routers (A, C). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
Carrier media restoration of ROUTER A-ROUTER B circuit and route addition	Data link, VC, and router connection re-establishment	5-10-1	Restore the ROUTER A-ROUTER B router connection. Confirm router connection is re-established between ROUTER A and ROUTER B.	OK / NG	/ /
	Routing table entries for ROUTER A	5-10-2	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for ROUTER B and ROUTER C exists, and that the route to ROUTER B is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER B	5-10-3	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for ROUTER A and ROUTER C exists, and that the route to ROUTER A is one direct hop.	OK / NG	/ /
Carrier media failure of ROUTER B-ROUTER C circuit	Data link and VC disconnection	5-11-1	Simulate carrier medium failure between ROUTER B and ROUTER C by disconnecting WAN cable from ROUTER B. Check and confirm data link and VC are disconnected between ROUTER B and ROUTER C.	OK / NG	/ /

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
	IDRP disconnection and route update	5-11-2	Check and confirm that IDRP connection between ROUTER B and ROUTER C is closed. At ROUTER B, check that route information for ROUTER C via one direct hop is deleted. At ROUTER C, check that route information for ROUTER B via one direct hop is deleted.	OK / NG	/ /
	ERQ transmission	5-11-3	Send ERQ PDU from ROUTER B to each of the other 2 routers (A, C). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
	ERQ transmission	5-11-4	Send ERQ PDU from ROUTER C to each of the other 2 routers (A, B). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
Carrier media restoration of ROUTER B-ROUTER C circuit and route addition	Data link, VC, and router connection re-establishment	5-12-1	Restore the ROUTER B-ROUTER C router connection. Confirm router connection is re-established between ROUTER B and ROUTER C.	OK / NG	/ /
	Routing table entries for ROUTER A	5-12-2	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for ROUTER A and ROUTER C exists, and that the route to ROUTER C is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER B	5-12-3	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for ROUTER A and ROUTER B exists, and that the route to ROUTER B is one direct hop.	OK / NG	/ /
Carrier media failure of ROUTER C-ROUTER A circuit	Data link and VC disconnection	5-13-1	Simulate carrier medium failure between ROUTER C and ROUTER A by disconnecting WAN cable from ROUTER C. Check and confirm data link and VC are disconnected between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP disconnection and route update	5-13-2	Check and confirm that IDRP connection between ROUTER C and ROUTER A is closed. At ROUTER C, check that route information for ROUTER A via one direct hop is deleted. At ROUTER A, check that route information for ROUTER C via one direct hop is deleted.	OK / NG	/ /

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
	ERQ transmission	5-13-3	Send ERQ PDU from ROUTER C to each of the other 2 routers (B, A). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
	ERQ transmission	5-13-4	Send ERQ PDU from ROUTER A to each of the other 2 routers (B, C). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
Carrier media restoration of ROUTER C-ROUTER A circuit and route addition	Data link, VC, and router connection re-establishment	5-14-1	Restore the ROUTER C-ROUTER A router connection. Confirm router connection is re-established between ROUTER C and ROUTER A.	OK / NG	/ /
	Routing table entries for ROUTER A	5-14-2	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for ROUTER B and ROUTER A exists, and that the route to ROUTER A is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER B	5-14-3	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for ROUTER B and ROUTER C exists, and that the route to ROUTER C is one direct hop.	OK / NG	/ /

Sequence diagram to be inserted

Table 20 Router Failure and Recovery Test Procedure: Routers A, B, C

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Failure and recovery of ROUTER A	Failure of ROUTER A	5-15-1	Simulate failure and recovery of ROUTER A by rebooting the router. At failure: ・At ROUTER B, verify that routing information for ROUTER A is deleted, but that routing information for ROUTER C remains. ・At ROUTER C, verify that routing information for ROUTER A is deleted, but that routing information for ROUTER B remains.	OK / NG	/ /
	Recovery of ROUTER A	5-15-2	Check that the ROUTER A-ROUTER B and ROUTER A-ROUTER C router connections are automatically re-established after ROUTER A recovers. After recovery: ・At ROUTER A, check that routing information is added for ROUTER B and ROUTER C. ・At ROUTER B, check that routing information for ROUTER A is added. ・At ROUTER C, check that routing information for ROUTER A is added.	OK / NG	/ /
Failure and recovery of ROUTER B	Failure of ROUTER B	5-16-1	Simulate failure and recovery of ROUTER B by rebooting the router. At failure: ・At ROUTER A, verify that routing information for ROUTER B is deleted, but that routing information for ROUTER C remains. ・At ROUTER C, verify that routing information for ROUTER B is deleted, but that routing information for ROUTER A remains.	OK / NG	/ /

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
	Recovery of ROUTER B	5-16-2	Check that the ROUTER A-ROUTER B and ROUTER B-ROUTER C router connections are automatically re-established after ROUTER B recovers. After recovery: ・At ROUTER B, check that routing information is added for ROUTER A and ROUTER C. ・At ROUTER A, check that routing information for ROUTER B is added. ・At ROUTER C, check that routing information for ROUTER B is added..	OK / NG	/ /
Failure and recovery of ROUTER C	Failure of ROUTER C	5-17-1	Simulate failure and recovery of ROUTER C by rebooting the router. At failure: ・At ROUTER A, verify that routing information for ROUTER C is deleted, but that routing information for ROUTER B remains. ・At ROUTER B, verify that routing information for ROUTER C is deleted, but that routing information for ROUTER A remains.	OK / NG	/ /
	Recovery of ROUTER C	5-17-2	Check that the ROUTER A-ROUTER C and ROUTER C-ROUTER B router connections are automatically re-established after ROUTER C recovers. After recovery: ・At ROUTER C, check that routing information is added for ROUTER A and ROUTER B. ・At ROUTER A, check that routing information for ROUTER C is added. ・At ROUTER B, check that routing information for ROUTER C is added.	OK / NG	/ /

Sequence diagram to be inserted

Table 21 Echo Test Procedure: Routers A, B, C

5. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
CLNP Echo Test between routers	ERQ transmission	5-18-1	Send ERQ PDU from ROUTER A to each of the other 2 routers (B, C). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /
	ERQ transmission	5-18-2	Send ERQ PDU from ROUTER B to each of the other 2 routers (A, C). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	5-18-3	Send ERQ PDU from ROUTER C to each of the other 2 routers (A, B). Confirm receipt of ERP PDU from each of the 2 routers.	OK / NG	/ /

Sequence diagram to be inserted

6.6. Test Case 6: ATN Router Network Test

a) Objective

Technical trial to verify multiple router addition/deletion, carrier medium failure/restoration and router failure/recovery with routers connected in four-domain configurations i.e. AMHSLAND1, AMHSLAND2, AMHSLAND3 and AMHSLAND4. The test will also verify routing table updates and automatic re-route. The test configurations are as shown below.

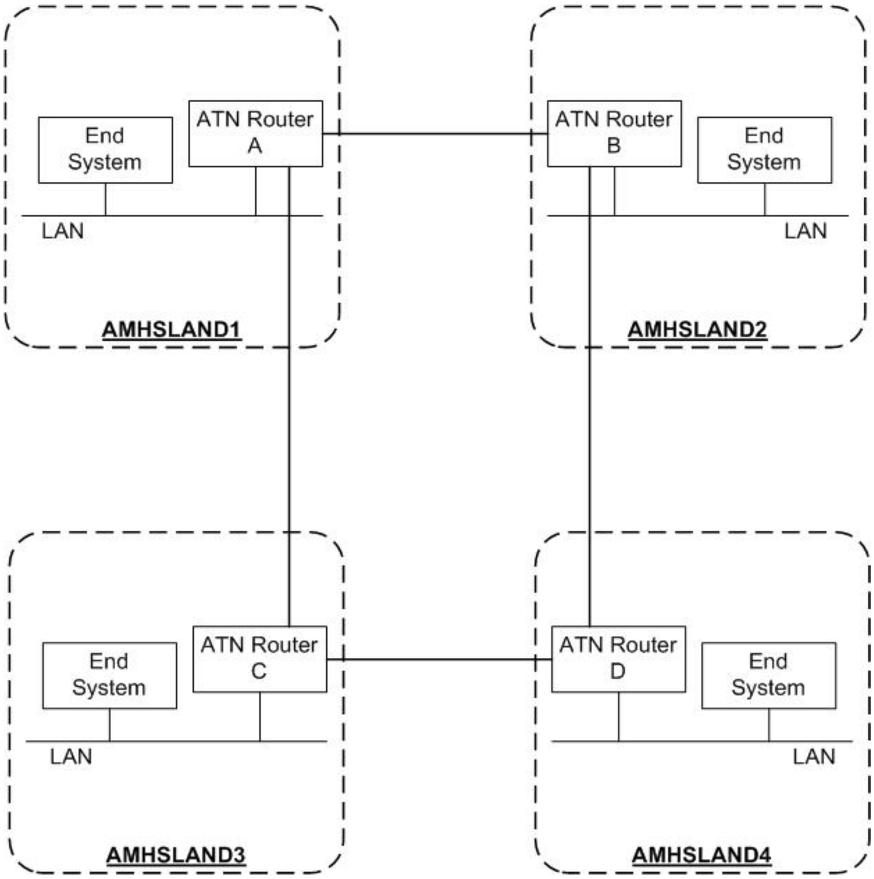


Figure 30 Test Configuration: Routers connected in three-domain configuration

b) Test Overview

(i) Router connected in four-domain configurations

ROUTER CONNECTION AND ECHO REQUEST (TABLE 22)

6-1: Router connection of ROUTER A to ROUTER B (ROUTER A-ROUTER C and ROUTER B-ROUTER D established).

6-2: Router connection of ROUTER C to ROUTER D.

6-3: Echo test between all routers.

ROUTER DISCONNECTION AND RE-ACTIVATION (TABLE 23)

6-4, 6-5: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.

6-6, 6-7: Manual router disconnection at ROUTER B of ROUTER B-ROUTER D route and re-activation.

6-8, 6-9: Manual router disconnection at ROUTER D of ROUTER D-ROUTER C route and re-activation.

6-10, 6-11: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation.

COMMUNICATION CIRCUIT FAILURE AND RECOVERY (TABLE 24)

6-12, 6-13: Failure and recovery of ROUTER A-ROUTER B circuit.

6-14, 6-15: Failure and recovery of ROUTER B-ROUTER D circuit.

6-16, 6-17: Failure and recovery of ROUTER D-ROUTER C circuit.

6-18, 6-19: Failure and recovery of ROUTER C-ROUTER A circuit.

ROUTER FAILURE AND RECOVERY (TABLE 25)

6-20: Failure and recovery of ROUTER A.

6-21: Failure and recovery of ROUTER B.

6-22: Failure and recovery of ROUTER C.

6-23: Failure and recovery of ROUTER D.

ROUTER CONNECTION AND ECHO REQUEST (TABLE 26)

6-24: Echo test between all routers.

Table 22 Router Connection, Echo Test: Routers A, B, C, D

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Router connection of ROUTER A to ROUTER B	Data link establishment between ROUTER A and ROUTER B	6-1-1	With VC and IDRP connections established between ROUTER A and ROUTER C and also ROUTER B and ROUTER D, initiate the router connection between ROUTER A and ROUTER B. Check and confirm data link and VC are established between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP connection establishment between ROUTER A and ROUTER B	6-1-2	After VC establishment, check and confirm IDRP connection established between ROUTER A and ROUTER B by exchange of OPEN PDUs.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	6-1-3	After IDRP connection established, confirm ROUTER A sends UPDATE PDUs to ROUTER B. At ROUTER B, after receiving UPDATE PDUs from ROUTER A, check that route information on ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	6-1-4	After IDRP connection established, confirm ROUTER B sends UPDATE PDUs to ROUTER A. At ROUTER A, after receiving UPDATE PDUs from ROUTER B, check that route information on ROUTER B and ROUTER D are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	6-1-5	At ROUTER A, after receiving UPDATE PDUs from ROUTER B, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received, and that route information of ROUTER B and ROUTER D is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER D	6-1-6	At ROUTER B, after receiving UPDATE PDUs from ROUTER A, confirm ROUTER B sends an UPDATE PDU to ROUTER D. At ROUTER D, confirm that UPDATE PDU is received, and that route information of ROUTER A and ROUTER C is added.	OK / NG	/ /

6. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
Router connection of ROUTER C to ROUTER D	Data link establishment between ROUTER C and ROUTER D	6-2-1	Initiate the router connection between ROUTER C and ROUTER D. Check and confirm data link and VC are established between ROUTER C and ROUTER D.	OK / NG	/ /
	IDRP connection establishment between ROUTER C and ROUTER D	6-2-2	After VC establishment, check and confirm IDRP connection established between ROUTER C and ROUTER D by exchange of OPEN PDUs.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER D	6-2-3	After IDRP connection established, confirm ROUTER C sends UPDATE PDUs to ROUTER D. At ROUTER D, after receiving UPDATE PDUs from ROUTER C, check that appropriate route information for ROUTER A and ROUTER B are present in routing table.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER D to ROUTER C	6-2-4	After IDRP connection established, confirm ROUTER D sends UPDATE PDUs to ROUTER C. At ROUTER C, after receiving UPDATE PDUs from ROUTER D, check that appropriate route information for ROUTER A and ROUTER B are present in routing table.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	6-2-5	At ROUTER C , after receiving UPDATE PDUs from ROUTER D, confirm ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm that UPDATE PDU is received, check that appropriate route information for ROUTER B and ROUTER D are present in the routing table.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER D to ROUTER B	6-2-6	At ROUTER D, after receiving UPDATE PDUs from ROUTER C, confirm ROUTER D sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received, check that appropriate route information for ROUTER A and ROUTER C are present in the routing table.	OK / NG	/ /
CLNP Echo Test between routers	ERQ transmission	6-3-1	Send ERQ PDU from ROUTER A to each of the other 3 routers (B, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /

6. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
CLNP Echo Test between routers	ERQ transmission	6-3-1	Send ERQ PDU from ROUTER A to each of the other 3 routers (B, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-3-2	Send ERQ PDU from ROUTER B to each of the other 3 routers (A, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-3-3	Send ERQ PDU from ROUTER C to each of the other 3 routers (A, B, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-3-4	Send ERQ PDU from ROUTER D to each of the other 3 routers (A, B, C). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /

Sequence diagram to be inserted

Table 23 Router Disconnection and Re-activation: Routers A, B, C, D

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER A	6-4-1	At ROUTER A, manually close the router connection to ROUTER B. Confirm ROUTER A sends a CEASE PDU to ROUTER B.	OK / NG	/ /
	CEASE PDU transmission from ROUTER B and route deletion	6-4-2	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A. However, confirm that route information for all 3 other routers still exists, and that the route to ROUTER A is through ROUTER D and ROUTER C.	OK / NG	/ /
	ERQ transmission	6-4-3	Send ERQ PDU from ROUTER A to each of the other 3 routers (B, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-4-4	Send ERQ PDU from ROUTER B to each of the other 3 routers (A, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	6-5-1	At ROUTER A, manually initiate router connection to ROUTER B (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	Routing table entries for ROUTER A	6-5-2	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for all 3 other routers exists, and that the route to ROUTER B is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER B	6-5-3	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for all 3 other routers exists, and that the route to ROUTER A is one direct hop.	OK / NG	/ /
Manual router disconnection at ROUTER B of ROUTER B-ROUTER D route	CEASE PDU transmission from ROUTER B	6-6-1	At ROUTER B, manually close the router connection to ROUTER D. Confirm ROUTER B sends a CEASE PDU to ROUTER D.	OK / NG	/ /
	CEASE PDU transmission from ROUTER D and route deletion	6-6-2	At ROUTER D, confirm receipt of CEASE PDU from ROUTER B. Confirm ROUTER D sends a CEASE PDU to ROUTER B. However, confirm that route information for all 3 other routers still exists, and that the route to ROUTER B is through ROUTER C and ROUTER A.	OK / NG	/ /

6. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
	ERQ transmission	6-6-3	Send ERQ PDU from ROUTER B to each of the other 3 routers (A, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-6-4	Send ERQ PDU from ROUTER D to each of the other 3 routers (A, B, C). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
Route re-activation from ROUTER B	Router connection re-activation from ROUTER B	6-7-1	At ROUTER B, manually initiate router connection to ROUTER D (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	Routing table entries for ROUTER B	6-7-2	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for all 3 other routers exists, and that the route to ROUTER D is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER D	6-7-3	Following the exchange of UPDATE PDUs, verify at ROUTER D that route information for all 3 other routers exists, and that the route to ROUTER B is one direct hop.	OK / NG	/ /
Manual router disconnection at ROUTER D of ROUTER D-ROUTER C route	CEASE PDU transmission from ROUTER D	6-8-1	At ROUTER D, manually close the router connection to ROUTER C. Confirm ROUTER D sends a CEASE PDU to ROUTER C.	OK / NG	/ /
	CEASE PDU transmission from ROUTER C and route deletion	6-8-2	At ROUTER C, confirm receipt of CEASE PDU from ROUTER D. Confirm ROUTER C sends a CEASE PDU to ROUTER D. However, confirm that route information for all 3 other routers still exists, and that the route to ROUTER D is through ROUTER A and ROUTER B.	OK / NG	/ /
	ERQ transmission	6-8-3	Send ERQ PDU from ROUTER D to each of the other 3 routers (A, B, C). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-8-4	Send ERQ PDU from ROUTER C to each of the other 3 routers (A, B, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
Route re-activation from ROUTER D	Router connection re-activation from ROUTER D	6-9-1	At ROUTER D, manually initiate router connection to ROUTER C (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	Routing table entries for ROUTER D	6-9-2	Following the exchange of UPDATE PDUs, verify at ROUTER D that route information for all 3 other routers exists, and that the route to ROUTER C is one direct hop.	OK / NG	/ /

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
	Routing table entries for ROUTER C	6-9-3	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for all 3 other routers exists, and that the route to ROUTER D is one direct hop.	OK / NG	/ /
Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER C	6-10-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	6-10-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C. Confirm ROUTER A sends a CEASE PDU to ROUTER C. However, confirm that route information for all 3 other routers still exists, and that the route to ROUTER C is through ROUTER B and ROUTER D.	OK / NG	/ /
	ERQ transmission	6-10-3	Send ERQ PDU from ROUTER C to each of the other 3 routers (A, B, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-10-4	Send ERQ PDU from ROUTER A to each of the other 3 routers (B, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
Route re-activation from ROUTER C	Router connection re-activation from ROUTER C	6-11-1	At ROUTER C, manually initiate router connection to ROUTER A (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	Routing table entries for ROUTER C	6-11-2	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for all 3 other routers exists, and that the route to ROUTER A is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER A	6-11-3	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for all 3 other routers exists, and that the route to ROUTER C is one direct hop.	OK / NG	/ /

Sequence diagram to be inserted

Table 24 Communication Circuit Failure and Recovery Test Procedure: Routers A, B, C, D

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Carrier media failure of ROUTER A-ROUTER B circuit	Data link and VC disconnection	6-12-1	Simulate carrier medium failure between ROUTER A and ROUTER B by disconnecting WAN cable from ROUTER A. Check and confirm data link and VC are disconnected between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP disconnection and route update	6-12-2	Check and confirm that IDRP connection between ROUTER A and ROUTER B is closed. However, confirm in ROUTER A that route information for all 3 other routers still exists, and that the route to ROUTER B is through ROUTER C and ROUTER D. Also, confirm in ROUTER B that route information for all 3 other routers still exists, and that the route to ROUTER A is through ROUTER D and ROUTER C.	OK / NG	/ /
	ERQ transmission	6-12-3	Send ERQ PDU from ROUTER A to each of the other 3 routers (B, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-12-4	Send ERQ PDU from ROUTER B to each of the other 3 routers (A, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
Carrier media restoration of ROUTER A-ROUTER B circuit and route addition	Data link, VC, and router connection re-establishment	6-13-1	Restore the ROUTER A-ROUTER B router connection. Confirm router connection is re-established between ROUTER A and ROUTER B.	OK / NG	/ /
	Routing table entries for ROUTER A	6-13-2	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for all 3 other routers exists, and that the route to ROUTER B is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER B	6-13-3	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for all 3 other routers exists, and that the route to ROUTER A is one direct hop.	OK / NG	/ /
Carrier media failure of ROUTER B-ROUTER D circuit	Data link and VC disconnection	6-14-1	Simulate carrier medium failure between ROUTER B and ROUTER D by disconnecting WAN cable from ROUTER B. Check and confirm data link and VC are disconnected between ROUTER B and ROUTER D.	OK / NG	/ /

6. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
	IDRP disconnection and route update	6-14-2	Check and confirm that IDRP connection between ROUTER B and ROUTER D is closed. However, confirm in ROUTER B that route information for all 3 other routers still exists, and that the route to ROUTER D is through ROUTER A and ROUTER C. Also, confirm in ROUTER D that route information for all 3 other routers still exists, and that the route to ROUTER B is through ROUTER C and ROUTER A.	OK / NG	/ /
	ERQ transmission	6-14-3	Send ERQ PDU from ROUTER B to each of the other 3 routers (A, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-14-4	Send ERQ PDU from ROUTER D to each of the other 3 routers (A, B, C). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
Carrier media restoration of ROUTER B-ROUTER D circuit and route addition	Data link, VC, and router connection re-establishment	6-15-1	Restore the ROUTER B-ROUTER D router connection. Confirm router connection is re-established between ROUTER B and ROUTER D.	OK / NG	/ /
	Routing table entries for ROUTER B	6-15-2	Following the exchange of UPDATE PDUs, verify at ROUTER B that route information for all 3 other routers exists, and that the route to ROUTER D is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER D	6-15-3	Following the exchange of UPDATE PDUs, verify at ROUTER D that route information for all 3 other routers exists, and that the route to ROUTER B is one direct hop.	OK / NG	/ /
Carrier media failure of ROUTER D-ROUTER C circuit	Data link and VC disconnection	6-16-1	Simulate carrier medium failure between ROUTER D and ROUTER C by disconnecting WAN cable from ROUTER D. Check and confirm data link and VC are disconnected between ROUTER D and ROUTER C.	OK / NG	/ /
	IDRP disconnection and route update	6-16-2	Check and confirm that IDRP connection between ROUTER D and ROUTER C is closed. However, confirm in ROUTER D that route information for all 3 other routers still exists, and that the route to ROUTER C is through ROUTER B and ROUTER A. Also, confirm in ROUTER C that route information for all 3 other routers still exists, and that the route to ROUTER D is through ROUTER A and ROUTER B.	OK / NG	/ /

6. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
	ERQ transmission	6-16-3	Send ERQ PDU from ROUTER D to each of the other 3 routers (A, B, C). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-16-4	Send ERQ PDU from ROUTER C to each of the other 3 routers (A, B, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
Carrier media restoration of ROUTER D-ROUTER C circuit and route addition	Data link, VC, and router connection re-establishment	6-17-1	Restore the ROUTER D-ROUTER C router connection. Confirm router connection is re-established between ROUTER D and ROUTER C.	OK / NG	/ /
	Routing table entries for ROUTER D	6-17-2	Following the exchange of UPDATE PDUs, verify at ROUTER D that route information for all 3 other routers exists, and that the route to ROUTER C is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER C	6-17-3	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for all 3 other routers exists, and that the route to ROUTER D is one direct hop.	OK / NG	/ /
Carrier media failure of ROUTER C-ROUTER A circuit	Data link and VC disconnection	6-18-1	Simulate carrier medium failure between ROUTER C and ROUTER A by disconnecting WAN cable from ROUTER C. Check and confirm data link and VC are disconnected between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP disconnection and route update	6-18-2	Check and confirm that IDRP connection between ROUTER C and ROUTER A is closed. However, confirm in ROUTER C that route information for all 3 other routers still exists, and that the route to ROUTER A is through ROUTER D and ROUTER B. Also, confirm in ROUTER A that route information for all 3 other routers still exists, and that the route to ROUTER C is through ROUTER B and ROUTER D.	OK / NG	/ /
	ERQ transmission	6-18-3	Send ERQ PDU from ROUTER C to each of the other 3 routers (A, B, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-18-4	Send ERQ PDU from ROUTER A to each of the other 3 routers (B, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Carrier media restoration of ROUTER C-ROUTER A circuit and route addition	Data link, VC, and router connection re-establishment	6-19-1	Restore the ROUTER C-ROUTER A router connection. Confirm router connection is re-established between ROUTER C and ROUTER A.	OK / NG	/ /
	Routing table entries for ROUTER C	6-19-2	Following the exchange of UPDATE PDUs, verify at ROUTER C that route information for all 3 other routers exists, and that the route to ROUTER A is one direct hop.	OK / NG	/ /
	Routing table entries for ROUTER A	6-19-3	Following the exchange of UPDATE PDUs, verify at ROUTER A that route information for all 3 other routers exists, and that the route to ROUTER C is one direct hop.	OK / NG	/ /

Sequence diagram to be inserted

Table 25 Router Failure and Recovery Test Procedure: Routers A, B, C, D

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
Failure and recovery of ROUTER A	Failure of ROUTER A	6-20-1	Simulate failure and recovery of ROUTER A by rebooting the router. At failure: ・At ROUTER B, verify that routing information for ROUTER A is deleted, but that routing information for ROUTER C and ROUTER D remains. ・At ROUTER C, verify that routing information for ROUTER A is deleted, but that routing information for ROUTER B and ROUTER D remains. ・At ROUTER D, verify that routing information for ROUTER A is deleted, but that routing information for ROUTER B and ROUTER C remains.	OK / NG	/ /
	Recovery of ROUTER A	6-20-2	Check that the ROUTER A-ROUTER B and ROUTER A-ROUTER C router connections are automatically re-established after ROUTER A recovers. After recovery: ・At ROUTER A, check that routing information is added for ROUTER B, ROUTER C and ROUTER D. ・At ROUTER B, check that routing information for ROUTER A is added. ・At ROUTER C, check that routing information for ROUTER A is added. ・At ROUTER D, check that routing information for ROUTER A is added.	OK / NG	/ /
Failure and recovery of ROUTER B	Failure of ROUTER B	6-21-1	Simulate failure and recovery of ROUTER B by rebooting the router. At failure: ・At ROUTER A, verify that routing information for ROUTER B is deleted, but that routing information for ROUTER C and ROUTER D remains.	OK / NG	/ /

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
			・At ROUTER C, verify that routing information for ROUTER B is deleted, but that routing information for ROUTER A and ROUTER D remains. ・At ROUTER D, verify that routing information for ROUTER B is deleted, but that routing information for ROUTER A and ROUTER C remains.	OK / NG	/ /
	Recovery of ROUTER B	6-21-2	Check that the ROUTER A-ROUTER B and ROUTER B-ROUTER D router connections are automatically re-established after ROUTER B recovers. After recovery: ・At ROUTER B, check that routing information is added for ROUTER A, ROUTER C and ROUTER D. ・At ROUTER A, check that routing information for ROUTER B is added. ・At ROUTER C, check that routing information for ROUTER B is added. ・At ROUTER D, check that routing information for ROUTER B is added.	OK / NG	/ /
Failure and recovery of ROUTER C	Failure of ROUTER C	6-22-1	Simulate failure and recovery of ROUTER C by rebooting the router. At failure: ・At ROUTER A, verify that routing information for ROUTER C is deleted, but that routing information for ROUTER B and ROUTER D remains. ・At ROUTER B, verify that routing information for ROUTER C is deleted, but that routing information for ROUTER A and ROUTER D remains. ・At ROUTER D, verify that routing information for ROUTER C is deleted, but that routing information for ROUTER A and ROUTER B remains.	OK / NG	/ /

6. ATN Router Network Test		Test Item	Procedure	Result	Date/Time
	Recovery of ROUTER C	6-22-2	Check that the ROUTER A-ROUTER C and ROUTER C-ROUTER D router connections are automatically re-established after ROUTER C recovers. After recovery: ・At ROUTER C, check that routing information is added for ROUTER A, ROUTER B and ROUTER D. ・At ROUTER A, check that routing information for ROUTER C is added. ・At ROUTER B, check that routing information for ROUTER C is added. ・At ROUTER D, check that routing information for ROUTER C is added.	OK / NG	/ /
Failure and recovery of ROUTER D	Failure of ROUTER D	6-23-1	Simulate failure and recovery of ROUTER D by rebooting the router. At failure: ・At ROUTER A, verify that routing information for ROUTER D is deleted, but that routing information for ROUTER B and ROUTER C remains. ・At ROUTER B, verify that routing information for ROUTER D is deleted, but that routing information for ROUTER A and ROUTER C remains. ・At ROUTER C, verify that routing information for ROUTER D is deleted, but that routing information for ROUTER A and ROUTER B remains.	OK / NG	/ /
	Recovery of ROUTER D	6-23-2	Check that the ROUTER B-ROUTER D and ROUTER C-ROUTER D router connections are automatically re-established after ROUTER D recovers. After recovery: ・At ROUTER D, check that routing information is added for ROUTER A, ROUTER B and ROUTER C. ・At ROUTER A, check that routing information for ROUTER D is added. ・At ROUTER B, check that routing information for ROUTER D is added. ・At ROUTER C, check that routing information for ROUTER D is added.	OK / NG	/ /

Sequence diagram to be inserted

Table 26 Echo Test Procedure: Routers A, B, C, D

6. ATN Router Network Test		**Test Item**	**Procedure**	**Result**	**Date/Time**
CLNP Echo Test between routers	ERQ transmission	6-24-1	Send ERQ PDU from ROUTER A to each of the other 3 routers (B, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-24-2	Send ERQ PDU from ROUTER B to each of the other 3 routers (A, C, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-24-3	Send ERQ PDU from ROUTER C to each of the other 3 routers (A, B, D). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /
	ERQ transmission	6-24-4	Send ERQ PDU from ROUTER D to each of the other 3 routers (A, B, C). Confirm receipt of ERP PDU from each of the 3 routers.	OK / NG	/ /

Sequence diagram to be inserted

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ASIA/PAC
AERONAUTICAL TELECOMMUNICATION NETWORK
SECURITY GUIDANCE DOCUMENT

DRAFT

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TABLE OF CONTENTS

1. INTRODUCTION

This Security Guidance Document for the Asia/Pacific Region provides guidance on the implementation of security for states and organizations operating in the region.

1.1 Background

As noted in the Asia/Pacific System Security Policy [Asia/Pac SSP], the fundamental objectives for system security of the ATN are to:

1. Protect ATN data from unauthorized disclosure, modification, or deletion, and
2. Protect ATN resources from unauthorized use and denial of service.

These objectives are achieved through the application of a set of high-level security services. The Asia/Pacific Security Policy identifies the following services:

(1) Confidentiality. Ensures data is not disclosed to unauthorized entities.

(2) Data Integrity. Ensures data has not been altered or destroyed in an unauthorized manner.

(3) Authenticity. Ensures that the source of data or the identity of an entity is as claimed.

(4) Availability. Ensures resources, services, and data are accessible and usable on demand or in a timely, reliable manner by an authorized entity.

(5) Accountability. Enables activities to be traced to users and processes that may then be held responsible for those actions.

These security services are in turn realized by the implementation of a comprehensive set of management, operational, and technical controls. Controls may be organized into the following control classes:

Management controls are safeguards or countermeasures that focus on the management of risk and the management of system security.

Operational controls are safeguards or countermeasures for a system that are primarily implemented and executed by people.

Technical controls are safeguards or countermeasures for a system that are primarily implemented and executed by the system through mechanisms contained in the components of the system.

Figure 1.1 depicts the relationship between Security Objectives, Services, and Controls.

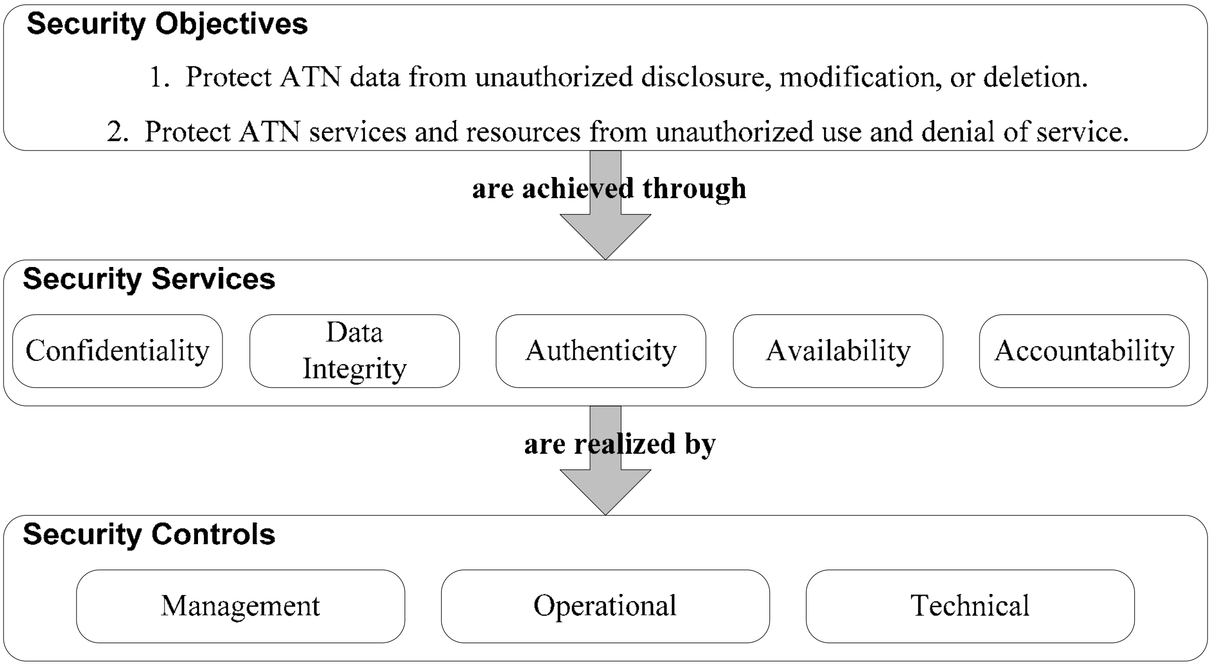


Figure 1-1. Security Objectives, Services, and Controls

1.2 Document Organization

In addition to this introduction, this document contains 4 major sections.

Section 2 provides a description of the 17 control families in the three Management, Operational, and Technical control classes. This section also provides a mapping from the high-level services to the control families.

Section 3 provides guidance on control families in the Management class. This section describes best practices for the management organization in an entity participating in the ATN.

Section 4 provides guidance on control families in the Operational control class. It describes procedures which constitute an effective security operation.

Section 5 provides guidance on control families in the Technical control class. Section 5 describes how technical controls are applied to various components of an ATN system. It gives specific examples of controls applied to each component.

2. SECURITY CONTROL FAMILIES

2.1 Description of Control Families

Access Control (AC) is the capability of the system to limit access to authorized users, processes acting on behalf of authorized users, and devices (including other systems) and to the types of transactions and functions that authorized users are permitted to exercise.

Awareness and Training (AT) ensures that operational personnel are aware of the security risks associated with their activities and the security policies which apply to their systems, and ensures that personnel are adequately trained to carry out their duties and responsibilities.

Audit and Accountability (AU) is the capability of the system to generate audit records that may indicate unauthorized or inappropriate system activity and that may be used to ensure that the actions of individual system users can be uniquely traced to those users so they can be held accountable for their actions.

Certification, Accreditation, and Security Assessments (CA) ensures that the organization's management assesses the security controls in their system and authorize (accredit) the system for operation.

Configuration Management (CM) ensures that operational personnel control changes to their system's configuration.

Contingency Planning (CP) ensures that operational personnel have a plan for continued operation to maintain availability of critical user and system-level information in emergency situations.

Identification and Authentication (IA) is the capability of the system to identify and verify (i.e., authenticate) system users, processes acting on behalf of users, or devices.

Incident Response (IR) ensures that operational personnel handle security incidents and promptly report incidents to appropriate authorities.

Maintenance (MA) ensures that operational personnel perform preventative and regular maintenance on their system.

Media Protection (MP) ensures that operational personnel restrict access to system media to authorized personnel and physically control system media in controlled areas.

Physical and Environmental Protection (PE) ensures that operational personnel limit physical access to systems and protect systems against environmental hazards.

Planning (PL) ensures that the organization's management develops and implements a security plan for the system.

Personnel Security (PS) ensures that operational personnel are trustworthy and meet security criteria for their positions.

Risk Assessment (RA) ensures that the organization's management assesses the risk and magnitude of harm that may result from security attacks on the system.

System and Services Acquisition (SA) ensures that the organization's management allocates the resources required to adequately protect their system.

System and Communications Protection (SC) is the capability of the system to monitor, control, and protect communications and includes architectural controls, confidentiality, data integrity and interoperability.

System and Information Integrity (SI) ensures that operational personnel remediate system flaws, provide protection from malicious code and other attacks on the system's integrity, and monitor alerts and advisories and take appropriate action in response.

2. 2 Realization of Security Services through Controls

Table 2-1 depicts a mapping from the Asia/Pacific System Security Policy to the controls identified in section 2.1.

Table 2-1. Mapping of Controls onto Asia/Pac System Security Policy

Asia/Pac System Security Policy	Technical Controls	Operational Controls	Management Controls
Confidentiality			
(a) ATN data shall be protected from unauthorized disclosure during processing, transmission, and storage commensurate with the designated sensitivity of the data.	System and Communications Protection (SC)	System and Information Integrity (SI) Physical and Environmental Protection (PE)	System and Services Acquisition (SA)
Data Integrity			
(a) ATN data shall be protected from unauthorized or undetected modification during transmission, storage, and processing.	System and Communications Protection (SC)	System and Information Integrity (SI) Physical and Environmental Protection (PE) Configuration Management (CM)	System and Services Acquisition (SA)
Authenticity			
(a) ATN users and processes shall be uniquely identified.	Identification and Authentication (IA)	Personnel Security (PS)	
(b) ATN users and processes shall be authenticated before being granted access to ATN data, services, and resources.	Identification and Authentication (IA) Access Control (AC)	Personnel Security (PS)	
(c) ATN data, services, and resources shall be protected from unauthorized use or tampering.	Access Control (AC)		
(d) ATN users and processes shall have access only to those ATN data, services, and resources for which they have authorization.	Access Control (AC)		
Availability			

Asia/Pac System Security Policy	Technical Controls	Operational Controls	Management Controls
(a) ATN data, services, and resources shall be available for use by authorized users and processes.	System and Communications Protection (SC)	System and Information Integrity (SI) Contingency Planning (CP) Incident Response (IR) Physical and Environmental Protection (PE) Personnel Security (PS)	System and Services Acquisition (SA)
Accountability			
(a) An audit trail of use of ATN data, services, and resources by ATN users and processes shall be maintained.	Audit and Accountability (AU)	Personnel Security (PS)	
Verification			
a. ATN systems shall be verified to have system security commensurate with the risk and magnitude of harm resulting from unauthorized disclosure, modification, or deletion of ATN data, or unauthorized use and denial of service of ATN services and resources.			Planning (PL) Risk Assessment (RA)
Authorization			
a. ATN systems shall be formally approved for operation by the cognizant Designated Approving Authority (DAA).			Certification, Accreditation, and Security Assessments (CA)
b. Significant changes to ATN systems shall require another formal approval (or re-authorization).			Certification, Accreditation, and Security Assessments (CA)

3. MANAGEMENT CONTROL GUIDANCE

As defined in section 1.1, Management Controls are safeguards or countermeasures that focus on the management of risk and the management of system security.

3.1 Certification, Accreditation, and Security Assessments (CA)

The Asia/Pacific System Security Policy requires that ATN systems be verified to have system security commensurate with the risk and magnitude of harm resulting from unauthorized disclosure, modification, or deletion of ATN data, or unauthorized use and denial of service of ATN services and resources. This requirement essentially says that a system should have controls in place to meet the fundamental objectives for system security as noted in section 1.1. Verification of system security is more generally termed certification. This is where an organization conducts a risk assessment (see 3.3) and an assessment of the security controls to determine the extent to which the controls are implemented correctly, operating as intended, and producing the desired outcome in terms of meeting the fundamental system security objectives. Management may use the Asia/Pacific System Security Checklist [Asia/Pac SSC]as a general guide in assessing security controls.

The Asia/Pacific System Security Policy also requires that ATN systems be formally approved (i.e., accredited) for operation by an individual responsible for security in the organization. This individual is called the Designated Approving Authority (DAA). The DAA is a senior organizational official that signs and approves the security accreditation thereby authorizing operation of the system.

3.2 Planning (PL)

A system may be authorized for operation by the organization's management even though there are controls not in place or controls which could be enhanced as determined by the security verification process. In this situation the organization would develop and implements a security plan for adding or enhancing controls in the system.

3.3 Risk Assessment (RA)

A formal risk assessment is the process by which an organization determines the risk and magnitude of harm resulting from unauthorized. The general process of risk assessment is depicted in Figure 3-1 from [NIST 800-100]. The process begins (1) with a characterization of the system. This involves identifying the data, resources, and services, that constitute the system and determining the importance of these items to the organization. The next steps are to identify threats to (2) and vulnerabilities of (3) the data, resources, and services. Identifiable threats (e.g., disclosure, modification, or loss of data) will have some probability of occurring and causing loss or damage to a system. An analysis (4) of the threats and vulnerabilities should be conducted following a structured approach to analyze controls, estimate likelihood of threat occurrence, and assess the potential impact of the threats to arrive at a general risk determination. Risk analysis are generally and qualitative (e.g., high, medium, low). For each identifiable threat one or more controls should be recommended (5). The nominal controls in the Asia/Pacific System Security Checklist [Asia/Pac SSC] may be used as a general guide; however, additional system specific controls may also be necessary. The overall results of the risk assessment should be formally documented (6).

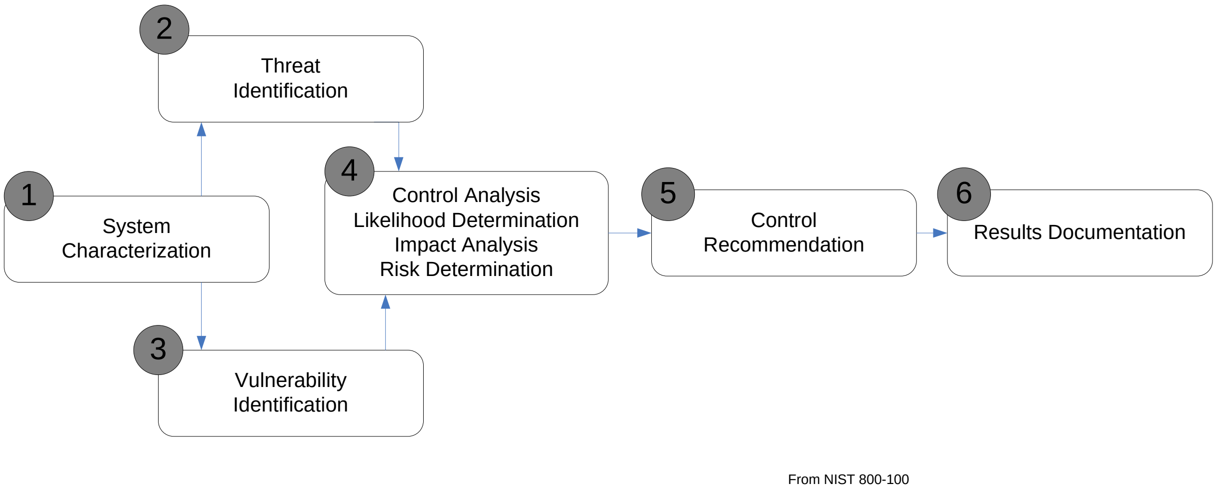


Figure 3-1. Risk Assessment Process

3.4 System and Services Acquisition (SA)

System and Services Acquisition (SA) is the control whereby an organization's management allocates the resources required to protect the system to level commensurate with the risks to the system. This activity should be applied as part of an on-going security policy for the organization. Specific resources should be allocated as a result of the CA and RA activities.

4. OPERATIONAL CONTROL GUIDANCE

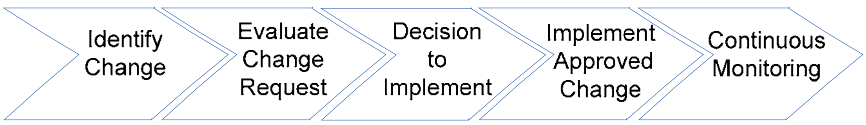
As defined in section 1.1, Operational Controls are safeguards or countermeasures for a system that are primarily implemented and executed by people.

4.1 Awareness and Training (AT)

Awareness and Training (AT) is the control for disseminating security information that management and operational personnel need to do their jobs. Awareness and Training ensures that management and operational personnel understand their security responsibilities and therefore are able to properly use and protect the system data, resources, and services.

4.2 Configuration Management (CM)

Configuration Management (CM) is the control that ensures that operational personnel control changes to their system's hardware components, software components and system adaptation parameters. Figure 4-1 depicts the Configuration Management process.



From NIST 800-100

Figure 4-1. Configuration Management Process

The first step in the process is to identify the need for the change. There can be various reasons for change such as the need to support more bandwidth on a communication channel, the need to upgrade to a new Operating System if the current is no longer supported, and general functional enhancements or corrections to the system. The change should be submitted to a decision-making body in the organization, e.g., to a Configuration Control Board (CCB).

The next step is to evaluate the change request. An impact assessment should be conducted to determine the effect of the change to the system under change or to other interrelated systems. For example a change in the routing policy could affect all systems in the network. Thus a change needs to be evaluated to determine if it is technically correct and if the gains (performance, new functionality, etc) are cost effective.

Next the CCM must make a decision to implement. The CCB may approve, deny, or otherwise defer implementation of the change.

If a decision to implement the change is made, then it should first be tested in an off-line or test environment. Once tested, the change may be placed into the operational system and the associated configuration control documentation is updated.

Configuration Management does not actually start and stop with incremental changes. Rather it is an on-going process that requires continuous monitoring. Configuration Management requires that operational personnel are always aware of their current baseline (for example a specific software release) and that the system is observed in operation to determine if there is any degradation in functional or performance capabilities as the system baseline is changed. In addition to managing software releases, application of fixes (i.e. "patches") to the system and changes in adaptation parameters must also be managed and continuously monitored.

4.3 Contingency Planning (CP)

Contingency Planning (CP) is the control that ensures that operational personnel have a plan for continued operation to maintain availability of critical user and system-level information in emergency situations. Figure 4-2 from [NIST 800-34] depicts the Contingency Planning Process.

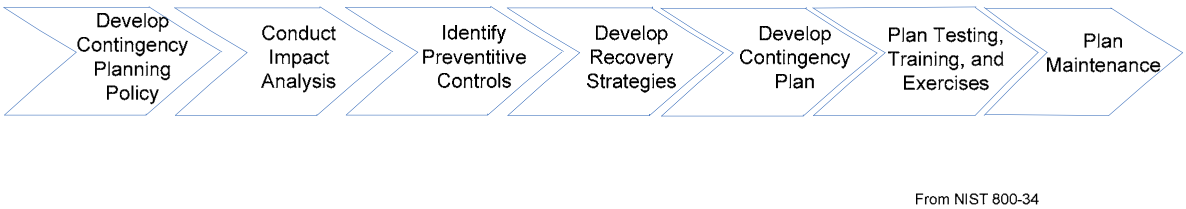


Figure 4-2. Contingency Planning Process

The organization should firstly have a policy for contingency planning that establishes the overall contingency objectives. There should be an impact analysis that evaluates the potential loss of a system or service. This may be the same as the system characterization in the Risk Assessment. The Preventive Controls are a subset of the overall CA controls which address the specific loss of systems and services. A recovery strategy should exist for each potential system/service loss. All the previous steps go into developing a formal Contingency Plan. Attachment A contains an outline for a Contingency Plan. Operational personnel should plan to test the Contingency Plan. Training should be conducted as necessary and actual exercises such as operation of backup systems should be conducted. As the system changes the contingency plan must be updated as part of a Plan Maintenance program.

4.4 Incident Response (IR)

Incident Response (IR) is the control that ensures that operational personnel handle security incidents and promptly report incidents to appropriate authorities. Figure 4-3 from [NIST 800-61] depicts the Incident Response Life Cycle.

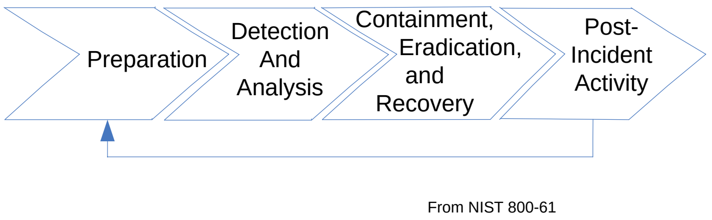


Figure 4-3. Incident Response Life Cycle

As depicted in Figure 4-3, Incident Response has several phases ranging from initial preparation through post-incident analysis which feeds back into the preparation phase. During preparation the organization selects and implements controls based on their risk assessment. The controls however cannot guarantee absolute protection and there will always be some residual risk. Therefore detection is required to alert the organization that an incident has occurred. Detection is primary through the technical controls described in section 5. When detected appropriate personnel within and external to the organization must be promptly notified. When an incident does occur, operational personnel can minimize the impact by firstly containing it before it spreads and does further damage. Measures should be taken to eradicate it as soon as possible so that recovery to normal services can be achieved. The post-incident analysis should attempt to identify the source of the incident as well as determine what additional controls can be implemented to prevent future occurrences, i.e., to apply “lessons learned” from the incident.

Attachment B contains an outline for an Incident Response Plan.

4.5 Maintenance (MA)

Maintenance (MA) is the control ensures that operational personnel perform preventative and regular maintenance on their system.

4.6 Media Protection (MP)

Media Protection (MP) is the control ensures that operational personnel restrict access to system media to authorized personnel and physically control system media in controlled areas.

4.7 Physical and Environmental Protection (PE)

Physical and Environmental Protection (PE) is the control ensures that operational personnel limit physical access to systems and protect systems against environmental hazards.

4.8 Personnel Security (PS)

Personnel Security (PS) is the control that ensures that operational personnel are trustworthy and meet security criteria for their positions.

4.9 System and Information Integrity (SI)

System and Information Integrity (SI) is the control that ensures that operational personnel remediate system flaws, provide protection from malicious code and other attacks on the system's integrity, and monitor alerts and advisories and take appropriate action in response.

5. TECHNICAL CONTROL GUIDANCE

5.1 Technical Controls

As defined in section 1.1, Technical Controls are safeguards or countermeasures that a system executes through mechanisms in the hardware or software components of the system itself. The technical controls addressed in this section are:

- AC - Access Control
- AU - Audit and Accountability
- IA - Identification and Authentication
- SC - System and Communications Protection

For the Management and Operational controls, general guidance was provided for each control. In this section Technical Controls are described in terms of the hardware or software components of the system to which they apply.

5.2 Technical Controls Applied to Information System Components

Technical Controls are best applied following a *Defense-in-Depth* strategy whereby multiple overlapping protection approaches are implemented. For the Asia/Pac ATN, this section provides guidance on the application of controls to the network, equipment, operating system, applications, and data. Figure 5-1 depicts the concept of Defense-in-Depth.

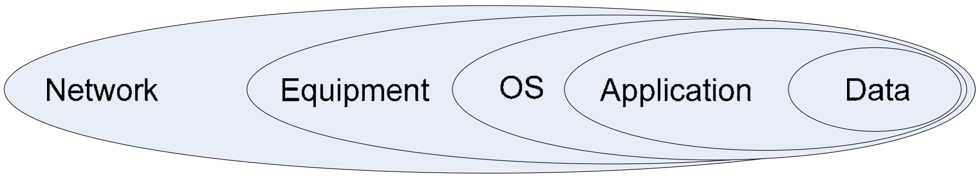


Figure 5-1: Defense-in-Depth

Figure 5-2 depicts the general technical controls applied to information system components.

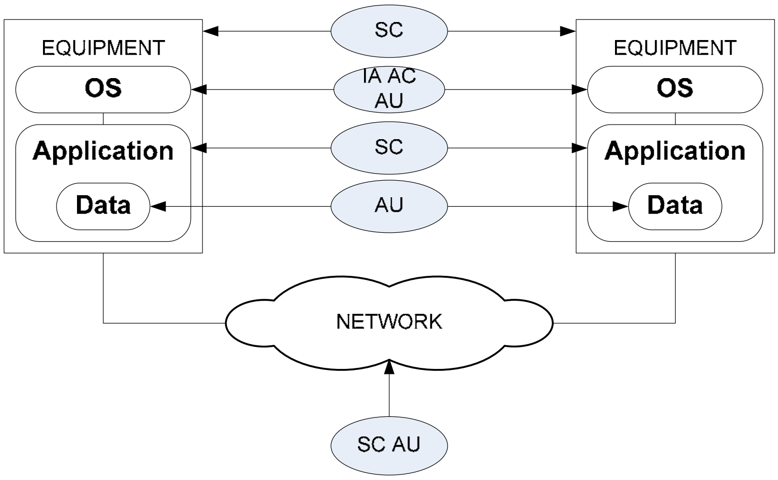


Figure 5-2: Technical Controls to ATN Component Mapping

As is depicted in Figure 5-2, the System and Communications Protection (SC) and Audit and Accountability (AU) control families apply to the Network. Note that network is used in a logical sense here so that protocol software in host systems is part of the network.

The System and Communications Protection (SC) control family also applies to equipment. This generally refers to architectural controls.

The Access Control (AC), Audit and Accountability (AU), and Identification and Authentication (IA) control families apply to the Operating System.

The Systems and Communications Protection (SC) control family applies to Applications.

The Audit and Accountability (AU) applies to Application Data.

5.2.1 Controls Applied to the Network

This section identifies network controls which may be applied in the Asia/Pac ATN in support of AMHS. Figure 5-3 provides an overview of the controls.

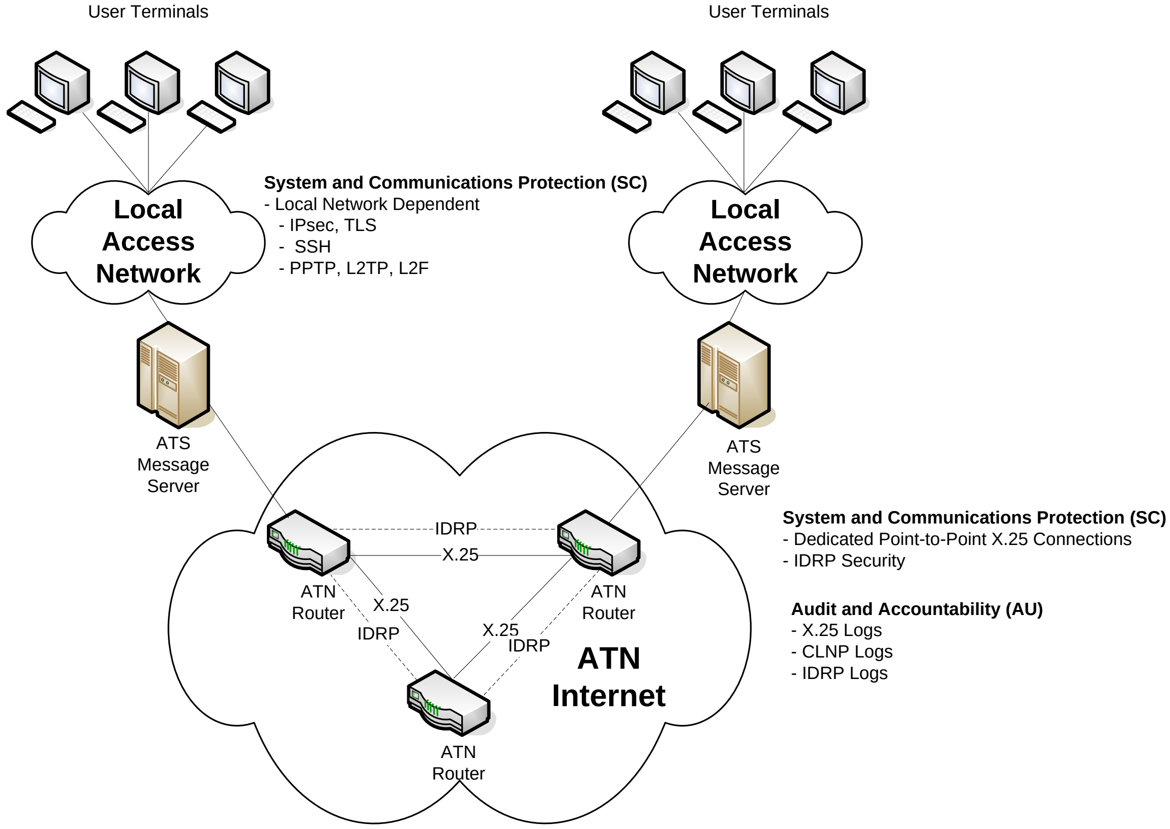


Figure 5-3: Network Controls

5.2.1.1 System and Communications Protection (SC)

5.2.1.1.1 Dedicated Point-to-Point X.25 Links

Currently interconnectivity in the Asia/Pac ATN Internet is through the use of dedicated point-to-point X.25 circuits. This limits access since X.25 circuits are associated with a specific physical port.

5.2.1.1.2 Inter-domain Routing Protocol Security

The Inter-domain Routing Protocol (IDRP) has defined options for authentication of routing data. Edition 3 of Doc 9705 defined a method of authentication using the HMAC keyed message authentication code. Edition 3 allows for two ATN routers to exchange public keys in public key certificates during the IDRP open exchange.

Rather than exchange certificates and implement a supporting Public Key Infrastructure (PKI) it is recommended that the routers derive a shared session key from a pre-shared value.

5.2.1.1.3 Local Access Network Security

The connection of User Terminal to the AMHS switching systems is a local matter. These connections may be secured in a number of ways.

One common method is to use the Secure Shell (SSH) protocol. SSH contains secure replacements for several unencrypted application protocols such as telnet, rcp, and FTP.

An alternative to SSH for HTTP type applications is to use Transport Layer Security (TLS). All major web-browsers support TLS. TLS authentication is typically one way, authenticating the client to a server.

If the local access network is an IP network then an IPsec Virtual Private Network may be used to secure Terminal to AMHS communications.

If the local access method is not a layer 3 network, then various Level 2 protocols may be used. Options include the Point-to-Point Tunneling Protocol (PPTP), the Layer 2 Tunneling Protocol (L2TP), and Layer 2 Forwarding (L2F).

5.2.1.1.4 IPsec with the IP SNDCF

In the ATN Internet of the future the Internet Protocol Subnetwork Dependent Convergence Function (IP SNDCF) may be used to interconnect ATN routers in place of X.25 links. In this case, it is recommended that the IP Security (IPsec) protocols be used. This may be with manual key establishment or dynamically using the Internet Key Exchange (IKE) protocol. IKE may be used with pre-shared keys or using public key certificates.

5.2.1.2 Audit and Accountability (AU)

5.2.1.2.1 System Logs

It is recommended that the communication logs of Asia/Pac ATN Routers be reviewed for anomalous activity. Specifically the following logs should be reviewed:

- X.25 Logs
- IDRP Logs
- Connectionless Network Protocol (CLNP) Logs

5.2.2 Controls Applied to Equipment

5.2.2.1 System and Communications Protection (SC)

5.2.2.1.1 Redundancy

Equipment may be configured redundantly to limit the effects of many attacks on systems including Denial-of-Service attacks.

5.2.3 Controls Applied to the Operating System

5.2.3.1 Identification and Authentication (IA)

5.2.3.1.1 User IDs and Passwords

System Administrators may configure the allowed users of the system. There are at least two classes of accounts which may be configured: normal system users and super-users.

5.2.3.2 Access Control (AC)

5.2.3.2.1 User Access

Once users have been identified and authenticated using IA controls, the system administrator may limit their operating environment, that is, an administrator may limit the types of transactions and functions that authorized users are permitted to exercise.

5.2.3.2.2 OS Checklists

The National Institute of Standards and Technology (NIST) maintains a Security Configuration Checklist Repository for various products and systems including all major Operating Systems. (http://checklists.nist.gov/repository/category.html)

5.2.3.3 Audit and Accountability (AU)

5.2.3.3.1 OS System Logs

The operating system logs should be reviewed on a regular basis for abnormal activity. This may be done manually or using automated tools such as TRIPWIRE.

5.2.4 Controls Applied to Applications

5.2.4.1 System and Communications Protection (SC)

5.2.4.1.1 AMHS Security

Figure 5-4 depicts AMHS Security which is applied from an originating ATS Message User Agent to a destination ATS Message User Agent.

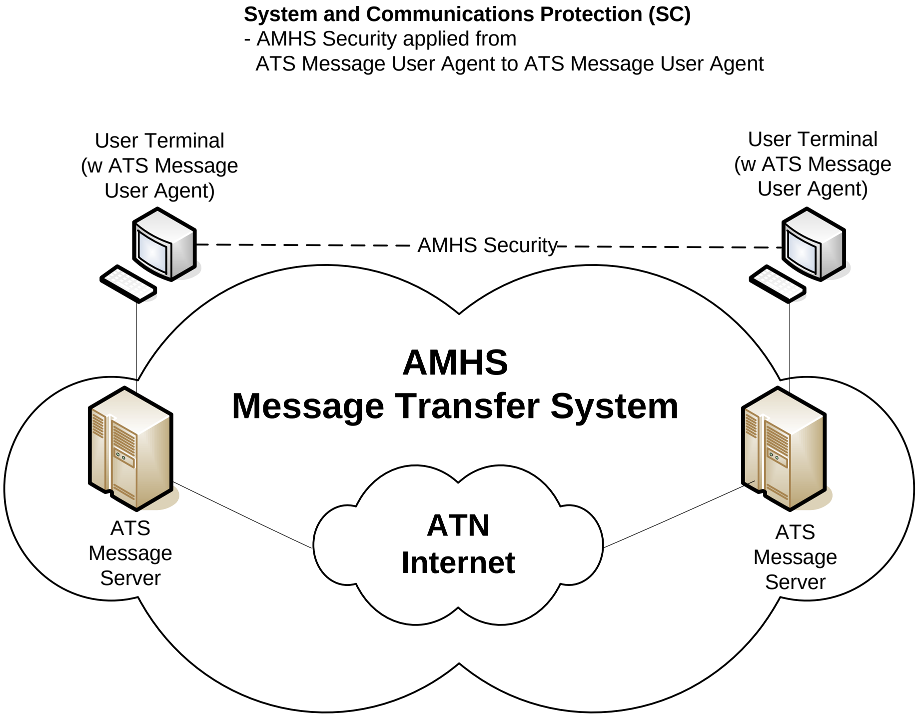


Figure 5-4: AMHS Security

AMHS security begins with the originating ATS Message User Agent digitally signing an Interpersonal Message using its Private Key. The message is sent through the ATS Message Transfer System to the recipient ATS Message User Agent. The recipient UA retrieves the Public Key of the originating UA from a public key certificate using a supporting directory service. With the originators public key the recipient UA can verity the signed message.

5.2.5 Controls Applied to Data

5.2.5.1 Audit and Accountability (AU)

5.2.5.1.1 AMHS Traffic Logging

Traffic Logging is required as part of the basic AMHS service. Specifically, Doc 9705 requires that "an AMHS Management Domain shall be responsible for long-term logging of all messages in their entirety which are originated by its direct AMHS users, for a period of at least thirty days."

6. References

[Asia/Pac SSP] ASIA/PAC Aeronautical Telecommunication Network System Security Policy, Second Edition, September 2008

[Asia/Pac SSC] ASIA/PAC Aeronautical Telecommunication Network System Security Checklist, First Edition, May 2009

[NIST 800-34] National Institute of Standards and Technology (NIST) Special Publication (SP) 800-34, "Contingency Planning Guide for Information Technology Systems"

[NIST 800-53] National Institute of Standards and Technology (NIST) Special Publication (SP) 800-53, "Recommended Security Controls for Federal Information Systems"

[NIST 800-61] National Institute of Standards and Technology (NIST) Special Publication (SP) 800-61, "Computer Security Incident Handling Guide"

[NIST 800-100] National Institute of Standards and Technology (NIST) Special Publication (SP) 800-100, "Information Security Handbook: A Guide for Managers"

ATTACHMENT A
CONTINGENCY PLAN OUTLINE

1. INTRODUCTION

1.1 Purpose

1.2 Applicability

1.3 Scope

1.4 References

[NIST 800-34]	National Institute of Standards and Technology (NIST) Special Publication (SP) 800-34, “Contingency Planning Guide for Information Technology Systems”, June 2002

2. CONCEPT OF OPERATION

2.1 System Description

2.2 Line of Succession

2.3 Responsibilities

3. NOTIFICATION/ACTIVATION

3.1 Notification Procedures

3.2 Damage Assessment

3.3 Plan Activation

4. RECOVERY

4.1 Sequence of Recovery Activities

4.2 Recovery Procedures

5. RECONSTITUTION

ATTACHMENT B
INCIDENT RESPONSE PLAN OUTLINE

1. INTRODUCTION

1.1 Purpose

1.2 Applicability

1.3 Scope

1.4 References

[CSIRT]	Carnegie Mellon Software Engineering Institute "Handbook for Computer Security Incident Response Teams (CSIRTs)", April 2003
[NIST 800-61]	National Institute of Standards and Technology (NIST) Special Publication (SP) 800-61, "Computer Security Incident Handling Guide", January 2004
[RFC 2196]	Fraser, B. Ed., "Site Security Handbook", September 1997
[RFC 2350]	Brownlee, N., and E. Guttman, "Expectations for Computer Security Incident Response", June 1998

2. Contact Information

2.1 Name of the Team 1

2.1.1 Team Member 1

Address

Time Zone

Telephone Number

Facsimile Number

Other Telecommunication

Electronic Mail Address

Public Keys and Encryption Information

Other Information

2.1.n Team Member n

2.x Name of the Team x

3. Charter

3.1 Mission Statement

3.2 Constituency

3.3 Sponsorship and/or Affiliation

3.4 Authority

4. Policies

4.1 Types of Incidents and Level of Support

4.2 Co-operation, Interaction and Disclosure of Information

4.3 Communication and Authentication

5. Services

5.1 Incident Response

5.1.1. Incident Triage

5.1.2. Incident Coordination

5.1.3. Incident Resolution

5.2 Proactive Activities

6. Incident Reporting Forms

PHASED APPROACH TESTING AND IMPLEMENTATION

To ensure an orderly test arrangement and coordinated implementation, the following phased approach is recommended:

Phase I (Initial stage: AFTN routing at MTA)

(a) MTAs of BBIS, BIS and EBIS to conduct interoperability test using the CITP with direct connected MTAs. (e.g. Hong Kong – Japan, Hong Kong – Macao);

(b) Cutover from AFTN to AMHS after successful completion of the interoperability test; and

(c) The MTA routing should follow the AFTN Routing Directory

Phase II (Intermediate stage – MTA direct routing to end BBIS)

(a) MTAs of BBIS, BIS and EBIS to conduct interoperability test with MTAs of BBIS without direct connection. The AITP is to be used. (e.g. Hong Kong – Singapore, Hong Kong –Australia, Hong Kong – India etc); and

(b) When all BBIS are up and running and interoperability test between each and every oneof them is completed, the MTAs should change from AFTN routing to direct BBIS routing. This has to be executed by changing the static routing table of AMHS and ICAO should be informed of the change so that the progress can be monitored.

Note: The following prerequisites should be ready before cutover to direct BBIS routing:

1) All States registered as an AMC user at Eurocontrol to follow AMHS address update procedures before AMC database for the Asia/Pacific Region is established;

2) Each BBIS has at least two BBIS links up and running and every BBIS is able to connect directly or indirectly with other BBIS in the region; and

3) For BBIS with inter-regional connections, alternate links should be available to cater for inter-regional link interruptions.

Phase III (Final Stage: direct MTA-to-any MTA routing within the region)

(a) Subject to traffic pattern and resources available, MTA of BIS and EBIS should schedule to conduct interoperability test among themselves using the AITP; and

(b) After successful completion of the interoperability test, the corresponding MTA pairs under test can be enhanced to direct MTA-to-any MTA routing instead of relaying through the end BBIS.

Note: Completion of Phase III would be subject to the resources available at each State. The target date may be decided by ATNICG depending on the progress.

Phase IV

(a) When IPS is ready and the AMHS within the region are able to support IPS, repeat the aforesaid interoperability tests using the IPS ATN.

(b) Transition the OSI router at BBIS to IPS first, then followed by BIS and EBIS.

4.2 A sample routing table showing the corresponding changes from AFTN routing in Phase I to direct MTA-to-any MTA routing in Phase III is given at Appendix A.

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**APPENDIX I – TERMS OF REFERENCE OF
THE ICAO INTER-REGIONAL SATCOM VOICE TASK FORCE**
(paragraph 4.3.8 of NAT SPG/46 refers)

Deliverable(s)

a) A globally applicable Guidance Material for the use of AMS(R)S voice for ATS communications.

Scope of work

The following are the broad principles describing the scope of work:

a) Take into account the NAT and any other existing guidance material related to the use of SATCOM voice for ATS communications;
b) In the spirit of the NAT SPG Conclusion 44/11 and NAT SPG/45, paragraph 2.2.4, 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) Take into account the FAA PARC CWG work on developing a performance based specification to evaluate third party SATCOM voice as an approved long range communication system (LRCS).
d) Take account of the ongoing revision of the aircraft equipment approval guidance material, e.g. by EASA and FAA; and
e) Accommodate any ICAO AMS(R)S compliant system.

The following items/scenarios should be considered in the scope of work:

a) Use of AMS(R)S voice for ATS communications via third party radio operator (No MEL relief considerations);
b) Minimum Equipment List (MEL) relief 1 HF + 1 SATCOM;
c) Use of portable SATCOM phones;
d) 1 or 2 portables or installed satellite phones and no HF radio at all; and
e) Use of SATCOM voice direct to controller communications.

Composition

Additional membership should be invited including aircraft operators, aircraft and equipment manufacturers, and satellite communications service providers.

Conduct of the work and schedule

The completion of this task requires more availability of resources than it was foreseen for the first 2 steps by the state letter EUR/NAT 10-0165.TEC. It would require a series of direct meetings among task force members in addition to teleconferences and other electronic means of communications. The ICAO Secretariat is ready to continue supporting this work but more involvement from the States will be required. The tentative completion date for this task, provided that this ToR is approved by the NAT SPG and APANPIRG and resources are made available, would be December 2011.

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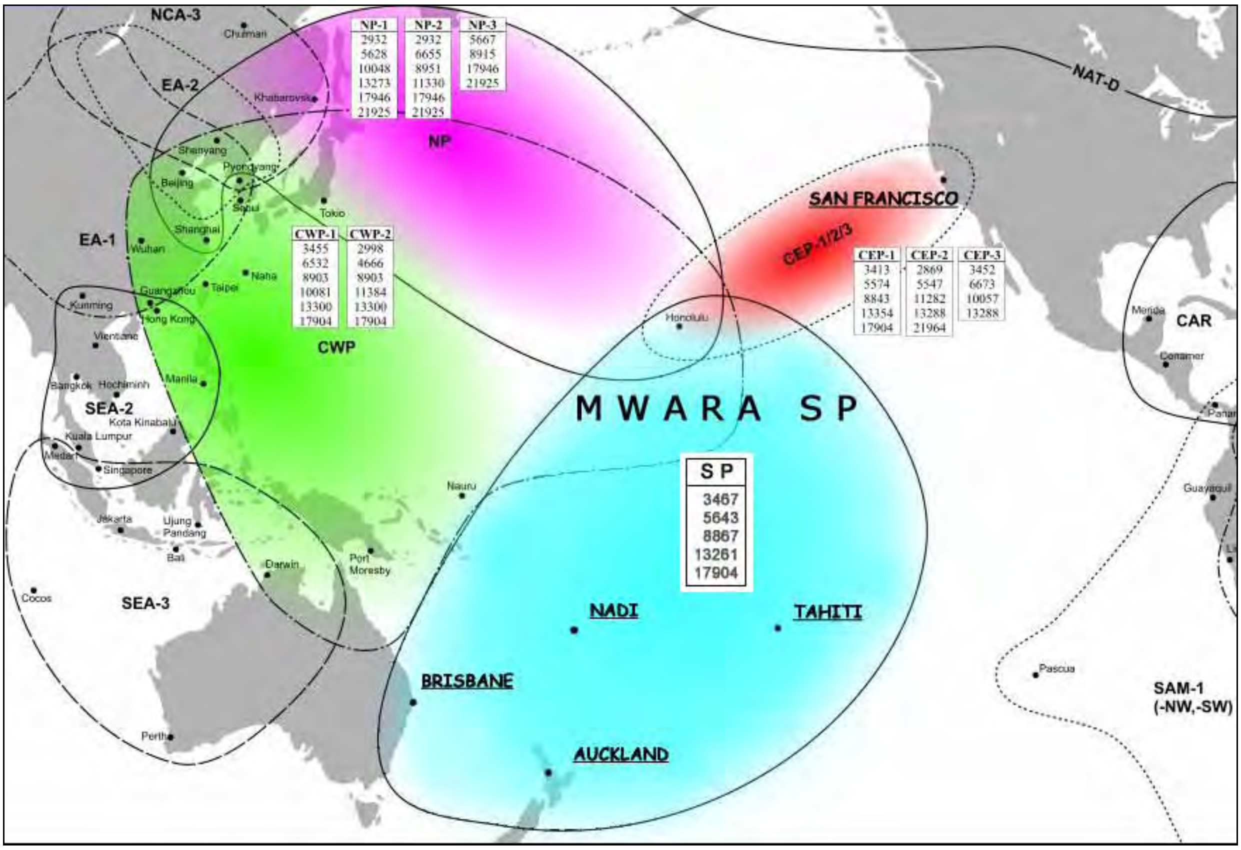
Informal South Pacific Air Traffic Services Coordinating Group		***Reference:* *ICAO APAC Regional Guidance Material GM-AMS001-Part 1***

ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP

September 2010



High Frequency Management Guidance Material For the South Pacific Region

Version 1.0 April 2010

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Table of Contents

Change Record

This chart provides records of changes to Version 0.1 and forward.

	Paragraph(s)	Explanation
.Version 0.2	Document identification	Callahan instead of Callaha
	Document identification	HF Frequency Management Guidance Materiel for the South Pacific Region instead of HF Frequency Management Guidance Materiel
	Acknowled-gements	Acknowledgement instead of thank you
	1.1.1	South Pacific instead of North Atlantic
	2.3.2	SP 6 instead of SP
	3.1.4.1.1 figure 2	Appendix instead of appendic
	3.1.4.3.1 figure 4	New map of the sectors in the NZZO FIR
	3.1.4.6.1	Selected instead of choose
	3.1.4.4.1	HF frequencies datas move to paragraph 3.1.4.3.1
	4.2.1 figure 7	New map of New Zealand FIR
	4.3.1 figure 8	New map of Nadi FIR
	5.5.1	Web link from www.ips.gov.au for SFO station
	Appendix B1	Datas from Airservices Australia Added the SATCOM SHORT CODE Nr. : 45 03 02
	Appendix B.2	Country code for New Zealand Added the SATCOM SHORT CODE Nr. : 45 12 01
	Appendix B.5	Added the SATCOM SHORT CODE Nr. : 42 27 90
.Version 0.3	3.1.4.4.1	Added RDARA **9B**
	3.1.4.51	Changed “there is no RDARA activity in the KZAK FIR”, instead of “There isn’t a RDARA network in activity in the KZAK FIR”
	Appendix B.2	Changed shift managers Robin Lee instead of Julie Wagner
.Version 0.4	Appendix B.5	Tahiti Control instead of Tahiti Radio
.Version 0.5	3.1.5	Added Brisbane Volmet station
.Version 1.0	Appendix B.4	Corrections on frequencies , stations and duty manager

Acknowledgements

The HF working group would like to acknowledge the OACI bureau of Paris and M. Cabral from the North Atlantic Systems Planning Group - Aeronautical Communications Group which accept that we re use part of the HF propagation theory published in the ICAO document NAT Doc 003 "*High Frequency Management Guidance Material For the North Atlantic Region*" and Mr. Hristo Hirvonen who autorize them to use his map of the SP MWARA in the first page of the document.

Preface

This Document is published by the Informal South Pacific ATS Co-ordination Group, and managed by the High Frequency Working Group, and is for guidance. Regulatory material relating to South Pacific communications procedures is contained in relevant ICAO Documents and Annexes. Annex 10 – Volume II, ITU Radio Regulations, Regional Supplementary Procedures (Doc. 7030), FASID, NAT OPS Manual, State AIP and current NOTAM's, which should be read in conjunction with the guidance material contained in this document.

To assist with the editing of this document and to ensure the currency and accuracy of future editions, comments and suggestions for possible amendments should be sent to the editor, to the contact information included in the document identification section.

List of Acronyms

ACARS	Aircraft Communication Addressing and Reporting System
ACC	Area Control Centre
ACG	Aeronautical Communications Group
ACID	Aircraft Identification
AIP	Aeronautical Information Publication
AFTN	Aeronautical Fixed Telecommunication Network
AMS	Aeronautical Mobile Service
ARINC	Aeronautical Radio INC.
ARP	Air Report Message
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSMP	Air Traffic Services Message Processor
ATSU	Air Traffic Services Unit
CAA	Civil Aviation Authority
CNS	Communications, Navigation and Surveillance
EMG	Emergency Message
FAP	Frequency Allotment Plan
FDPS	Flight Data Processing System
FIR	Flight Information Region
FMC	Flight Management Computer
FMS	Flight Management System
GP	General Purpose
GPS	Global Positioning System
HF	High Frequency (3 to 30 MHz)
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
ISPACG	Informal South Pacific ATS Coordinating Group
ITU	International Telecommunications Union
LDOC	Long Distance Operations Control
kHz	Kilohertz
LF	Low Frequency (30 to 300 kHz)
LUF	Lowest Usable Frequency
MET	Meteorological
MF	Medium Frequency (300 to 3000 kHz)
MHz	Megahertz
MUF	Maximum Usable Frequency
MWAR	Major World Air Route
MWARA	Major World Air Route Area
NAT	North Atlantic
NAT SPG	North Atlantic Systems Planning Group
NOTAM	Notice to Airmen
OCA	Oceanic Control Area
POS	ICAO Position Report Message
RDAR	Regional and Domestic Air Routes

RDARA	Regional and Domestic Air Route Area
R/T	Radio-Telephony
SARPS	Standards and Recommended Practices
SEAC - PF	Service d'Etat de l'Aviation Civile en Polynésie Française
SELCAL	Selective Calling System
SP	South Pacific
VHF	Very High Frequency (30 to 300 MHz)
VLF	Very Low Frequency (3 to 30 kHz)
WP	Waypoint Position
WPR	Waypoint Position Reporting

1 Introduction

1.1 Purpose of the document

1.1.1 The purpose of this document is to provide a guidance methodology for the utilisation of the Families and Frequencies employed by the Aeronautical Communication Stations on the South Pacific, to support a better management plan of the available families, frequencies and human resources, in order to increase the efficiency and capacity of the Communications Network.

1.1.2 It will also include information about HF frequencies for air-ground communications. In addition, it will contain contact information for Aeronautical Stations.

2 Operational concept

2.1 Overview

2.1.1 The Aeronautical Mobile Service is a service reserved for air-ground communications related with the safety and regularity of flights, flying primarily along national or international civil air routes.

2.1.2 In areas like the South Pacific, where VHF coverage is insufficient due to range limitation to cover all portions of the routes flown, the use of HF frequencies are necessary because they provide long range communications coverage, not only for air-ground voice communications, but also for the broadcast of ATS or Meteo information.

2.1.3 For various reasons, some technical, others economical, environmental, physical, natural, etc., coverage of a wide area by a single station with equipment located in a single place are impractical.

2.1.4 Taking these factors into account, the most practical option is to employ a number of stations sharing a range of frequencies and working as a network to provide the facilities and services required for the AMS.

2.1.5 To work as a network the AMS should follow appropriate principles of operation, in order to achieve the highest possible level of capacity and efficiency, otherwise, its purpose will not be achieved and the safety and regularity of flights will be affected.

2.2 HF medium characteristics

2.2.1 This section presents only a short description on the HF medium characteristics, a more detail description can be found in Appendix A.

2.2.2 As a general rule, radio signals travel in straight lines, that is, they follow great circle paths over the surface of the earth. Under certain circumstances, however, the path of a signal may change direction; this change of direction is called refraction. Refraction examples are coastal, atmospheric and ionospheric, and the amount of refraction varies considerably, depending on certain conditions. Those conditions could be a change in direction when a signal crosses a coastline (coastal refraction), a change in direction due to a variation in temperature, pressure and humidity, particularly at low altitude (atmospheric refraction), or a change in direction when the radio wave passes through an ionised layer (ionospheric refraction).

2.2.3 The ionosphere is still under investigation but it is known that several definite ionised layers exist within it. During daytime hours there are four main ionisation layers designated D, E, F_1 and F_2 in ascending order of height. At night, when the sun's radiation is absent, ionisation still persists but it is less intense, and fewer layers are found (D and F layers). Factors that affect the ionosphere layers is strength of the sun's radiation, since it varies with latitude causing that the structure of the ionosphere varies widely over the earth's surface, and the state of the sun, since sunspots affect the amount of ultra-violet radiation.

2.2.3.1 Maximum Usable Frequency (MUF) at night is much less than by day, because the intensity of ionisation in the layer is less so than lower frequencies have to be used to produce the same amount of refractive bending and give the same critical angle and skip distance as by day. However, the signal attenuation in the ionosphere is also much less at night so the lower frequency needed is still usable. Hence the night frequency for a given path is about half of the day frequency, and shorter distances can be worked at night than by day while still using a single reflection from the F layer.

2.2.3.2 The MUF not only varies with path length and between day and night, but also with season, meteor trails, sunspot state, and sudden ionospheric disturbances produced by eruptions on the sun. Because of the variations of MUF, HF transmitting stations have to use frequencies varying widely between about 2 and 20 MHz.

2.2.4 As consequence of this conditions, frequency band usage can be viewed in the following table:

Areas	Bands between: (MHz)	Sharing conditions
MWARA area	3 and 6.6	Night propagation
	9 and 11.3	Day propagation
	Higher than 13	Day propagation

Table 1: Frequency band usage (ref. ITU Appendix 27 Aer2)

2.3 Radiotelephony Network

2.3.1 Definition

2.3.1.1 A radiotelephony network is defined as a group of radiotelephony aeronautical stations which operate on and guard frequencies from the same family and which support each other in a defined manner to ensure maximum dependability of air-ground communications and dissemination of air-ground traffic

2.3.2 SP 6 Radiotelephony Network Composition

2.3.2.1 In the South Pacific 6 network there are five aeronautical stations, one per each of the Oceanic FIR's, responsible for the provision of air-ground communications as part of the Aeronautical Mobile Service.
They are:
Brisbane Radio (Australia, Brisbane ACC),
Auckland Radio (New Zealand, Auckland OACC),
Nadi Radio (Fiji, Nadi ACC),
San Francisco Radio (USA, Oackland OACC) and
Tahiti Radio (French Polynesia, Tahiti OACC).

2.3.2.2 To support the air-ground communications of the AMS in the South Pacific 6 network, five frequencies were allocated by the ITU (Appendix 27 Aer2), in different bands to ensure SP MWARA, continuous coverage.

2.3.2.3 To separate International and Domestics (Regionals) flights some states use their own RDARA network. (defined in paragraph 3.1.4)

2.3.3 Principles of Network Operation

2.3.3.1 The aeronautical stations of a radiotelephony network should assist each other in order to provide the air-ground communication service required of the network by aircraft flying on the air routes for which the network is responsible.

2.3.3.2 When the network comprises a large number of stations, network communications for flights on any individual route segment should be provided by selected stations, termed "regular stations" for that segment. In principle, the regular station will be those serving the locations immediately concerned with flights on that route segment, i.e. points of take-off and landing and appropriate flight information centres or area control centres.

2.3.3.3 In areas or on routes where radio conditions, length of flights or distance between aeronautical stations require additional measures to ensure continuity of air-ground communications throughout the route segment, the regular stations should share between them a responsibility of primary guard whereby each station will provide the primary guard for that portion of the flight during which the messages from the aircraft can be handled most effectively by that station.

2.3.3.4 During its tenure of primary guard, each regular station should, among other things:

a) be responsible for designating suitable primary and secondary frequencies for its communications with the aircraft;
b) receive all position reports and handle other messages from and to the aircraft essential to the safe conduct of the flight;
c) be responsible for the action required in case of failure of communication.

2.3.4 Frequencies to be used

2.3.4.1 Aircraft stations shall operate on the appropriate radio frequencies.

2.3.4.2 The air-ground radio station shall designate the frequency(ies) to be used under normal conditions by aircraft stations operating under its control.

2.3.4.3 In network operation, the initial designation of primary and secondary frequencies should be made by the network station with which the aircraft makes pre-flight check or its initial contact after take-off. This station should also ensure that other network stations are advised, as required, of the frequency(ies) designated.

2.3.4.4 An aeronautical station when designating frequencies, should take into account the appropriate propagation data and distance over which communications are required.

2.3.4.5 If a frequency designated by an aeronautical station proves to be unsuitable, the aircraft station should suggest an alternative frequency.

2.3.5 Establishment of communications

2.3.5.1 Aircraft stations shall, if possible, communicate directly with the air-ground control radio station appropriate to the area in which the aircraft are flying. If unable to do so, aircraft stations shall use any relay means available and appropriate to transmit messages to the air-ground control radio station.

2.3.5.2 When normal communications from an aeronautical station to an aircraft station cannot be established, the aeronautical station shall use any relay means available and appropriate to transmit messages to the aircraft station. If these efforts fail, the originator shall be advised.

2.3.5.3 When, in network operation, communication between an aircraft station and a regular station has not been established after calls on the primary and secondary frequencies, aid should be rendered by one of the other regular stations for that flight, either by calling the attention of the station first called or, in case of a call made by an aircraft station, by answering the call and taking the traffic.

2.3.5.4 Other stations of the network should render assistance by taking similar action only if attempts to establish communication by the regular stations have proved unsuccessful.

2.3.6 Transfer of communications

2.3.6.1 The transfer of primary guard from one station to the next will normally take place at the time of the traversing of flight information region or control area boundaries, this guard being provided at any time, as far as possible, by the station serving the flight information centre or area control centre in whose area the aircraft is flying.

2.3.6.2 An aircraft station should be advised by the appropriate aeronautical station to transfer from one radio frequency or network to another. In the absence of such advice, the aircraft station should notify the appropriate aeronautical station before such transfer takes place.

2.3.6.3 In the case of transfer from one network to another, the transfer should preferably take place while the aircraft is in communication with a station operating in both networks to ensure continuity of communications. If, however, the change of network must take place concurrently with the transfer of communication to another network station, the transfer should be co-ordinated by the two network stations prior to advising or authorizing the frequency change. The aircraft should also be advised of the primary and secondary frequencies to be used after the transfer.

2.3.7 Communications failure

2.3.7.1 When an aircraft station fails to establish contact with the aeronautical station on the designated frequency, it shall attempt to establish contact on another frequency appropriate to the route. If this attempt fails, the aircraft station shall attempt to establish communication with other aircraft or other aeronautical stations on frequencies appropriate to the route. In addition, an aircraft operating within a network shall monitor the appropriate VHF frequency for calls from nearby aircraft.

2.3.7.2 When an aeronautical station has been unable to establish contact with an aircraft station after calls on the frequencies on which the aircraft is believed to be listening, it shall:

a) Request other aeronautical stations to render assistance by calling the aircraft and relaying traffic, if necessary;
b) Request aircraft on the route to attempt to establish communication with the aircraft and relay traffic, if necessary.

2.3.7.3 The air-ground control radio station shall notify the appropriate air traffic services unit and the aircraft operating agency, as soon as possible, of any failure in air-ground communications.

2.4 SELCAL operation

2.4.1 With the selective calling system known as SELCAL, the voice call is replaced by the transmission of coded tones to the aircraft over the radiotelephony channels. A single selective call consists of a combination of four pre-selected audio tones whose transmission requires approximately two seconds. The tones are generated in the aeronautical station coder and are received by a decoder connected to the audio output of the airborne receiver. Receipt of the assigned tone code activates a cockpit call system in the form of light and/or chime signals.

3 SP6 Frequencies Allotment Plan

3.1 Frequency Allotment Plan for the Aeronautical Mobile Service (AMS)

3.1.1 The frequencies allocated for use in the South Pacific, are based on the Frequency Allotment Plan, for the MWARA - SP as defined on the "Appendix 27 Aer2 to the Radio Regulations – Frequency Allotment Plan for the Aeronautical Mobile (R) Service and Related Information".

3.1.2 Major World Air Route Area – South Pacific (MWARA - SP)

3.1.2.1 The MWARA - SP is an area defined as the area from the from the South Pole through the points 38° S 145° E, 00° 167° E, 00° 175° W, 22° N 158° W, 22° N 156° W, 00° 120° W to the South Pole, and can be viewed on Figure **1** (Ref. ITU Appendix 27 Aer2).

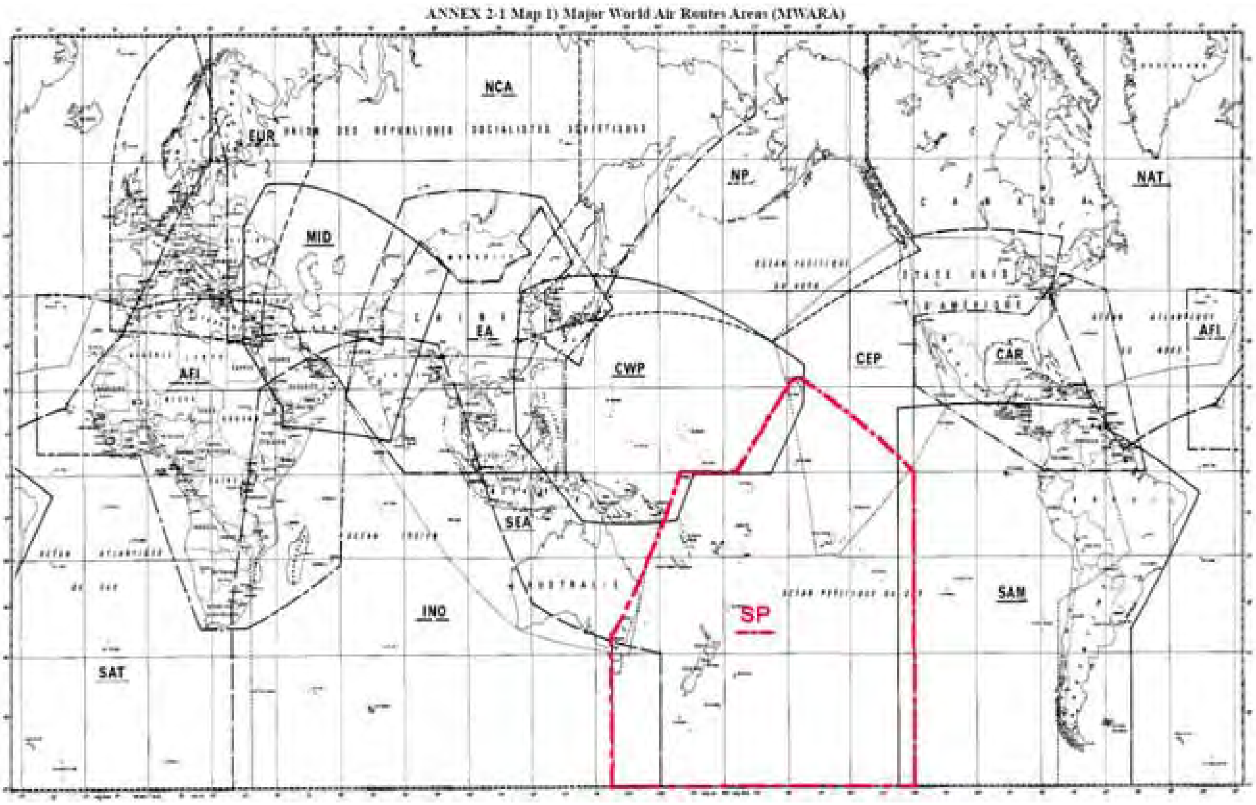

Figure 1 : MWARA – SP (Ref. ITU Appendix 27 Aer2)

3.1.3 MWARA – SP Frequencies

3.1.3.1 The frequencies allocated to the MWARA – SP includes a number of frequencies in a range of bands designed to provide twenty-four hour area coverage and are contained in Table **2**.

Area	Frequency Bands								
	3.5 kHz	**4.7 kHz**	**5.6 kHz**	**6.6 kHz**	**9 kHz**	**10 kHz**	**11.3 kHz**	**13.3 kHz**	**18 kHz**
SP	3467		5559 5643		8867	10084	11327	13300	17904

- Frequency 3467 shared with MWARAs AFI, MID ,RDARAs 10B and 13D
- Frequency 5559 shared with RDARAs 2A, 4A, 6G, 10E, 12G and 13J
- Frequency 5643 shared with RDARA 3C
- Frequency 8867 shared with RDARAs 6G, 10C, 13D and 13M
- Frequency 10084 shared with MWARA EUR , RDARAs 6E and 13D
- Frequency 11327 shared with RDARA 3B , 5 and 13C
- Frequency 13300 shared with MWARAs CEP, CWP, NP and RDARA 4
- Frequency 17904 shared with MWARAs CEP, CWP, NP and RDARA 4

Table 2 : Frequency bands of the MWARA – SP (Ref. ITU Appendix 27 Aer2)

3.1.3.2 The **SP 6 NETWORK** uses **13261 kHz** instead of **13300 kHz**. This change was endorsed by ICAO in 1987 (refer ASIA/PAC FASID Doc 9673, 2001 Appendix Chart CNS4). The ITU-R Radio Regulations AP27/213 (WRC 2000) will be updated to reflect this change.

3.1.3.3 The **SP 6 NETWORK** use the following frequencies in kHz :

3467	**5643**	**8867**	**13261**	**17904**

Table 3 : HF Frequencies SP6 NETWORK (in KHz)

3.1.4 RDARA networks in the South Pacific area

3.1.4.1 THE APPENDIX 27 (REV. WRC-03) FROM THE ITU RR :

3.1.4.1.1 The ITU gives the definition of the South Pacific's RDARA 9.

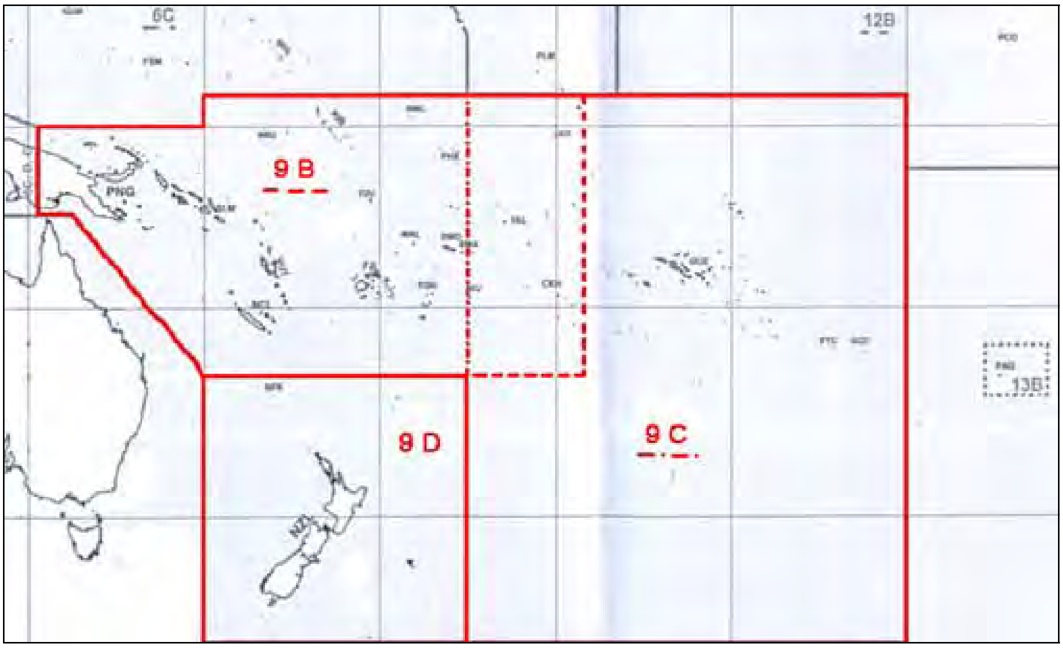

Figure 2 : RDARA Map - South Pacific (Appendix S27 ITU RR)

3.1.4.1.2 Regional and Domestic Air Route Area – 9 (RDARA-9)

From the South Pole along the 160° E meridian to 27° S. Then through the points 19° S 153° E, 10° S 145° E, 10° S 141° E, 00° 141° E, 00° 160° E, 03° 30' N 160° E, 03° 30' N 120° W. Then along the 120° W meridian to the South Pole.

3.1.4.1.3 Sub-Area 9B

From the point 00° 141° E through points 10° S 141° E, 10° S 145° E, 27° S 160° E, 27° S 157° W, 03° 30' N 157° W, 03° 30' N 160° E, 00° 160° E to the point 00° 141° E.

3.1.4.1.4 Sub-Area 9C

From the South Pole along the 170° W meridian to 03° 30' N. Then through the point 03° 30' N 120° W and along the 120° W meridian to the South Pole.

3.1.4.1.5 Sub-Area 9D

From the South Pole along the 160° E meridian to 27° S. Then through the point 27° S 170° W and along the 170° W meridian to the South Pole.

3.1.4.2 BRISBANE FIR (YBBB) :

3.1.4.2.1 The Australian RDARA network area n°14 is divided in three sub-area with 3 frequencies (in KHz) in use for each.

Sub-area 14C: NORTHWEST
coordinates: From the South Pole along the 110° E meridian to 19° S. Then through the points 19° S 118° E, 24° S 120° E, 24° S 137° E, 34° S 151° E, 34° S 160° E . Then along the 160° E meridian to the South Pole

3452	**6541**	**8843**

Sub-area 14B: NORTHEAST
coordinates: From the point 19° S 110° E to the point 10° S 110° E, 10° S 139° E, 16° S 139° E, 16° S 137° E, 24° S 137° E, , 24° S 120° E, 19° S 118° E to the point 19° S 110° E.

3452	**6610**	**8831**

Sub-area 14A: SOUTHERN
coordinates :From the point 24° S 137° E, 16° S 137° E, 16° S 139° E, 10° S 139° E, 10° S 145° E to the point 27° S 160° E, 34° S 160° E to the point 24° S 137° E.

3461	**6565**	**8822**

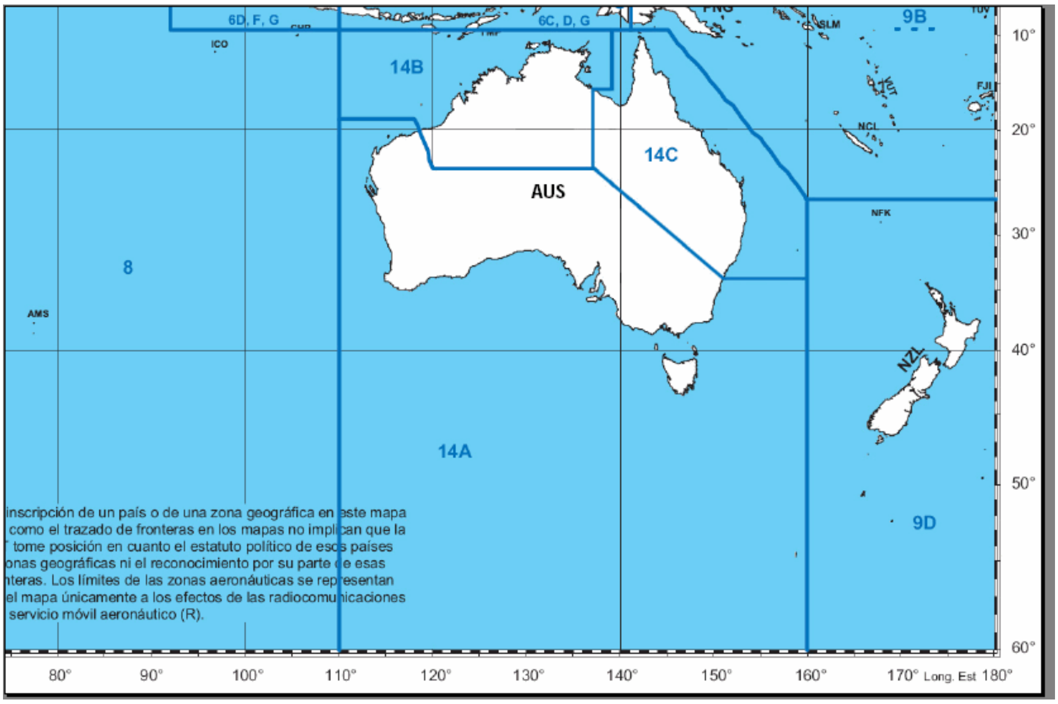

Figure 3 : Australian RDARA network

3.1.4.3 AUCKLAND FIR (NZZO):

3.1.4.3.1 New Zealand authorities don't implement a RDARA network in the NZZO FIR. However the following airports use HF frequencies from the RDARA 9B:

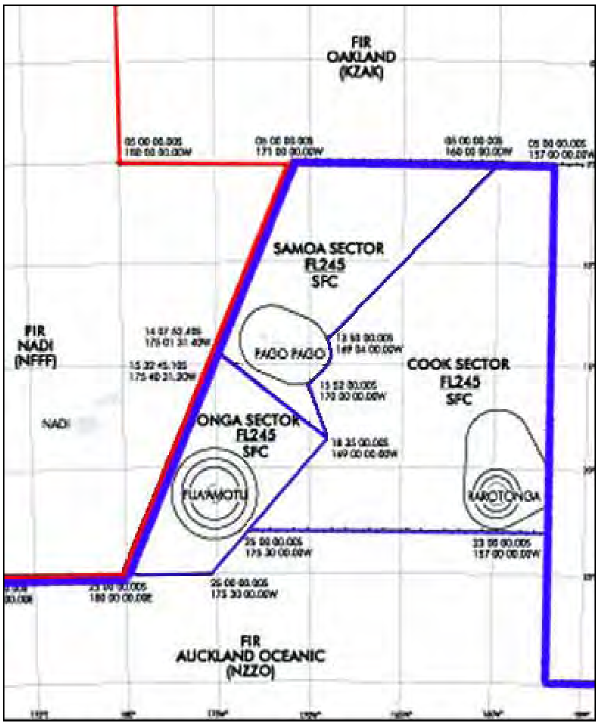

Figure 4 : Sectors in the NZZO FIR

- **<u>Rarotonga (Cook sector) :</u>**

3425	**6553**	**8846**	**11339**

- **<u>Niue :</u>**

6553	**8846**

- **<u>Faleolo (Samoa sector):</u>**

3425	**6553**	**8846**	**11339**

- **<u>Fua'amotu (Tonga sector):</u>**

3425	**6553**	**8846**	**11339**

3.1.4.4 NADI FIR (NFFF):

3.1.4.4.1 The following RDARA network (9B) is operational in the Nadi FIR.(see map chap 4.3.1)

- **Nadi :**

3425	**6553**	**8846**	**11339**

- **Funafuti:**

6553	**8846**	**11339**

3.1.4.5 OACKLAND FIR (KZAK):

3.1.4.5.1 There is no RDARA activity in the KZAK FIR.

3.1.4.6 TAHITI FIR (NTTT):

3.1.4.6.1 The French civil Aviation in the French Polynesia (SEAC-PF) will create a RDARA network with 3 HF frequencies in 2009. The frequencies are selected in RDARA 9C network from the ITU.

This future network will use the following frequencies (in KHz):

5481	**8873**	**11312 or 11279**

3.1.5 VOLMET Stations in the South Pacific.

VOLMET Stations broadcast meteorological bulletins in following HF frequencies (kHz):

3.1.5.1 Auckland VOLMET Station :

6679	**8828**	**13282**

3.1.5.2 Brisbane VOLMET Station :

6676	**11387**

3.2 Frequency allocation principles

3.2.1 Taking into account the characteristics of the HF medium, the general principles for frequency assignment used by radio station personnel is as outlined in 2.2.4 and contained in Table **4**.

Bands between: (MHz)	Sharing conditions
3 and 6.6	Night propagation
9 and 11.3	Day propagation
Higher than 13	Day propagation

Table 4 : General principles for frequency assigment

3.2.2 As a general rule, when assigning primary and secondary frequencies, radio station personnel should assign lower frequencies as primary and higher frequencies as secondary for aircraft flying away from the Station. Conversely, for aircraft routing towards the station, the higher frequencies should be assigned as primary and lower frequencies as secondary.

3.2.3 In circumstances were sunspot or solar flare activity is expected to affect propagation conditions, the radio station personnel should always inform the flight crews and in addition to assigning the primary and secondary frequencies, they should advise the highest frequencies in use at the station as a precautionary measure.

3.2.4 In accordance with the principles governing transfer of communications as defined in paragraph 2.3.6, stations sharing a common boundary should, whenever possible, assign common frequencies for the transfer of communications.

3.2.5 Aircraft routing along common boundaries, or flying a route or portion of a route within 60 NM of a common boundary, should be assigned frequencies common to the stations sharing those boundaries.

4 FIR coordinates and maps

4.1 BRISBANE FIR

4.1.1 The Brisbane FIR is an area from the South Pole through the points 38° S 145° E, 25°S 155° E 21° 163° E 00° 167° E, 00° 175° W, 22° N 158° W, 22° N 156° W, 00° 120° W to the South Pole.

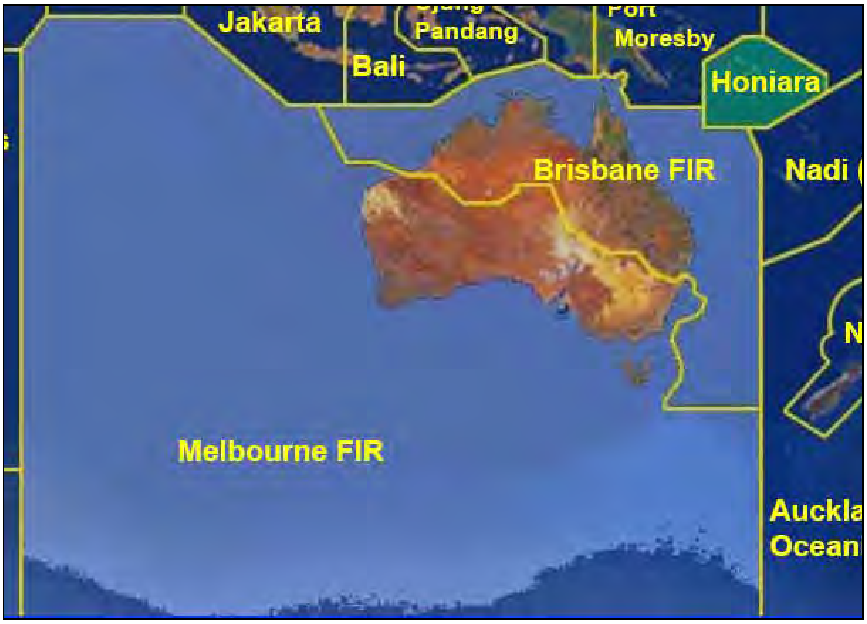

Figure 5 : Map of Australian's FIR

4.1.2 The SP6 Network area is a part of the Brisbane FIR. The coordinates of this area are :

<u>Lateral limits :</u>
44 33 57S - 150 00 00E ; 45 00 00S -150 00 00E
45 00 00S - 163 00 00E ; 21 22 50S -163 00 00E
24 49 40S - 153 56 22E ; 24 59 04S -154 00 31E
then along the minor arc of a circle of 150.00 NM radius centred on 27 21 57S -153 08 21E (BN/DME) to 29 49 13S -153 42 58E
30 40 20S -153 08 21E ; 32 53 01S -152 26 31E
33 30 06S -151 54 31E;
then along the minor arc of a circle of 45.00 NM radius centred on 33 56 34S -151 10 51E (SY/DME) to 34 28 18S -151 49 23E
35 18 59S -152 55 50E;
then along the minor arc of a circle of 120.00 NM radius centred on 34 57 00S -150 32 00E (NWA/TAC) to 36 56 43S -150 45 03E
38 11 19S -150 19 14E ; 43 00 00S -151 00 00E
43 51 03S -150 39 53E ; 44 33 57S -150 00 00E

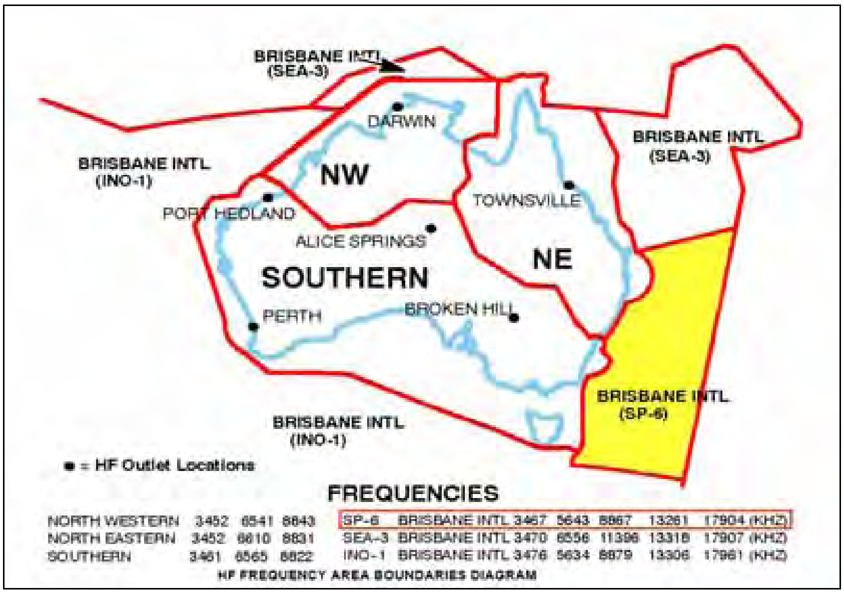

Figure 6 : Map of Australia - HF Frequencies Areas

4.2 AUCKLAND FIR

4.2.1 The Auckland Oceanic FIR is that airspace bounded on the west by meridian 16300E, on the east by meridian 13100W, and extending south to the South Pole, and on the north by a line joining 3000S 16300E, 2800S 16800E, 2500S 17125E, 2500S 18000E, 153245.1S 1754031.2W, 0500S 17100W, 0500S 15700W, 3000S 15700W, 3000S 13100W from surface to FL999 and excluding the New Zealand (Domestic) FIR

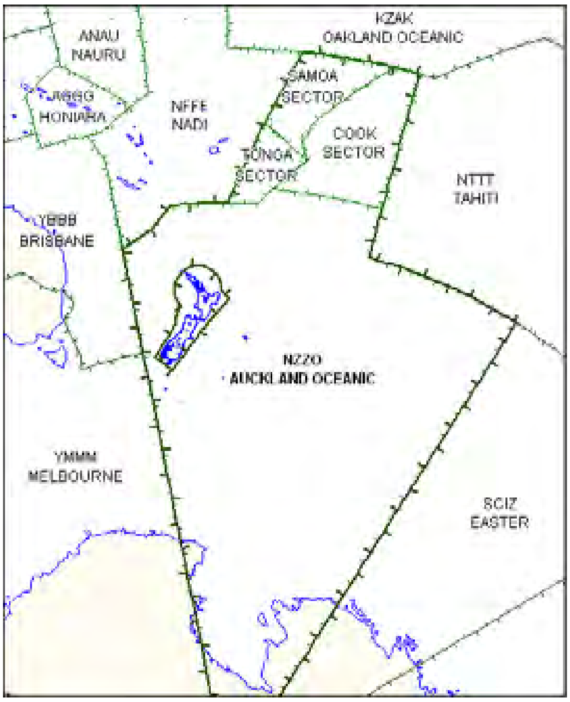

Figure 7 : map of the Auckland Oceancic FIR

4.3 NADI FIR

4.3.1 The coordinates of the Nadi FIR are shown in the table 5 :

Name	Horizontal imits	Vertical limits
Nadi Flight Information Region	N 03 30.0 - E 170 00.0 – N 03 30.0 - E 180 00.0 – S 05 00.0 - W 180 00.0 – S 05 00.0 - W 171 00.0 – S 25 00.0 - E 180 00.0 – S 25 00.0 - E 171 25.0 – S 28 00.0 - E 168 00.0 – S 30 00.0 - E 163 00.0 – S 17 40.0 - E 163 00.0 – S 14 00.0 - E 161 15.0 – S 14 00.0 - E 163 00.0 – S 10 00.0 - E 170 00.0 – N 03 30.0 - E 170 00.0	Surface to 9500 ft and above FL460
New Caledonia Sector	S 14 00.0 - E 165 15.0 – S 14 00.0 - E 163 00.0 – S 21 00.0 - E 170 30.0 – S 24 00.0 - E 170 30.0 – S 24 00.0 - E 163 00.0 – S 17 40.0 - E 163 00.0 – S 14 00.0 – E 163 00.0	Surface to FL245
Xport Vila Sector	S 14 00.0 - E 163 00.0 – S 13 00.0 - E 164 50.0 – S 13 00.0 - E 170 30.0 – S 21 00.0 - E 170 30.0 – S 14 00.0 - E 163 00.0	Surface to FL245
Vanua Sector	S 16 00.0 - E 176 40.0 – S 16 00.0 - E 178 10.0 – S 16 00.0 - W 178 00.0 – S19 20.0 - W 178 00.0 – S 19 20.0 - E 178 10.0 – S 19 20.0 - E 176 40.0 – S 16 00.0 - E 176 40.0	West pf E 178 10.0 outside Nadi CTR Surface to 5500ft East of E 178 10.0 outside Naurosi CTR Surface to 9500ft

Table 5 : Nadi FIR coordinates

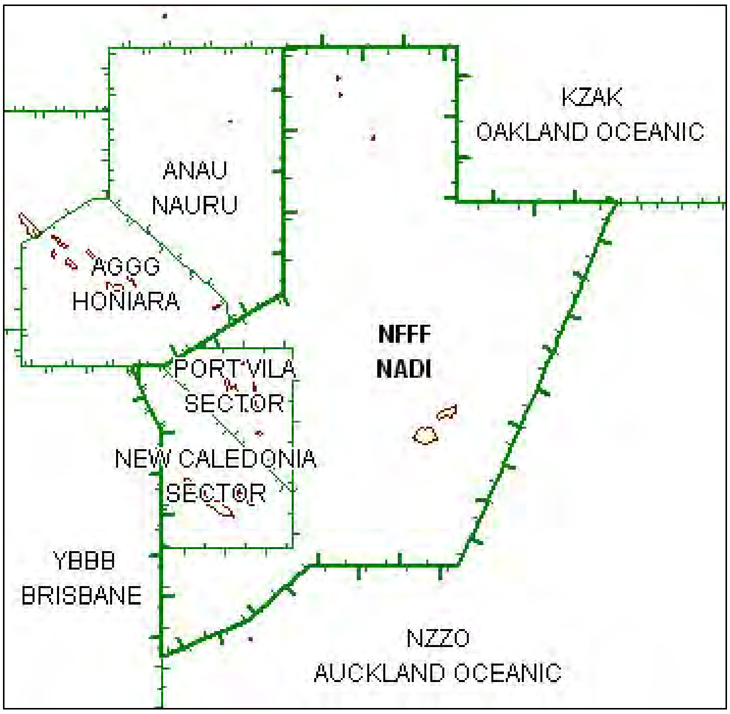

Figure 8 : Map of the NADI FIR

4.4 OAKLAND FIR

4.4.1 The coordinates of the OAKLAND FIR are:

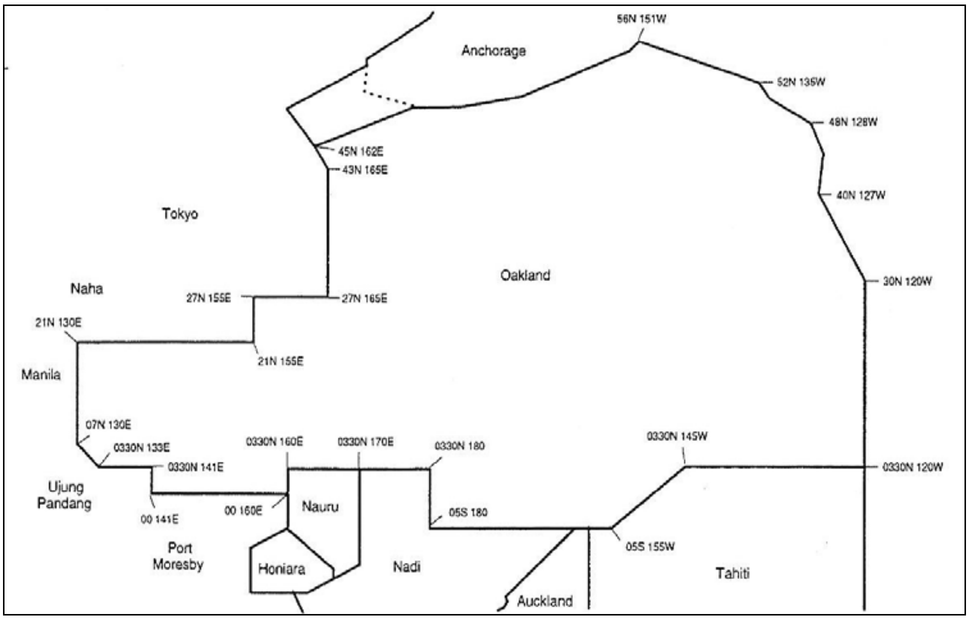

Figure 9 : Oakland FIR map with coordinates

4.4.2 The HF SP6 network is use in the sectors OC3 and OC4 from the Oakland FIR

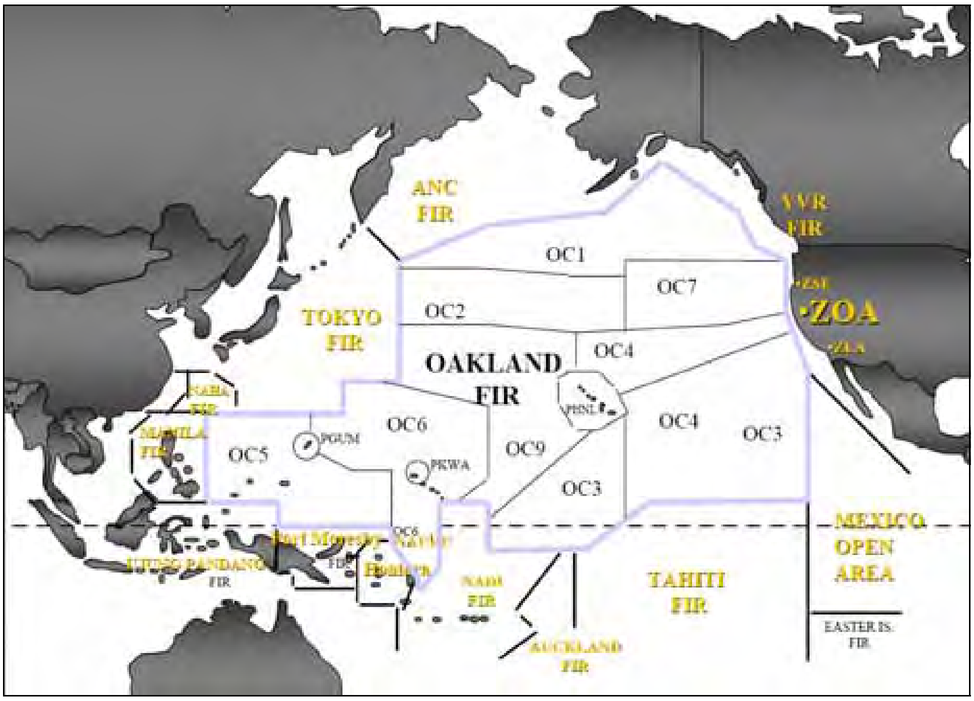

Figure 10 : Map of the OAKLAND FIR

4.5 TAHITI FIR

4.5.1 The TAHITI FIR's coordinates are:

03 30 00 N . 120 00 00 W – 30 00 00 S .120 00 00 W – 30 00 00 S . 157 00 00 W – 5 00 00 S . 157 00 00 W – 5 00 00 S . 155 00 00 W – 03 30 00 N . 145 00 00 W .

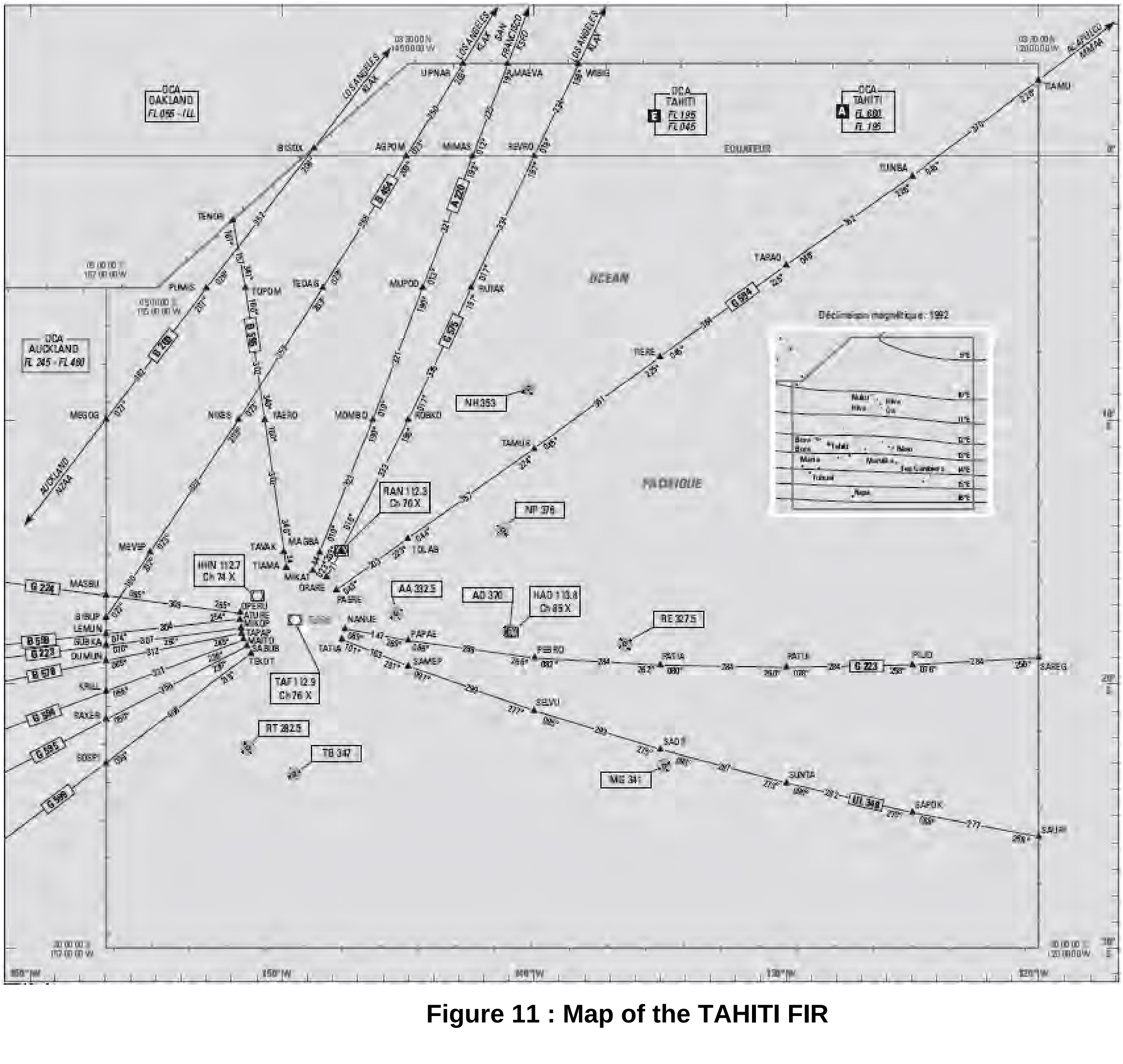

Figure 11 : Map of the TAHITI FIR

5 HF propagation prediction

5.1 AUSTRALIAN SPACE WEATHER AGENCY

5.1.1 The Australian Space Weather Agency provides in his Website : http://www.ips.gov.au predictions of HF propagation.

5.2 BRISBANE FIR

5.2.1 A special webpage was created for Airservices Australia: http://www.ips.gov.au/Products_and_Services/5/1

5.3 AUCKLAND FIR

5.3.1 After reaching this webpage http://www.ips.gov.au/HF_Systems/1/1/1 select the city of Auckland to get the map of the propagation conditions in the FIR.

5.4 NADI FIR

5.4.1 From this webpage http://www.ips.gov.au/HF_Systems/1/1/1 select the city of Nadi to get the map of the propagation conditions in the FIR.

5.5 OAKLAND FIR

5.5.1 The daily and hourly prediction of propagation are available on the IPS website : http://www.ips.gov.au/Products_and_Services/5/12

5.6 TAHITI FIR

5.6.1 The IPS Web site provide for the FIR of Tahiti this link : http://www.ips.gov.au/HF_Systems/1/1/2

5.6.2 Using theses informations the SEAC-PF has developped this website used by the ATC controllers daily.

http://pro.hilaire.org/hf/
login: prophf
passwd: 2M3H0Z

6 General notes

6.1 Hours of service

6.1.1 Each station of the SP 6 network works 24/24 and 7/7.

6.2 Points of contact

6.2.1 Contact details of the station managers and watch supervisors for each radio station are contained in the Annexes section as follows: Appendix B-1 (Brisbane), Appendix B-2 (Auckland), Appendix B-3 (Nadi), Appendix B-4 (San Francisco) and Appendix B-5 (Tahiti)

6.3 Coordination principles

6.3.1 For routine day-to-day operations such as inter-station tactical co-ordination of frequency assignments, network co-operation and support, etc., contact should be made with the duty supervisor/watch manager using the contact means specified in Appendixes B-1, 2, 3, 4 and 5.

6.3.2 When the coordination between stations involves subjects such as procedures, institutional issues, or issues affecting the Network as a whole, etc., the contact to the station or stations should be made to the station manager through the points of contact defined in Appendixes B-1, 2, 3, 4 and 5.

6.4 Poor HF propagation conditions

6.4.1 Whenever a radio station duty supervisor/watch manager have access to information or warnings regarding poor HF propagation conditions or high levels of solar activities, that will affect the normal HF operations, he should notify the on duty Supervisor of the ATC unit in which the station provide the service.

6.5 HF operator

6.5.1 The FIR of Nadi, Brisbane, Auckland and Oakland use an Air Ground Operator.

6.5.2 In the FIR of Tahiti, the Air Traffic Controler is also the Air Ground Operator.

Appendices

Appendix A - HF medium characteristics

1.1 The term frequency is used to state the number of cycles occurring in one second, taking into account that cycle means a complete oscillation of the alternating current. The distance travelled by a radio signal during the transmission of one cycle is called wavelength. Wavelength is inversely proportional to frequency, so that if frequency is increased the wavelength will decrease.

1.2 If an alternating current of suitably high frequency is fed to a transmitting aerial, the energy is not confined to the metal of the aerial but radiates out into space in the form of electro-magnetic waves (radio waves). This radiation of energy through space comprises alternating and magnetic fields at right angles to each other.

1.3 As a general rule, radio signals travel in straight lines, that is, they follow great circle paths over the surface of the earth. Under certain circumstances, however, the path of a signal may change direction, this change of direction is called refraction. Refraction examples are coastal, atmospheric and ionospheric, and the amount of refraction varies considerably, depending on certain conditions. Those conditions could be a change in direction when a signal crosses a coastline (coastal refraction), a change in direction due to a variation in temperature, pressure and humidity, particularly at low altitude (atmospheric refraction), or a change in direction when the radio wave passes through an ionised layer (ionospheric refraction).

1.4 The path of a radio wave from a transmitter to a receiver many miles away is not necessarily direct, and in many cases, the signal may be reaching the receiver by more than one path at the same time. Because of the different path lengths there will be phase differences between the signals, and this fact will affect the resultant signal strength, phenomenon known as fading.

1.5 The main propagation paths between a transmitter and a receiver are, direct wave, ground-reflected wave, space wave, surface wave, ground wave and sky wave.

1.5.1 When a signal travels in a straight line between the transmitter and receiver it is called direct wave and its use is limited because of the earth curvature. If the radio wave arrive to the receiver after reflection at the earth's surface it is called ground-reflected wave. These two waves are jointly known as the space wave and under normal conditions it's the only propagation path for frequencies above 30 Mhz.

1.5.2 When a signal follows the curvature of the earth, this path is called surface wave, and is normally caused by a phenomenon called diffraction. Diffraction occurs for all types of wave motion, and allows the wave to pass round earth obstacles and depends on the wavelength in relation to the radius of the earth. The range of surface wave depends on the wavelengths, with longer wavelengths (lower frequencies) the diffraction effect becomes more pronounced with consequently improved surface wave range, the type of surface, because different surfaces absorb different amounts of radio energy resulting in different rates of attenuation, being higher over land than over sea, and the frequency used, with lower frequencies suffering less attenuation along the surface and therefore providing better surface wave range.

1.5.3 The combination of direct, ground-reflected and surface waves can be described has the ground wave. However, not all of those types of waves have to be necessarily present together.

1.5.4 When signals are reflected or refracted down from ionised layers above the earth the path is called sky waves, also sometimes called ionosphere waves.

1.6 Electron density Ultra-violet light from the sun can cause electrons to become separated from their parent atoms of the gases in the atmosphere. The atoms are left with resultant positive charges and are then known as ions. The intensity of the ionisation depends on the strength of the ultra-violet radiation and the density of the air.

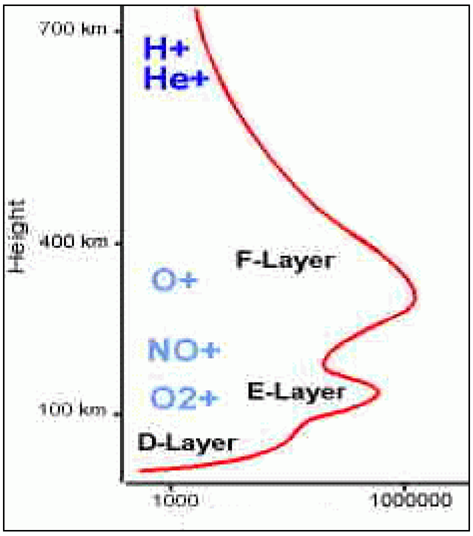

Figure 12 : Electron density (El/m^3)

The part of the atmosphere in which this process occurs is called the ionosphere, extending from about 50 Km to as high as 500 Km above the earth's surface. When a radio wave enters such a layer, refraction occurs causing the wave to be bent away from its straight path. The amount of refraction depends on the frequency, the angle at which the wave enters the layer, and the intensity of ionisation.

1.7 The ionosphere is still under investigation but is known that several definite ionised layers exist within it. During daytime hours there are four main ionisation layers designated D, E, F_1 and F_2 in ascending order of height. At night, when the sun's radiation is absent, ionisation still persists but it is less intense, and fewer layers are found (D and F layers). Factors that affect the ionosphere layers is strength of the sun's radiation, since it varies with latitude causing that the structure of the ionosphere varies widely over the earth's surface, and the state of the sun, since sunspots affect the amount of ultra-violet radiation.

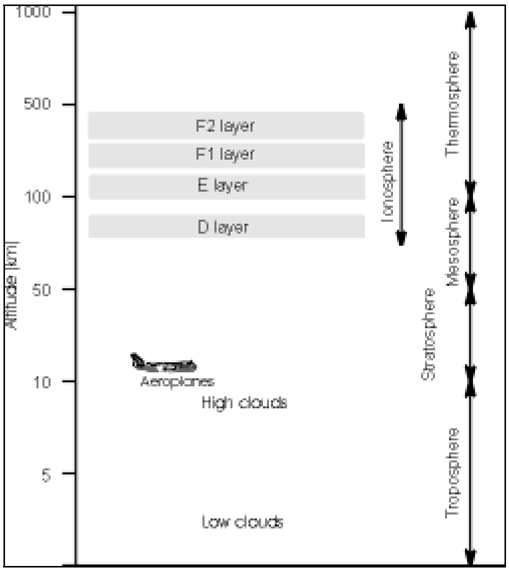

Figure 13 : Description of the Atmosphere

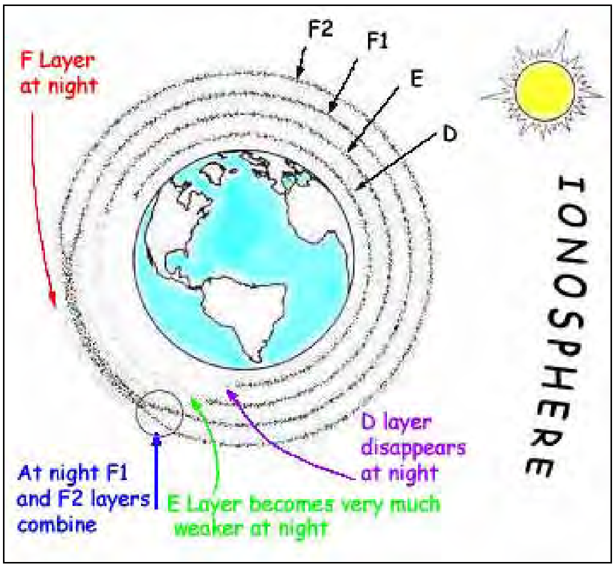

Figure 14 : Layers around the Earth

1.7.1 The D layer is only significant during daylight hours, dispersing soon after sunset. It is the lowest layer and its intensity of ionisation is not great, in which VLF waves are reflected from the base of the layer, LF and MF waves enter the layer and are severely attenuated without being appreciably refracted, and higher frequency signals pass through the layer with less attenuation.

1.7.2 The E layer is strong ionised by day and remains weakly ionised by night, producing strong sky waves in the LF and MF bands by night, but during the daytime due to the attenuation caused by the D layer the sky waves produced are too weak to used in these bands. Usable HF sky waves may be produced by this layer during nigh and day, and VHF signals usually pass through this layer, and if refraction exist it is insufficient to generate sky waves, unless under “freak” conditions, duct (or super-refraction) and scatter (or sporadic-E reflections) propagation. Ionospheric refraction is negligible with UHF, SHF and EHF signals and sky waves do not occur in these bands.

1.7.3 The F layer is the highest and more intensely ionised layer. At night there is only one F layer, but during the daytime is divided into two layers, the F_1 and F_2. Strong sky waves are produced in the LF, MF and HF bands at night but only the HF band has usable F layer sky waves by day. Signals in the VHF and higher bands escape through the F layer into space with, normally, no sky waves produced.

1.8 Sky wave propagation in the HF band (3 to 30 MHz) is complicated, because there are many variable factors, which decide whether or not there is a propagation path open between transmitter and receiver for long-range radiotelephony.

1.8.1 For a given frequency and state of the ionosphere, the amount of refractive “bending” of the wave will depend on the angle at which the wave penetrates the layer. Waves travelling nearly vertically may escape through a layer, but may be returned to earth if a higher more intensely ionised layer exists.

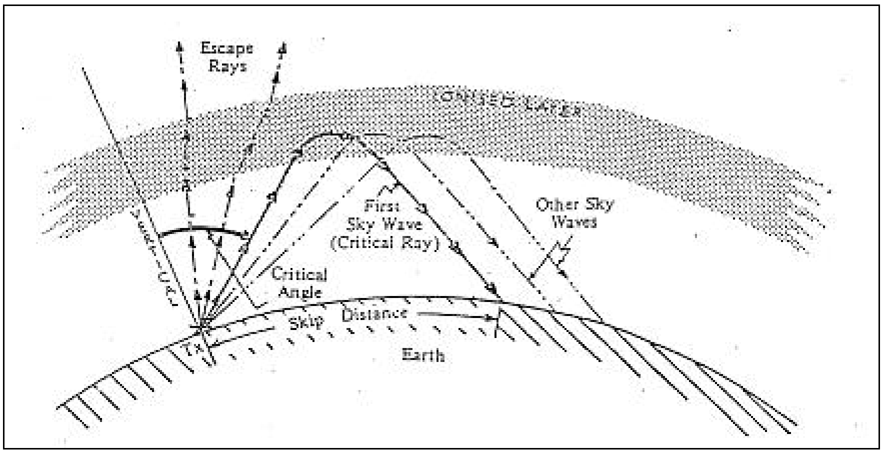

Figure 15 : Critical angle (HF band)

1.8.2 As can be seen on Figure **15**, waves ascending with an increased angle with the vertical, the amount of bending is greater and when the angle with the vertical is increased to the critical angle, the path is bent enough for the wave to return to earth as the first sky wave. Waves making an angle with the vertical greater than the critical angle will also produce sky waves, coming down to earth at greater ranges than that of the first sky wave. The range from the transmitter and the first sky wave for a given frequency and set of conditions is called the skip distance. If the surface wave from a HF transmitter become completely attenuated at a shorter range than that at which the first sky wave returns to earth, leaves an area in which neither ground wave nor sky waves are received and which is none as dead space (Figure **16**).

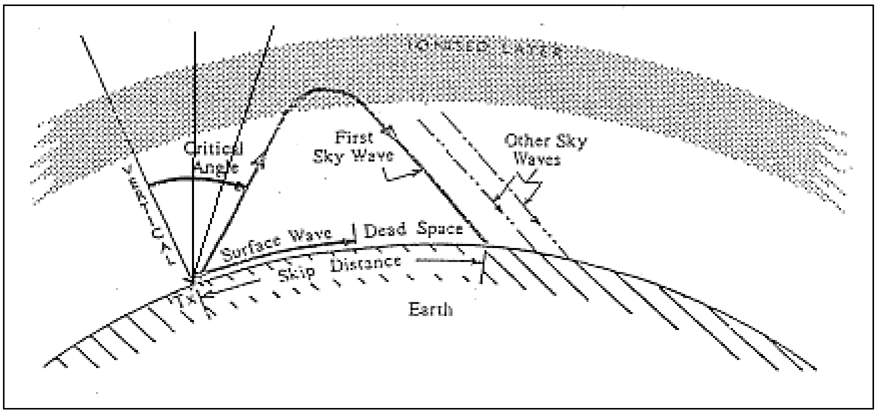

Figure 16 : Dead space (HF band)

1.8.3 Critical angle depends largely on the frequency, the higher the frequency the greater the critical angle, therefore, if skip distance is to be reduced, a lower frequency has to be used. This is most significant when choosing the optimum frequencies for HF communications and ensuring that the skip distance is less than the range of the distant receiver.

1.8.4 For good long-range HF R/T reception a frequency must be chosen which will not suffer too much attenuation. If a relatively high frequency is used, for example 29 MHz, most of the energy will pass through the E layer and be reflected from the more intensely ionised F layer. The higher the frequency, the greater degree of ionisation is required to give reflection. As frequency is reduced and attenuation of the E layer reflections increases, a limit is reached called the “Lowest Usable Frequency (LUF)”, and bellow this frequency the attenuation is too great for the signal to be usable.

1.8.5 Thus for least attenuation, and so the highest received signal strength for a given transmitter power, a frequency is chosen which is as high as possible without exceeding the MUF (Maximum Usable Frequency) for the path between the transmitter and distant receiver. The MUF is that frequency, for the prevailing conditions, which produces a skip zone extending just short of the distant receiver. Any higher frequency would give a higher critical angle and a greater skip distance exceeding beyond the receiver, which would then loose that sky wave contact with the transmitter.

1.8.6 MUF at night is much less than by day, because the intensity of ionisation in the layer is less so than lower frequencies have to be used to produce the same amount of refractive bending and give the same critical angle and skip distance as by day. However, the signal attenuation in the ionosphere in the ionosphere is also much less at night so the lower frequency needed is still usable. Hence the night frequency for a given path is about half of the day frequency, and shorter distances can be worked at night than by day while still using a single reflection from the F layer.

1.8.7 The MUF not only varies with path length and between day and night, but also with season, meteor trails, sunspot state, and sudden ionospheric disturbances produced by eruptions on the sun. Because of the variations of MUF, HF transmitting stations have to use frequencies varying widely between about 2 and 20 MHz.

1.9 The theoretical range for HF frequencies varies, depending on the propagation path used, ground or sky waves. Ground waves usually can reach up to 100 nm and sky waves longer distances, however, sky waves will not be received within the skip distance (probably several hundred miles from the transmitter). The theoretical maximum range obtained by means of a single reflection from the E layer is about 1 300 nm, and from the F layer about 2 500 nm. This theoretical maximum range is achieved with the transmitted signal leaving the earth’s surface tangentially. Ranges of 8 000 nm or more may be achieved by means of multiple reflections, mainly from the F layer, being the signal alternately refracted down from the layer and reflected up again from the earth’s surface until it becomes too weak to use.

Appendix B-1 - Brisbane Radio Station Information

Station Name:	Brisbane Radio

Country: Australia	**State: Queensland**
City: Brisbane	**Geographic Location: S27.23.0 E153.07.1**
AFTN Address: YBBBYINTL	**Aircraft in Flight Address: YBBB**
SATCOM SHORT CODE Nr. : 450 302	

Facilities

Transmitter site(s)	Receiver site(s)
Location and equipment:	**Location and equipment:**
Cape Pallarenda (Townsville) – 19.12.05.8S 146.46.05.3E 4 X Cubic T-4180/COM1000 1kW HF transmitters, comprising 2 X SP6 & 2 X SEA3 2 X Andrew Model 3005 Triple Mode Low Profile Spira-Cone HF antenna	**Cape Clevedon (Townsville)** – 19.21.03.8S 147.01.06.5E 18 X Cubic LCR-2000 HF receivers, comprising 9 X SP6 & 9 X SEA3 1 X Andrew Model 3005 Dual Mode Low Profile Spira-Cone HF antenna
Broken Hill – 31.55.38.7S 141.28.57.4E 2 X Cubic T-4180/COM1000 1kW HF transmitters, comprising 2 X SP6 2 X Andrew Model 3005 Triple Mode Low Profile Spira-Cone HF antenna	**Broken Hill** – 32.00.22.4S 141.28.26.1E 9 X Cubic LCR-2000 HF receivers, comprising 9 X SP6 1 X Andrew Model 3005 Dual Low Profile Spira-Cone HF antenna
Knuckeys Lagoon (Darwin) – 12.25.52.0S 130.57.51.5E 2 X Cubic T-4180/COM1000 1kW HF transmitters, comprising 2 X SEA3 2 X Andrew Model 3005 Triple Mode Low Profile Spira-Cone HF antenna	**Shoal Bay (Darwin)** – 12.22.49.5S 130.58.26.2E 9 X Cubic LCR-2000 HF receivers, comprising 9 X SEA3 1 X Andrew Model 3005 Dual Low Profile Spira-Cone HF antenna
Class of Emission: J3E	**SELCAL:** selcal-coder

Frequencies

Family	Frequency bands								
	3 MHz	3.5 MHz	4 MHz	5 MHz	6 MHz	8 MHz	11 MHz	13 MHz	17 MHz
SP6	3.467			5.643		8.867		13.261	17.904
SEA-3	3.470				6.556		11.396	13.318	17.907
Volmet					6.676		11.387		

Station Manager *	**Supervisor**
Name: Mr Ian Harding	**Name: Duty Operations Supervisor**
Post Address: Locked Bag 747 **Eagle Farm** **Brisbane** **Australia 4009** **Phone: + 61 7 38663544** **Fax: + 61 7 38663742** **Email: ian.harding @airservicesaustralia.com**	**Post Address:** **The Australian Flight Information Centre** **Locked Bag 747** **Eagle Farm** **Brisbane** **Australia 4009** **Phone: + 61 7 38663429** **Fax: + 61 7 38663553** **Email: ausfic@airservicesaustralia.com**

Remarks:

Brisbane Radio also provides international HF communications for Australian Air Traffic Control within the contracted airspace of the Honiara and Naru FIR's

Brisbane Radio provides communication services from Perth and Port Hedland sites that cover the INO-1 MWARA

Appendix B-2 - Auckland Radio Station Information

Station Name:	**Auckland Radio**
Country: New Zealand	**State**
City: Auckland	**Geog. Location: 370017S1744849E**
AFTN Address: NZAAYSYX	**Aircraft in Flight Address:** NZZO
SATCOM SHORT CODE Nr. : 451 201	
Facilities	
Transmitter site	**Receiver site**
Location: Wiroa Island	**Location:** Seagrove
Equipment	**Equipment**
Transmitters 8 x Marconi ST-5000/NZ 5 KW HF Transmitters comprising 2 x Air Ground 3 x VOLMET 1 x METFAX 1 x Air New Zealand 1 x Spare Aerials 5 x Civil Aviation (NZ) RM 88 Wideband 2–30 MHz 1 x Marconi R7070 wideband 2–30 MHz (Air New Zealand only) 4 x Marconi R7080 wideband 2-30 MHz	Receivers 16 x Eddystone 6100 HF receivers comprising:- 5 x MWARA 3 x ODF 2 x Spare 6 x OCC (Air New Zealand only) 2 x Eddystone 1771 receiver remote controllers Aerials 3 x Civil Aviation (NZ) RM 88 Wideband 2–30 MHz 1 x Creative Design sector coverage log-periodic dipole antenna Type 230HF-2D (Air New Zealand only)
Class of Emission: USB/AM	**SELCAL:**

Frequencies

Family	Frequency bands								
	3 MHz	3.5 MHz	4.7 MHz	5.6 MHz	6.6 MHz	9 MHz	11.3 MHz	13.3 MHz	18 MHz
A	3467			5643		8867		13261	17904
LDOCC	3007				6637		10072	1333	17940
SAR									
VOLMET					6679	8828		13282	

<table>
<tr><th>Station Manager</th><th>On Duty Supervisor</th></tr>
<tr><td>Name: Mark Goodall
Post Address:
Airways New Zealand Limited.
Fred Ladd Way.
Auckland International Airport.
Phone: + 64 9 2753109
Fax: + 64 9 2753106
Email: Goodallm@airways.co.nz
AFTN/SITA Address: NZZOZQZF</td><td>Post Address:
Airways New Zealand Limited.
Fred Ladd Way.
Auckland International Airport.

Phone: + 64 9 2568071
Fax: + 64 9 2753627
Email: tim.halpin@airways.co.nz
AFTN/SITA Address: NZAAYSYX</td></tr>
<tr><td colspan="2">Remarks: By international agreement Auckland Radio provides communications services for the Auckland OCA. The associated OACC is located at Auckland, New Zealand.</td></tr>
</table>

Appendix B-3 - Nadi Radio Station Information

<table>
<tr><td>Station Name:</td><td>Nadi Radio</td></tr>
</table>

<table>
<tr><td>Country: Fiji</td><td>State</td></tr>
<tr><td>City: Nadi</td><td>Geog. Location:
17° 45′ 19″ S, 177° 26′ 36″ E</td></tr>
<tr><td>AFTN Address: NFFNYFYX</td><td>Aircraft in Flight Address: NFFNZZZX</td></tr>
<tr><td>SATCOM SHORT CODE Nr. :
+ 679 6724174</td><td></td></tr>
<tr><td colspan="2">Facilities</td></tr>
<tr><td>Transmitter site</td><td>Receiver site</td></tr>
<tr><td>Location: Enamanu Transmission station</td><td>Location: Nadi Airport</td></tr>
<tr><td>Equipment (see below)</td><td>Equipment (see below)</td></tr>
<tr><td><u>Transmitters</u>
JRC JRS-714 10 KW x4

JRC JRS-753 5 KW x2

JRC JRS-752 500 W x2

Antenna Patch §unit NKZ – 93 x1

<u>Modems :</u>
NHH 62 modems frames x2
CNM 199 TV x6

<u>Aerials</u>
Conifans – 600 Ohms 2-30 MHz x1

Mono pole – 75 Ohms 2-30 MHz x1

Marconipoles – 50 Ohms 2-30 MHz x5

<u>VoiceSwitch:</u>
GAREX VCSS 220</td><td><u>Receivers :</u>

JRC NRD 840A All wave receiver x 36

JRC NRD 302A Tunable receiver x 9

Antenna Multicoupleurs NAJ -110B x3

Receiver Controller Unit NJC-536B x8

Modems NMC – 207 x16

<u>Antenna System:</u>

TFD – Terminated folded dipole x3
2-30 Mhz Range</td></tr>
<tr><td>Class of Emission: J3E</td><td>SELCAL: Baumberger Electronics
BEW 783 -200 X 3 units</td></tr>
</table>

Frequencies									
Family	**Frequency bands**								
	3 MHz	**3.5 MHz**	**4.7 MHz**	**5.6 MHz**	**6.6 MHz**	**9 MHz**	**11.3 MHz**	**13.3 MHz**	**18 MHz**
A	3467			5643		8867		13261	17904
RDARA	3425					8846	11339		
SAR	3023			5680					

Station Manager	**On Duty Supervisor**
Name: MR Vula SERU	**Post Address:** Airport Fiji Limited. Private Mail Bag. Nadi Airport. Fiji **Phone:** **Fax:** **Email** **AFTN/SITA Address:**
Post Address: . Airport Fiji Limited. Private Mail Bag. Nadi Airport. Fiji **Phone:** + 679 6725777 Ext 4514 **Fax:** + 679 6725161 **Email:** vulas@afl.com.fj **AFTN/SITA Address:** NANCDYA	

Remarks:.

Appendix B-4 - San Francisco Radio Station Information

Station Name:	**SAN FRANCISCO Radio Station Information**
Country: United States of America	**State:** California
City: Livermore	**Geographic Location:** 37.70 N 121.72 W
AFTN Address: KSFOXAAG	**Aircraft in Flight Address:** KSFOZZZX
SATCOM SHORT CODE Nr. : 436625	
Facilities	
Transmitter site See below	**Receiver site See below**

Transmitters	Receivers
<u>Dixon (38. 22.46.7 N 121.45. 50.9 W)</u> **(D)** 2 TCI 532-N Log-Periodic (3-30 MHz) 2 TCI 530 log-periodic OMNI (3-30 MHz) 4 AERCOM 1330 (5KW) 1 Cubic CTX-1000 (1KW) standby **<u>Moloka'i, Hawaii</u>** **<u>(21.10.33.5N 157.10.38.9 W)</u>** **(M)** 3 TCI 527-B Log-Periodic (6.2-30 MHz) -NP2 Direction: 346 deg., 6.2-30 MHz -NP3 Direction: 346 deg., 6.2-30 MHz 2 TCI 527-3-28 Log-periodic (6.2-30 MHz) -CWP2 275 deg., 6.2-30 MHz -CWP1 183.5 deg., 6.2-30 MHz 3 TCI 532-4-28 Log-Periodic. (3-30 MHz) -CEP Direction: N - 51 deg., 3-30 MHz -CEP Direction: S - 57 deg., 3-30 MHz -SP Direction: 188 deg., 3-30 MHz 2 TCI 530-4-28 Log-Periodic OMNI (3-30 MHz) 7 CUBIC CTX-5000 (5KW) **Standby transmitter** 1 Cubic CTX-5000 (5KW) **<u>Oahu, Hawaii (21.22.30.6 N 158.5.5.1 W)</u>** Auxiliary transceiver 1 TCI 530 Log-Periodic (3-30 MHz) 1 Cubic CTX-1000 (1KW) **<u>Barrow, Alaska</u>** **<u>(71.15.30.9 N 156. 34.38.9 W</u>** **(B)** 1 TCI 530 Omni (3-30 MHz) 1 CTX-1000 (1KW) **<u>Mt. Barragada, Guam</u>** **<u>13.19.17 N 144.49.30 E</u>** 1 Fan Dipole Antenna 7 TenTec transmitters **<u>Hat Yai, Thailand</u>** **<u>06.56.10.84N 100.23.18.12E</u>** <u>Antenna 06.56.12.79N100.23.19.41E</u> 1 TCI 530-05 (2.8-30MHz) 1 Cubic TCX 1000	**<u>Half Moon Bay (37.39. 00 N 122. 41. 00 W)</u>** 2 TCI 532-B log-periodic (3-30 MHz) -North Direction W 278 degrees -West Direction SW 222 degrees 1 TCI 530 log-periodic OMNI (3-30 MHz) 1 TCI 527B log-periodic (3-30 MHz) -Direction S – 135 degrees 5 TenTec RX331 (CEP2) 14 TenTec RX330 **<u>Moloka'i, Hawaii (21.12.23 N 157.12.30 W)</u>** 1 TCI 532-4 Log-Periodic (3-30 MHz) -CEP Direction: 051 deg. 1 TCI 527-3 Log-Periodic (6.2-30 MHz) -WP Direction: 283.5 deg. 2 TCI 527-B Log-Periodic (6.2-30 MHz) NP Direction: 346 deg. SP Direction: 188 deg. 38 LCR-2000 **Moloka'I standby receiver** 7 Cubic LCR-2000 **<u>Oahu, Hawaii 21.22.30.6 N 158.5.5.1 W</u>** Oahu Auxiliary transceivers 7 TenTec RX330B **<u>Barrow, Alaska 71.15.30.9 N 156.34.38.9 W</u>** TCI 530-6 7 Cubic LCR-2000 **<u>Pulantat, Guam 13.25.00 N 144.44.47 E</u>** 1 HF Braodband dipole (2 MHz-30 MHz) TCI-535 (3-30 MHz) 1 TCI Conical Monopole Antenna (LDOC) 4 CDR-3250 6 TenTec RX331 (LDOCF) 7 TenTec RX331 (CWP) **<u>Hat Yai, Thailand</u>** **<u>06.56.24.71N 100.24.47.28E</u>** <u>Antenna 06.56.25.03N 100.24.49.84E</u> TCI 530-05 (2.8-30MHz) 7 Cubic LCR 2000 1 Cubic LCR 2000 (Spare)
Class of Emission: 1K40H2B/2K80J3E	**SELCAL: 17 FREQUENTIS Units**

Frequencies

Family	Frequency bands								
	2-3 MHz	4 MHz	5 MHz	6 MHz	8 MHz	10-11 MHz	13 MHz	17 MHz	21 MHz
(D)CEP1	3413		5574		8843		13354		
(D)CEP2	2869		5547			11282	13288		21964
(D)CEP3	3452			6673		10057	13288		
(M) SP	3467		5643		8867		13261	17904	
(M)CWP1	2998 / 3455	4666		6532		11384	13300	17904	
(M)CWP2	2998		5652	6532	8903	11384		17904	21985
Guam CWP	2998 / 3455	4666	5652	6532	8903	11384			
(M) NP1			5628	6655	8915	10048	13339	17946	21925
(M) NP2	2932		5667	6655	8951	11330	13273	17946	
(B) NP			5628	6655	8915	10048	13339	17946	21925
(M) CEP1	3413		5574		8843		13354		
(M) CEP2	2869		5547		8867	11282	13288		
(M) SP	3467		5643		8867		13261	17904	
(G/M/D/B) LDOCF	3494			6640	8933	11342	13348	17925	21964
(HDY) LDOCF	3494			6640		11342	13348	17925	21964

Station Operations Manager:	**On Duty Manager:** Andrew Colombana, Robin Lee, Lynn Sallady, Leigh-Lu Prasse or Swami Nand (Shift Managers)
Name: Tammy J. Callahan **Post Address:** 6011 Industrial Way Livermore, California, USA 94550	**Post Address:** 6011 Industrial Way Livermore, California, USA 94550
Phone: + 1 925-519-0792 **Fax: + 1** 925-294-9597 **Email:** tcallaha@arinc.com **AFTN/SITA Address:** KSFOTCXA	**Phone: + 1** 800-799-7847 **Fax: + 1** 925-294-9597 **Email:** sfomgr@arinc.com **AFTN/SITA Address:** KSFOSMXA

Remarks: : PHNL-PMKK VHF 131.95 (HA)
PGUM VHF 191.95 (GA)

Appendix B-5 - TAHITI Control Station Information

Station Name:	**TAHITI Control**

Country: France	**State:** French Polynesia
City: FAAA	**Geographic Location:** 17° 33 20S 148° 36 60W
AFTN Address: NTTTZQZX	**Aircraft in Flight Address:** NTTTZZZX
SATCOM SHORT CODE Nr. : 42 27 90	

Facilities

Transmitter site	**Receiver site**
Location: FAAA (17° 33 20S 148° 36 60W)	**Location:** FAAA (LA HUNA) (17° 33 20S 148° 36 60W)
Equipment	**Equipment**
Antennas 2 Biconics (Fuseau) 1 Spiracone Andrew 3002 Transmitters **2* Nardeux T166 1KW** **Backup station:** Antennas 1 Volubilis 1 Hormi (THX) 1 Spiracone Andrew 3002 Transmitters 1 * Rhode &Schwarz XK 2900 1 KW	20 I2E receivers 1 Biconic antenna BCI3-30 1 Spiracone Andrew 3002 (1 low angle (long-medium range)) (1 high angle (short- range)) Backup station 6 * I2E receivers 1 * ASD 2-30 semi delta
Class of Emission: 2K80J3E /	**SELCAL:** 5 DANKS RADIO SC9100

Frequencies

Family	**Frequency bands**								
	3 MHz	**3.5 MHz**	**4.7 MHz**	**5.6 MHz**	**6.6 MHz**	**9 MHz**	**11.3 MHz**	**13.3 MHz**	**18 MHz**
SP		3467		5643		8867		13261	17904
9C(*project*)									
Fix				5066.5	6801	9116		12166.5	
SAR				5680					

Station Manager	On Duty Supervisor
Name: Eric LIEUTAUD **Post Address:** Service Navigation Aerienne Division technique BP 6011 FAAA 98702 FAAA TAHITI – French Polynesia **Phone:** + 689 86 10 30 **Fax:** + 689 86 10 39 **Email:** Lieutaud_Eric@seac.pf **AFTN/SITA Address:** NTAA	**Post Address:** Service Navigation Aerienne Division technique BP 6011 FAAA 98702 FAAA TAHITI – French Polynesia **Phone:** + 689 86 11 33 **Fax:** + 689 86 10 39 **Email:** na.tec@seac.pf **AFTN/SITA Address:** NTAAYSYX

Remarks: TAHITI radio is collocated and is a department within TAHITI OACC

Backup receiver site is also located in the vicinity of TAHITI OACC

LIST OF FIGURES

LIST OF TABLES

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TASKS LIST – PBN Task Force

No.	Tasks/Strategy	Category	Status
C4/1	The APAC PBN TF encourages States to consider the GO Team visit.	Implementation	**On-going.** States are encouraged to consider the GO Team visit as required.
C4/2	The APAC PBN TF requests the Global PBN Task Force to consider providing assistance to States which currently are at the early stage of PBN implementation.	-	**Closed.**
C4/3	The APAC PBN TF agrees to provide progress report of PBN implementation in the Asia-Pacific to the Global PBN Task Force	-	**Closed.** The PBN TF has provided progress report to the Global PBN Task Force.
C4/4	The APAC PBN Task Force requested that the Interim Edition (V '0.2') of the Regional PBN Implementation Plan be presented at theATM/AIS/SAR/SG/19 Meeting (June 22-26, 2009) for review as required by APANPIRG/19.	-	**Closed.**
C4/5	The APAC PBN TF agrees to continue an annual review of the Asia-Pacific Regional PBN Implementation Plan	Reporting	**Routine**
A4/6	Develop an up-to-date archive of all relevant guidance materials for each PBN implementation step as outlined in the PBN manual	-	**Closed.** Information on relevant guidance materials is currently available and can be downloaded from ICAO PBN web site. (http://www.icao.int/pbn) The Secretariat also provides a comprehensive CD containing important PBN guidance and resource materials.

No.	Tasks/Strategy	Category	Status
A4/7	Arrange future annual PBN implementation seminars to serve as a forum for exchanging expertise and implementation experiences and invite interested States who would like to host future seminar to make a formal proposal at the next PBN TF meeting and to invite industry representatives to attend the seminar	Education	**On-going.** The PBN TF/5 accepted Hong Kong's offer to host the second PBN Seminar, planned for Feb 2010, subjected to APANPIRG approval. Vietnam and Thailand also offer to host future PBN seminars.
C4/8	In respect to the request by COSCAPs regarding the development of guidance material for APV, the APAC PBN TF recognized the work currently being conducted by the Global PBN TF to develop and review materials on the issues of APV and Non-Precision Approach as related to PBN	-	**Closed.**
C4/9	The ICAO APAC PBN TF recommends that the PBNSG continue to review and revise the PBN Manual to achieve a more hierarchical and easily used structure to minimize the number and complexity of the airworthiness approvals required for PBN operations. The GPBNTF is considered to be an organization well placed to advise ICAO Regions on harmonization and the development of common standards	-	**Closed.** PBNSG noted the request from the APAC PBN TF. Materials and suggestions on structure of the PBN manual have been forwarded to PBN SG. Updated version of the PBN manual would be available in the second quarter of 2010.
C4/10	The APAC PBN TF agrees to continue coordination with other regional PBN task forces and the Global PBN Task Force to ensure harmonization of PBN implementation	Planning	**On-going.** Report on Global PBN Task Force activities are presented and noted by PBN TF/5.
A4/11	States are requested to provide progress report regarding PBN implementation at each Task Force meeting	-	**Closed.** Transferred to Action Item 5/08

No.	Tasks/Strategy	Category	Status
A4/12	Mandate States to present their PBN Implementation Plan and to provide progress reports on the development of the State Plan at the next PBN TF meeting	Planning	**Routine.** States are requested to provide report on the developments of State PBN Implementation Plans.
A4/13	Request the Task Force Chairperson and Rapporteurs to develop a common template for State PBN Implementation Progress Report to be reviewed by the next PBN TF meeting	-	**Closed**. The TF/5 agreed on the report template.
C4/14	The APAC PBN TF agreed to develop a regional PBN progress report to be reported annually to CNS/MET and APANPIRG and to be posted on ICAO APAC and ICAO Global PBN web site	Reporting	**Routine.**
A4/15	Request ICAO Headquarter to provide a presentation on the requirement for safety assessment for PBN implementation and overview of how to conduct proper safety assessment at future PBN TF meetings	Education	**On-going**. The TF referred to the PBN SG for the development of safety assessment criteria.
C4/16	The APAC PBN Task Force considers itself a suitable forum to facilitate and harmonize terminal and en-route PBN implementation in the Asia Pacific Region. Therefore, the Task Force requests APANPIRG to consider adding the following task into the Task Force's TOR. "*Facilitate and coordinate the harmonized implementation of PBN for terminal and en-route applications in the Asia Pacific Region*"	-	**Closed.** APANPIRG/20 has a decision to establish a Route Review Task Force.
A4/17	Recognizing that the PBN planning activities for the Asia-Pacific are nearing completion and acknowledging the Task Force's willingness to support actual PBN implementation, the APAC PBN Task Force request working papers regarding revision of the Task Force's work structure to be submitted for consideration at PBN TF/5. Members of the PBN TF are encouraged to coordinate intersessionally to prepare the working papers.	Implementation	**On-going.**
A4/18	Request ICAO to provide status report of the work by PBNSG, SASP and IFPP	-	**Closed.**
C5/01	Confirmed the likely inability of many APAC states to meet the APV implementation goals of Assembly Resolution A 36-23 within the required timeframe. The PBN/TF/5 meeting requested that, APANPIRG while taking note of the limitation of many of the APAC States, consider conveying the same to ICAO with the recommendation that the Resolution be reviewed.	Planning	**On-going.**

No.	Tasks/Strategy	Category	Status
C5/02	As the authorized GNSS Service Areas, in which SBAS based APVs may be implemented are very limited in coverage, the PBN/TF/5 meeting requests that APANPIRG consider the feasibility of establishing a regional SBAS capability to support all aircraft types.	-	**Closed.** CNS/MET will consider the feasibility of establishing a regional SBAS capability.
C5/03	That, the concern raised by the US GAO report was noted; and this concern be forwarded to APANPIRG and ICAO HQs.	-	**Closed**. US Government has guaranteed availability of minimum GPS constellation in writing to ICAO HQ.
C5/04	The PBN/TF/5 meeting recommends that the PBN Study Group review the current PBN GNSS reporting and prediction requirements with a view to establishing common implementation rules and technical standards for such requirements.	Implementation	**On-going.** APANPIRG Conclusion 20/37invites ICAO to develop the guidance materials.
C5/05	That, APANPIRG consider tasking the PBN TF with examining the feasibility of establishing a regional RAIM prediction system.	-	**Closed.** APANPIRG Conclusion 20/38 tasks the PBN TF with examining the feasibility of establishing a regional RAIM prediction system.
C5/06	That, the PBNSG consider the proposal to develop Guidance Material that provides a means to assign PBN capability to GPS IFR aircraft in the first instance without the need for recertification.	Education	**On-going.** APANPIRG Conclusion 20/37invites ICAO to develop the guidance materials.
C5/07	That, States distribute the RNAV safety message and emphasize on all operators involved in RNAV to apply the lessons learnt on Human Factor issues, as discussed in the paper presented by New Zealand on RNAV Human Factors and System Safety.	-	**Closed.** APANPIRD Conclusion20/39 distributes the Report to the States for further distribution to all operators.
C5/08	That, States / Administrations be requested to use the PBN Implementation Progress Report Template for all future reporting on their status of PBN implementation. The Report should be submitted at each of the future PBN Task Force Meeting.	Reporting	**Routine.**

No.	Tasks/Strategy	Category	Status
C5/09	That, States / Administrations be requested to submit their PBN Implementation Progress Report by 15 August 2009 for onward submission to APANPIRG/20 Meeting scheduled to be held from 7 – 11 September 2009.	-	**Closed.**
C5/10	That, the APAC Regional PBN Implementation Plan (Interim Edition Version 0.3) be presented at the APANPIRG/20 for approval.	-	**Closed.** APANPIRG Conclusion 20/41 adopted the APAC Regional PBN Implementation Plan (Interim Edition Version 0.3) as Version 1.0
C5/11	That, APANPIRG consider in conjunction with the proposal to establish a SEA RR/TF, acquiring the necessary resources to establish a Regional PBN Office or a dedicated Project to design PBN based regional air routes and facilitate their adoption by the States in the APAC region.	-	**Closed.**
C5/12	That, the PBNSG be requested to provide guidance on any PBN-specific aspects of en route safety assessment.	Education	**On-going.**
C5/13	That, presentation(s) on Safety Assessment be included in the Agenda for the PBN Implementation Seminar to be held in Hong Kong in February 2010.	-	**Closed.**
C5/14	That, ICAO kindly assist with addressing the PBN safety assessment training needs in the region.	Education	**On-going**
C5/15	Urged States to give detailed considerations to the operational need, safety and cost benefits prior to deciding on RNP AR Approach implementation.	-	**Closed.**
C5/16	That, APANPIRG agree to the PBN Task Force activities continuing for two additional meetings in the first half of 2010 using the Task Force's current TORs.	-	**Closed.**
C5/17	That, ICAO be requested to consider providing an annual summary of panel and working group activities to allow proper coordination amongst different groups (PBN/TF/4 Action Item 4/18)	Reporting	**Routine.**

No.	Tasks/Strategy	Category	Status
A6/1	States are encouraged to consider implementing CDO in accordance with ICAO CDO Manual Doc 9331 on as many STARs as practicable to enhance fuel efficiency, ease pilot and ATC workloads, and reduce emission and noise.	Implementation	
A6/2	States are encouraged to attend to ICAO PBN Airspace Design Workshop in 19-22 April 2010 to enhance their expertise with airspace design relating to implementation of PBN	Education	
A6/3	States are encouraged to attend CDO workshop to be hold in Bangkok on the week of March 15 in conjunction with IFPP meeting.	Education	
A6/4	IATA is requested to provide the progress on the development of global database for PBN approval at the PBN TF/7 Meeting.	Implementation	
A6/5	States are requested to list the challenges and impediments for PBN implementations to be reported at the PBN TF/7 Meeting.	Implementation	**Routine**
A6/6	A harmonization analysis report on State PBN Implementation Plans to be developed by IATA and volunteering States (Australia, Hong Kong, New Zealand and Thailand) and reported to the PBN TF/7 Meeting.	Planning	
A6/7	States are requested to review the draft PBN Operational Approval Handbook and provide feedback at future PBN TF meetings. States are also invited to contribute relevant material to be integrated into the Handbook.	Implementation	
A6/8	States are encouraged to participate in the PBN Operational Approval Training to be conducted under the auspices of COSCAPs in Singapore on during 26-30 April 2010. Invitation will be issued to select States by COSCAPs.	Education	

No.	Tasks/Strategy	Category	Status
A6/9	ICAO Regional Office to inform IFPP, PBNSG and APANPIRG limitation of older FMS in inputting procedure identification within 6-digit alphanumeric. This limitation occurs when pilots attempt to select specific approach for an airport that has multiple runways and each of runways has multiple approach procedures of the same type of navigation system. ICAO is requested to provide guidance and standardized solution to the issue.	Implementation	
DC6/10	The proposed revision to the APAC Regional PBN Implementation Plan as shown in Appendix 'F' of the PBN TF/6 Meeting report be adopted.	Planning	
DC6/11	ICAO provides guidance on aircraft that do not have a lateral and vertical readout on the navigation display, but do display the lateral and vertical profile on the navigation equipment, could be considered as alternate means of compliance if supplemented by appropriate flight crew training for RNP value of 0.3 RNP or greater.	Implementation	
DC6/12	Request CNS/MET SG, ATM/AIS/SAR SG, and APANPIRG to review and consider amending the APAC Performance Monitoring and Measurement Metrics 2 and 3 for PBN to include specific measurements that capture operational benefits in terms of PBN's ability to help fulfill strategic objectives (safety, efficiency, capacity, access, and the environment).	Planning	
A6/13	ICAO Secretariat to identify the appropriate office or forum that would be best suited to develop a standardized calculation and reporting method for States. This would include a mathematical model to ensure environmental benefit calculations are standardized.	Reporting	

No.	Tasks/Strategy	Category	Status
D6/14	The PBN TF agrees to integrate its Implementation Task List into the PBN Task Force Task List and updates the PBN Task Force Task List as shown in an Appendix of the Meeting Report.	-	**Closed.**
A6/15	ICAO Secretariat to provide an update report on PBN TF activities to ICAO Route Review TF. The PBN TF also requested that activities of the RR TF to be reported to the PBN TF.	Coordination	
A6/16	States / Administrations to submit their PBN Implementation Progress Report by 20 February 2010 for onward submission to APANPIRG/21 Meeting.	Reporting	
D6/17	The PBNTF agrees in principle to the establishment of a regional RAIM prediction system and cooperation between the ICAO PBN TF and the APEC GIT. Australia, India, Japan and USA also agreed to be part of the project team.	Implementation	
A6/18	The PBN TF requests AEROTHAI in conjunction with the project team to develop more detailed technical architecture, operational concepts, and administrative arrangements to be reviewed by the Task Force at the PBN TF/7.	Implementation	
A6/19	States are requested to develop Working Papers on back up requirements for PBN to be discussed at the PBN TF/7 Meeting.	Planning	
A6/20	Working Paper PBN/TF/6 – W/7 be forwarded to the Flight Plan and ATS Messages Implementation Task Force (meeting now to be held in July 2010).	Coordination	

No.	Tasks/Strategy	Category	Status
A6/21	States be requested to review the requirements of the State Letter on the implementation of the interim 2012 flight plan format in the context of PBN implementation and report to the PBN TF 7 meeting issues noted.	Implementation	

— END —

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ASIA/PACIFIC REGIONAL PERFORMANCE-BASED NAVIGATION IMPLEMENTATION PLAN

VERSION 2.0

September 2010

RECORD OF AMENDMENT

Version	Activity	Date
0	Adopted by APANPIRG/19 as Interim Edition	September 2008
0.1	RASMAG Proposal	December 2008
0.2	Amended/Finalized by PBN/TF/4	March 2009
0.3	Amended/Finalized by PBN/TF/5	July 2009
1.0	Adopted by APANPIRG/20	September 2009
1.x	PBN/TF/6 Proposal for Amendment	February 2010
2.0	To be adopted by APANPIRG/21	September 2010

Proposed Revision to Summary Table & Implementation Targets

Medium Term (2013-2016)*		
Airspace	**Preferred Nav. Specification**	**Acceptable Nav. Specification**
Route – Oceanic	RNP 2**, RNP 4	RNAV 10
Route – Remote continental	RNP 2	RNAV 2, RNP 4, RNAV 10
Route – Continental en-route	RNAV 1, RNP 2	RNAV 2, RNAV 5
TMA – Arrival	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
TMA – Departure	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
Approach	Expansion of RNP APCH (with Baro-VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations	

Implementation Targets

- RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016
- RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016
- RNAV 1 or RNP 1 SID/STAR for 70% of busy domestic airports where there are operational benefits
- Implementation of additional RNAV/RNP routes

* **Note 1:** In circumstances where affected States are agreeable to completing an implementation in advance of the timeline, early implementation is encouraged on the basis of coordination between affected States and airspace users.

** **Note 2:** Related CNS requirements and operational procedures for RNP 2 application in Oceanic Airspace are yet to be determined.

<u>Proposed Revision Note 3</u>

*** **Note 3:** When establishing the implementation targets in accordance with Assembly Resolution A36/23, the States should first conduct an analysis of the instrument RWY eligibility for APV approach. This analysis should include the feasibility of the APV at a particular location, the presence of regular commercial operations and the current or projected user fleet capability for APV. Locations where APV approach is either not feasible or where the regular operators cannot realize the benefit of APV within the set implementation timeline, need not be included. Where APV is not implemented, States should consider implementation of RNP APCH with LNAV minima instead of APV to provide the safety benefits of straight-in approach procedures.

CNS/MET SG/14 – **WP/2**
Agenda Item 5 (3)
19/07/10

International Civil Aviation Organization

FOURTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND METEOROLOGY SUB-GROUP OF APANPIRG (CNS/MET SG/14)

Jakarta, Indonesia, 19 – 22 July 2010

Agenda Item 5: **Navigation**

3) Discuss issues related to implementation of GNSS and review developments that have taken place in the Region

GLOBAL NAVIGATION SATELLITE SYSTEM MANUAL (DOC 9849) – REVISION

SUMMARY

First Edition of GNSS Manual (Doc 9849) was published in 2005 to provide guidance on the implementation of GNSS. There has been a significant change in the global GNSS environment and hence the need has been felt to update the Manual should to reflect those changes. It has also been decided to provide guidance on the hurdles identified by the States in the implementation process. This paper presents a list of hurdles already identified and invites comments. Paper also invites information on additional hurdles faced by the States to supplement the list so that guidance on those also can be included in the Manual.

This paper relates to:

Strategic Objective:
A. Safety – Enhance global civil aviation safety
D. Efficiency – Enhance the efficiency of aviation operations

Global Plan Initiative:
GPI –5 RNAV and RNP (Performance Based Navigation)
GPI – 21 Navigation

1. Introduction

1.1 The Standards and Recommended Practices (SARPs) for Global Navigation Satellite Systems (GNSS) were developed by the Global Navigation Satellite Systems Panel (GNSSP) and were introduced as part of Amendment 76 to Annex 10 to the *Convention on International Civil Aviation – Aeronautical Telecommunications, Volume I (Radio Navigation Aids)* in 2001. Guidance on the technical aspects and the applications of GNSS SARPs are provided in Attachment D to Annex 10, Volume I.

1.2 Subsequently a guidance manual was developed by the GNSSP to provide information on the implementation aspects of GNSS in order to assist the States in the introduction of GNSS operations. First Edition of *Global Navigation Satellite System (GNSS) Manual* (Doc 9849, AN/457) was published in 2005. The document is generally aimed at air navigation service providers (ANSPs) responsible for fielding and operating GNSS elements, and at regulatory agencies responsible for approving the use of GNSS for flight operations. It also provides GNSS information to the aircraft operators and manufacturers.

1.3 With the rapidly changing GNSS operating environment, it was found necessary to review the contents of Doc 9849 and amend them in line with the changes that have taken place. Working Group 2 (WG2) of Navigation Systems Panel (NSP), in its meeting held in November 2009 agreed to draft text for specific sections of the GNSS Manual and Secretariat agreed to coordinate a full review of the manual with the intent of presenting the final draft at the November 2010 NSP meeting.

1.4 Secretariat now requires information from States on the current hurdles to the implementation of GNSS due to the lack or inadequacy of guidance or due to any other factors.

2. Discussions

2.1 Navigation Systems Panel Secretariat, through a Working Paper presented at the NSP Working Group of the Whole meeting held from 17 to 28 May 2010 in Montreal, informed the Meeting that information on hurdles to the implementation of GNSS operations will be solicited from the ICAO Regional Offices and from specific States to support the action of reviewing and updating *Global Navigation Satellite System* (GNSS) Manual (ICAO Doc 9849). Secretariat also invited members and Advisors of the Navigation Systems Panel to provide information, based on their experience and knowledge on hurdles to GNSS implementation by 30 June 2010. A draft version of GNSS Manual proposing changes was also presented by the Secretariat for review by the meeting.

2.2 Subsequent to the publication of GNSS Manual in 2005, implementation activities of Performance Based Navigation (PBN) started globally and Third significantly revised Edition of the Performance Based Navigation (PBN) Manual (Doc 9613, AN/937) had been published in 2008. It was agreed that implementation of PBN, to a large extent is dependent on GNSS. A need therefore has been felt to provide a linkage between GNSS and PBN implementation in the GNSS Manual and avoid duplication of information in the two documents. Also information provided in the manuals needs to be updated to take into account the introduction of new constellations like Galileo etc.

2.3 While updating the manual in line with the observations made above, it has been suggested to incorporate guidance on the issues and hurdles which have been faced by the States while implementing GNSS in their administrations.

2.4 A list of the hurdles, compiled based on the information already available is attached for reference. The meeting is invited to review the list and comment. The meeting is also invited to bring out additional issues, which have been faced during implementation.

3. Action required by the Meeting

3.1 The meeting is invited to:

(a) review the list placed at A**ttachment** identifying the hurdles in the implementation of GNSS and provide comments; and

(b) identify additional hurdles based on their knowledge and experience in implementing GNSS in their administrations.

Attachment to CNS/MET SG/WP/2

Review of GNSS Manual (ICAO Doc 9849)
Current hurdles to the implementation of GNSS operations

1. The Secretary of the Navigation Systems Panel (NSP) is coordinating a revision of the GNSS Manual (Doc 9849). To ensure that the revised manual meets the goal of supporting GNSS implementation at the national level, the Secretary requires information from Regional Offices and States on current hurdles to the implementation of GNSS due to the lack or inadequacy of available ICAO guidance, or to any other factors.

2. At the NSP Working Group of the Whole Meeting in Montreal 17-28 May 2010, participants developed a partial list of hurdles (below), but it is expected that Regional Offices are in the best position to identify other hurdles and to validate the list.

3. The Secretary has asked Mr. Ross Bowie, who retired from NAV CANADA in 2009 and who chaired the NSP working group that developed the current GNSS Manual, to coordinate this work. It would be appreciated if you would provide your comments and suggestions to the NSP Secretary (ACapretti@icao.int) and to Mr. Bowie (ross.bowie@sympatico.ca) via e-mail at your earliest convenience.

4. Preliminary list of hurdles:

- There is uncertainty about NOTAM requirements. The meeting agreed that it was feasible to provide NOTAMs about potential service outages for Basic GNSS Receivers (GPS RAIM) and for SBAS and GBAS to be used as a tool by operators to make operational decisions. The meeting also agreed that the wide variety of avionics implementations that support RNP dictated that aircraft operators should use aircraft-specific tools to predict service outages for their fleets. To do this, operators need basic information about GNSS component planned and actual outages. The meeting went on to discuss ways to address this hurdle in the manual revision. The manual needs to demonstrate the link between NOTAM provision and safety.

- The meeting noted that the GNSS Manual was developed before PBN Manual development started, and that having these two manuals creates confusion. This can be resolved by ensuring compatibility between the two manuals.

- Documentation does not support the requirement of some States to develop a safety assessment. The meeting recommended that the manual describe safety assessments that were used by States to support current operations and to encourage the acceptance of these assessments by other States, while noting any geographical or traffic-related issues that could dictate a differences analysis.

- Some States feel that there is an institutional problem because the current core satellite constellations are operated by the military. The manual needs to stress the commitments to civil aviation by Russia and the United States of America.

- Some States are worried about vulnerability. The current manual addresses this issue and includes mitigation techniques, but this material needs to be emphasized. The manual needs to stress that availability is the issue, spoofing is not an issue for aviation.

- The meeting noted that States do not always use the GNSS Manual as a reference to support implementation.

- States require a business case analysis to support implementation, and the manual does not provide enough information to support identification and quantification of benefits. The meeting agreed that examples would be useful and might obviate the necessity for States to complete their own business cases for simple applications like Basic GNSS non-precision approach operations.

- The implementation of GNSS-based terminal area operations in some States faces the requirement for an environmental assessment including extensive public consultation, all at great cost. This is a difficult institutional issue that has no easy solution.

- Some States do not know how to address aircraft certification, in part because there are currently different standards applied globally.

- Some States perceive there is a barrier to APV implementation because of the lack of currency and consistency among ICAO publications. The meeting agreed that the manual should clearly show that APV is possible despite these issues, perhaps including a documentation map and that the NSP should work within ICAO to resolve inconsistencies.

- The meeting noted that there is a lack of GNSS knowledge within some regulatory agencies, and that this is exacerbated by inconsistencies in ICAO documentation. The meeting agreed that the manual should be revised to support the education of regulators. Once the manual is revised there should be a program to provide material and support to regional offices to allow them to provide pertinent information to States.

- Some States have difficulties meeting survey requirements because responsibilities are split between ANS providers and airport operators.

- A major hurdle to full implementation in most States is avionics equipage. Aircraft operators face major costs to equip their fleets, and to equip a large fleet can take five years or more. At the same time, different mandates, different airspace requirements and different mandate deadlines in different areas make it difficult to decide when to equip. As an example, in Europe there is a mandate for ADS-B that can be supported by C129 avionics, and a mandate for APV that requires more advanced avionics. There is a requirement for a vision developed among ANSPs and aircraft operators.

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DRAFT TERMS OF REFERENCE

PBN Regional Development and Implementation Teams (PBN REDI Teams)

It was recognized that PBN implementation has not kept pace with ICAO objectives and timelines. From a review of State plans, it is evident many States are struggling and increased efforts need to be made to provide direct support.

To support this effort, APANPIRG is requested to:

a) Identify States within the region that are further advanced in PBN and request their commitment to provide support to other States as part of a regional support program;

b) Formulate cooperative arrangements with these volunteering States to leverage knowledge and experience already gained and to assist developing States;

c) Develop additional support mechanisms that create skills and capabilities within States to implement and to sustain PBN operations;

d) Further promote PBN to decision makers within States to create the political will to invest and devote the necessary resources for PBN implementation;

e) Establish PBN Regional Development and Implementation Teams (PBN REDI Teams); and

f) Establish a mechanism to ensure appropriate resourcing is available.

<u>Draft Terms of Reference:</u>
<u>PBN Regional Development and Implementation Teams (PBN REDI Teams)</u>

The objective of the PBN REDI Teams is:

1) To identify implementation needs and to direct and/or organize the appropriate resources that will deliver PBN solutions to States;

2) To meet this objective the REDI Team shall directly assist States to achieve:

   a) completion and improvement of PBN implementation plans;

   b) conducting safety assessments;

   c) collection of required data and practices to maintain data integrity; and

   d) guidance to establish the regulatory framework, approvals process and other mechanisms necessary for implementation and sustainment of PBN capabilities.

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ISCS OPERATIONAL FOCAL POINTS

Note. – This list is kept up-to-date by the ICAO Secretariat based on the input from States

Update: July 2010

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	Iman Sukardi Hasanuddin Meteorological Station Hasanuddin Airport – Makassar South Sulawesi 97552	Tel: +62 4 1155 3019 Fax: +62 4 1155 3087 E-mail: imamsukardi@telkom.net
JAPAN	**Osamu Hamada** 1-3-4 Otemachi Chiyoda-ku Tokyo 1008122	Tel: +81 (3) 3212-8341 Fax: +81 (3) 3284-0180 E-mail: o-hamada@met.kishou.go.jp
MALAYSIA	**Ab Llah Che Cob** Malaysian Meteorological Department 1st Floor, Airport Management Centre KL International Airport, 64000 Sepang Selangor	Tel: +603 8787 2388 Fax: +603 8787 1020 E-mail: ablah@met.gov.my
NEW ZEALAND	**Matt Ruglys** Manager, Aviation Forecasting MetService, 30 Salamanca Road Kelburn, P.O. Box 722 Wellington 6140	Tel: +64 (4) 470 0731 Fax: +64 (4) 470 0748 E-mail: matt.ruglys@metservice.com
PAPUA NEW GUINEA	**Kevin Luana** PNG National Weather Service UNDP, ADF House, 3rd Floor Musgrave Street, Port Moresby	Tel: +675 325 2788 Fax: +675 325 5544 E-mail: kluana@pngmet.gov.pg
THE PHILIPPINES	**Lazaro M. Marqueses** Aeronautical Meteorology Services, Weather Division, PAGASA, Room 415, IPT Building, NAIA, Pasay City Metro Manila 1300	Tel: +63 (2) 879 5269 +63 (2) 852 2927 Fax: +63 (2) 832 3023 E-mail: lm_marqueses@pagasa.dost.gov.ph lalloymmarqueses@yahoo.com
	Roel M. Santiago	Tel: +63 (2) 879 9159 Fax: +63 (2) 879 9288 E-mail: roemarie5368@yahoo.com
REPUBLIC OF KOREA	**Dong-Su Kim** Korea Meteorological Agency Incheon International Airport Post Office Box No. 43 Incheon 300-560	Tel: +82 (32) 740 2841 Fax: +82 (32) 740 2847 E-mail: kimdsu@kma.go.kr

STATE	NAME & TITLE	TEL/FAX/E-MAIL
SINGAPORE	**Chua Guat Mui** Meteorological Service National Environment Agency # 048-033, 4th Storey, South Finger Passenger Terminal Building II Singapore 819643	Tel: +65 6542 2861 Fax: +65 6542 5026/6545 7192 E-mail: chua_guat_mui@nea.gov.sg
THAILAND	**Somchai Yimsricharoenkit** Meteorologist, Professional Level Bureau of Aeronautical Meteorology 6th Floor, ATC Complex Suvarnabhumi International Airport Rachatheva, Bang Phli Samut Prakarn 10540	Tel: +66 (2) 134 0007 Fax: +66 (2) 134 0010 E-mail: somchai_yim@hotmail.com
VANUATU	**Jotham Napat** Vanuatu Meteorological Service Private Mail Bag 054 Efate,Port Vila	Tel: +678 23866 Fax: +678 22310 E-mail: jnapat@meteo.gov.vu

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APPENDIX B
EXAMPLE OF THE AUTHORIZATION FORM

Note. – This is an example of the form – the most up-to-date version of this form can be found on the WIFS web-site

WIFS AUTHORIZED USER APPLICATION

General Information	
Date of Application	
State	
ID	
WAFC	
Point of Contact Information	
First Name	
Last Name	
E-mail	
Phone	
Address	
City	
WorkStation Information	
E-mail	
Phone	
Address	
City	
Vendor	
Operating System	
FAA Approval Authority	
Approved Date	
Approved By	
For AWC use only	
Entered Date	
Entered By	
User Name	
Password	

WAFC AND SADIS DEVELOPMENTS

WAFC

- Continued development and implementation of WAFS upper-air forecasts in GRIB 2 code form including forecast parameters for CB, icing and turbulence
  - Harmonization of content, encoding and compression algorithms
  - Harmonization of CB, icing and turbulence forecasts continues

- Implemented provision of WAFS Aviation GRIB 2 data in compressed form on server based system SADIS FTP (and WIFS) on 2 March 2010
  - CB, icing and turbulence made available as trial forecasts for evaluation
  - Not available yet on SADIS (and ISCS) satellite broadcasts
  - *Consider contacting workstation vendors for updates on software enhancements to visualize WAFS Aviation GRIB 2 data*

- Provision of WAFS Aviation GRIB 2 data via SADIS 2G (and ISCS) broadcast
  - Effective 18 November 2010
  - CB, icing and turbulence not initially transmitted (after endorsement of WAFSOPSG)
  - *Consider contacting workstation vendors for updates on software enhancements to visualize WAFS Aviation GRIB 2 data*
  - *Monitor WAFS Change Implementation Notice Board on WAFSOPSG for further information on implementations*

- Alignment of SIGWX issue times on 15 June 2010
  - SWH BUFR, SWM BUFR and SIGWX PNG issued 17 hours ahead of validity
    - 15 hours ahead of validity under WAFC backup scenarios – test or real

- WAFC backup tests
  - Routine quarterly tests successful this past year and mainly transparent
  - Administrative message used to notify of WAFC backup tests
  - *Consider visiting the WAFSOPSG website to obtain information pertaining to WAFC backup tests and procedures*

- Corrections to WAFS SIGWX forecasts
  - Implemented plain text administrative bulletin that advise on identified errors
  - BUFR data or PNG charts are not reissued with corrections (reference WAFSOPSG4)
  - Synchronizing lead time of SWH BUFR, SMH BUFR and PNG SIGWX charts on 15 June 2010 has eliminated the large number of bulletins associated with the receipt of Volcanic Ash or Tropical Cyclone advisories after the issuance of SWH BUFR but before the issuance of SWM BUFR and PNG SIGWX charts
  - *Guidance available on WAFSOPSG website*

- Workshop on gridded WAFS forecasts for icing, turbulence and CB cloud held in Paris, 14-15 September 2009
    - Preference for WAFS forecasts to be provided in current form
    - WAFS Aviation GRIB data (GRIB 1 and GRIB 2) and WAFS SIGWX BUFR should be provided as raw data and visualized by workstation software
        - Development of WAFS web-based server forecasts temporarily suspended
    - Further harmonization of forecasts necessary and reiterated at WAFSOPSG/5 (update at WAFSOPSG/6)
    - Provide guidance on the use of products necessary (update at WAFSOPSG/6)

- Implemented additional WAFS output performance indicators at WAFC London on 9 February 2010 for standard levels of 850, 700, 500, 400, 300, 275, 225, 200, 150, 100 hPa

- Update to the legend box text of WAFS forecasts that indicates the provider of data and the issuer of source data (one of the WAFCs)
    - To be implemented on 18 November 2010
    - *Consider visiting WAFSOPSG website to obtain information on WAFS forecast legend boxes*

- Maintain web-based coordination procedures between WAFCs and TCACs for increased harmonization of tropical cyclone information

- Provide updates to Guidance for States on the use and visualization of new gridded WAFS forecasts (present at WAFSOPSG/6)

- Developing web-based training for States and WAFS users and associated costs for possible endorsement at WAFSOPSG/6
    - *Consider training needs on the interpretation and use of the new gridded products*

SADIS

- Upgraded uplink ground segment infrastructure of the SADIS 2G service
    - To provide quality, reliable service for next 5 years
    - Reduced support and maintenance costs
    - Opportunity to purchase cold spares

- Progress made in eliminating cause of transmission data losses on SADIS 2G
    - Continue investigation of data losses
    - note that some are due to reception issues

- Update to the 4th edition of the SADIS User Guide
    - GRIB 2 data on SADIS
    - Issue time changes of SIGWX forecast data
    - Other editorials

- Development of Secure SADIS FTP service also known as Phase 2
    - Available 18 November 2010
    - Assist work station vendors on implementation
    - Existing service to run in parallel with Phase 2 for at least 12 months
    - *Consider re-registering for Secure SADIS FTP upon receipt of invitation by SADIS Provider and contact work station vendors for updates on software enhancements*

- SADIS 2G future bandwidth will not change
    - Spare capacity no longer needed and saves cost

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SADIS Strategic Assessment Tables

**SUMMARY OF THE STRATEGIC ASSESSMENT TABLES:
CURRENT AND PROJECTED DATA VOLUMES 2010-2014**

Table 1. OPMET data volumes per day (in K bytes)

Region	*Current 2010*	*Projected 2011*	*Projected 2012*	*Projected 2013*	*Projected 2014*
ASIA	970	975	1010	1041	1065

Table 2. PNG data volumes per day (in K bytes)

Region	*Current 2010*	*Projected 2011*	*Projected 2012*	*Projected 2013*	*Projected 2014*
ASIA	195	195	195	195	195

Table 3. AIS data volumes per day (in K bytes)

Region	*Current 2010*	*Projected 2011*	*Projected 2012*	*Projected 2013*	*Projected 2014*
ASIA	2	2	2	2	2

APPENDIX B

SADIS STRATEGIC ASSESSMENT TABLES CURRENT AND PROJECTED DATA VOLUMES 2011-2014

Note.— 1 octet = 1 byte = 1 character.

Table 1. ASIA— OPMET data volumes

OPMET data	*Current 2010*	*Projected 2011*	*Projected 2012*	*Projected 2013*	*Projected 2014*
ALPHANUMERIC DATA Number of **FC bulletins** issued per day	0	0	0	0	0
Number of **FT bulletins** issued per day	312	350	380	400	410
Number of **SA bulletins** issued per day	2355	2400	2450	2500	2550
Number of **SP bulletins** issued per day	3	20	30	45	50
Number of **SIGMET** bulletins issued per day	72	85	95	100	105
TOTALS Total number of OPMET bulletins per day	2886	2855	2955	3045	3115
Average size of OPMET bulletin (bytes)	344	350	350	350	350
Total estimated OPMET data volume per day (in K bytes)	**970**	**975**	**1010**	**1041**	**1065**

Note. — No provision is being made for the distribution of BUFR-coded OPMET data. Capacity for this data may need to be included in future depending on the issuance of this data in the region.

Table 2. ASIA — PNG data volumes

Graphical information in the PNG chart form	*Current 2010*	*Projected 2011*	*Projected 2012*	*Projected 2013*	*Projected 2014*
TOTALS Total number of PNG charts per day	2	2	2	2	2
Average size of charts (bytes)	100000	100000	100000	100000	100000
Total estimated volume of PNG charts per day (in K bytes)	**195**	**195**	**195**	**195**	**195**

Note. — Provision is made for the distribution of PNG-encoded VAG.

Table 3. ASIA — AIS data volumes

AIS data	*Current 2010*	*Projected 2011*	*Projected 2012*	*Projected 2013*	*Projected 2014*
ALPHANUMERIC AIS DATA (NOTAM related to volcanic ash, ASHTAM) Number of ASHTAM bulletins issued per day	2	2	2	2	2
Number of NOTAM bulletins issued per day	2	2	2	2	2
TOTALS Total number of AIS bulletins per day	4	4	4	4	4
Average size of AIS bulletin (byte)	600	600	600	600	600
Total estimated volume of AIS data per day (in K bytes)	**2**	**2**	**2**	**2**	**2**

Note. — Provision is made for the distribution of ASHTAMs and NOTAMs related to volcanic ash.

ASIA/PAC WAFS Implementation Plan and Procedures

13th Edition - July 2010

ASIA/PAC WAFS Implementation Plan and Procedures

13th Edition - July 2010

Introduction

1. The Asia/Pacific WAFS Implementation Plan and Procedures has been revised to take account of progress made in the region.

The Implementation of WAFS

2. This plan is based on the understanding that the implementation of WAFS in the Asia/Pacific Region involves the:

a. Production and dissemination by the WAFCs of global forecast winds, temperatures, tropopause height, tropopause temperature and humidity in GRIB format.

b. Implementation of communication system/s for the reception or retrieval of WAFS products in the Asia/Pacific Region by all States in support of international air navigation. The current communication systems include satellite broadcast (SADIS and ISCS/G2), FTP and WAFS Internet File Service (WIFS) and will soon include Secure SADIS FTP. States may need to use an alternative distribution system.

c. Production and distribution by the WAFCs, of Global, quality controlled SWH (FL 250 - 630) in BUFR format and in PNG format for the ICAO standard areas.

d. Production and distribution by the WAFCs of quality controlled SWM (FL 100 - 250) in BUFR format and in PNG format over limited geographical areas where required by PIRGs.

e. Capability of States to convert current BUFR and GRIB messages to graphical products on an operational basis.

f. Implementation of WIFS.

g. Access to WAFS data on the planned Secure FTP server at WAFC London.

h. Development and utilization of gridded forecasts of icing, turbulence and CB~~convective clouds~~.

i. Transition from GRIB1 to GRIB2 WAFS data.

WAFS SIGWX Forecasts & Gridded Data Fields

3. There will be an ongoing requirement for NMSs to monitor the quality of WAFC products.

4. Action required to be taken by States to adhere to the provision of Annex 3 to ensure the relevant advisories for tropical cyclones, volcanic ash, the accidental release of radioactive material and SIGMETs are made available to the WAFCs in a timely manner. The WAFS Implementation Task Force will coordinate with the ICAO Secretariat and the VAACs in the Region to also make available ASHTAMs and NOTAMs for VA to the WAFCs in a timely manner.

5. The SIGWX forecasts produced by WAFC Washington are also available on the US NWS Aviation Weather Center Internet site at: http://aviationweather.gov/iffdp/sgwx.php. All WAFC London and WAFC Washington products are available on the internet-based SADIS FTP server.

6. States are encouraged to provide regular feedback to WAFC London and WAFC Washington about the quality and accuracy of both SIGWX forecasts and various gridded data fields. Contact details for comments are:

WAFC Washington

i. NWS/Aviation Weather Center
Attention: Mr Michael Pat Murphy
Warning Coordination Meteorologist
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371

ii. E-mail addressed to: Michael.Pat.Murphy@noaa.gov

iii. Fax number: 1 816 880 0650

WAFC London

i. The Met. Office
Attention: Mr. Nigel Gait
International Aviation Manager
Fitzroy Road
Exeter
Devon EX1 3PB
United Kingdom

ii. E-mail addressed to: nigel.gait@metoffice.gov.uk

iii. Fax number: +44 (1392) 885 681

Gridded Forecasts of Icing, Turbulence and CB~~onvective Clouds~~

7. Gridded forecasts of icing, turbulence and CB~~convective clouds~~ are made available on a trial basis by the two WAFCs via SADIS FTP & WIFS for evaluation by NMSs. Currently there is no standard method for the displaying of these gridded forecasts. Work is underway at WAFSOPSG to determine a standardized method of displaying these parameters and provide “at a glance” products, similar to current SIGWX charts, for flight planning purposes. Training will be provided to WAFS users on the utilization of the gridded forecasts. This training is likely to be provided in the form of computer based training (CBT).

Distribution of WAFS Products

8. The two WAFCs provide global forecast winds, temperatures, tropopause height, tropopause temperature and humidity in GRIB format, global quality controlled SWH and quality controlled SWM for limited geographical areas in PNG and BUFR formats. These products are available via satellite (SADIS & ISCS) and internet (FTP & WIFS) communication channels. Suitable decoding and visualization software is required by States in the Asia/Pacific Region to operationally construct graphical SIGWX from the BUFR files~~messages~~ and a range of products from the GRIB files of gridded datasets. The provision of PNG formatted SIGWX charts from WAFCs is expected to continue for the foreseeable future.

9. Recently the two WAFCs offered a range of gridded datasets in GRIB2 format. The GRIB2 products offer a higher spatial resolution (unthinned 1.25° x 1.25°, rather than thinned 2.5° x 2.5°) and higher temporal resolution (3 hourly rather than 6 hourly). The two WAFCs welcome feedback on these new GRIB2 fields as well as the new communication channels (secure FTP and WIFS).

WAFC London Services

10. WAFC London provides WAFS data over its satellites service (SADIS 2G) and via SADIS FTP internet based service. The SADIS 2G service will continue to operate until at least 2015. States wishing to utilise the satellite service should arrange for the procurement of the necessary hardware, and as necessary, compliant visualization software. Guidance material for users accessing the SADIS 2G broadcast is available at the SADIS web site – http://www.metoffice.gov.uk/sadis/index.html.

11. The current SADIS FTP service is made available for the purpose of providing a backup to the satellite based service. To improve deficiencies in the FTP protocol, specifically proof of source and data integrity, WAFC London is in the process of implementing a secure SADIS FTP service using Digital Signing technology. It is anticipated that this service will be available by November 18, 2010.

WAFC Washington Services

12. WAFC Washington plan to terminate the ISCS satellite broadcast on 30 June 2012. The data currently provided by ISCS satellite service will then be available via WIFS. The WIFS commenced operation in May 2010. WIFS provides access to WAFS products which are stored in directories, grouped by type. This data is accessed by the WAFS workstation application using the GNU “wget”, a free software package for retrieving files using HTTPS, a widely-used secure

Internet protocol. This open source package is available for Windows or Linux Operating Systems. States wishing to get access to WIFS:

- require WIFS server access details. To obtain these details, each State needs to submit a WIFS registration form, which is available on the WIFS web site, http://aviationweather.gov/wifs.

- should commence discussions with their WAFS visualisation/workstation provider to ensure their software supports WIFS data retrieval. Further details on the WIFS can be found at the aforementioned WIFS web site.

Indicative Timetable for Implementation of WAFS

13. The table given in Attachment 1 provides an indicative timetable for the implementation of WAFS within the Asia/Pacific Region.

Volcanic Ash Advisory Centres (VAACs)

14. The VAACs are encouraged to monitor WAFS SIGWX forecasts that cover their areas of responsibility, and to advise the appropriate WAFC to ensure the accurate inclusion of the volcanic ash symbol.

Tropical Cyclone Advisory Centres (TCAC)

15. The TCACs are encouraged to monitor WAFS SIGWX forecasts that cover their areas of responsibility, and to advise the appropriate WAFC to ensure the accurate inclusion of the tropical cyclone symbol.

16. The operational contact points in the WAFCs for coordination with the VAACs and TCACs are:

WAFC Washington

i. NWS/Aviation Weather Center
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371

ii. Tel: 1 816 584 7269

WAFC London

i. The Met. Office
Attention: WAFC London Forecaster
Fitzroy Road
Exeter
Devon EX1 3PB
United Kingdom

ii. Tel: 00-44-1392-884926 or 00-44-1392-884908

Attachment 1

ASIA/PAC WAFS Implementation Plan and Procedures

Indicative Timetable for Implementation of WAFS

Item	Task/Stage of Implementation of WAFS	Anticipated Date
1	WAFC London products on access controlled internet site	Completed
2	The establishment of back-up distribution arrangements for WAFS products	Completed
3	Training in the operational conversion of GRIB forecasts to Wind / Temp charts	Completed
4	All states that receive GRIB products capable of converting GRIB forecasts to Wind / Temp charts	Completed
5	Removal of T4 Facsimile Wind / Temp charts from the satellite broadcast	Completed
6	Training in the operational conversion of BUFR to SIGWX charts	Completed
7	States having the ability to operate the decoding software to convert BUFR SIGWX messages into graphical format	Completed
8	The satellite distribution by the two WAFCs of global SWH and of SWM for limited geographical areas in BUFR format	Completed
9	Launch of SADIS 2G service	Completed
10	SADIS 2G seminar for ASIA/PAC States	Completed
11	Removal of T4 Facsimile SIGWX products from the satellite broadcast	Completed
12	Procurement of SADIS 2G hardware by SADIS user States	Completed
13	Termination of the SADIS 1G service	Completed

Item	Task/Stage of Implementation of WAFS	Anticipated Date
14	Launch of trial gridded forecasts of icing, turbulence and convective clouds	Completed
15	Implementation of WAFS Internet File Service (WIFS)	Completed
16	Workshop on gridded forecasts of icing, turbulence and convective clouds	Completed
17	WAFCs begin ~~parallel broadcast~~provision of WAFS forecasts in the GRIB2 code form via internet based services (FTP/WIFS)	Completed
18	WAFCs begin broadcast of WAFS forecasts in the GRIB2 code form (excluding gridded forecasts of icing, turbulence and CB) via satellite services (SADIS/ISCS)	November 2010
19	WAFCs provide web-based gridded forecasts of icing, turbulence and CB	Suspended until WAFSOPSG/6
20	Regional training on the use of the gridded forecasts	To be discussed at WAFSOPSG/6 Mar 2011
21	WAFS end-user workstations upgraded to accept the GRIB2 code form	May 2011 – November 2013
22	Termination of the ISCS-G2 service	30 June 2012
23	Broadcast of WAFS forecasts in the GRIB 1 ceases	November 2013
24	Implementation of Secure SADIS FTP Service	November 2010

ASIA/PAC WAFS IMPLEMENTATION TASK FORCE

1. Terms of Reference

(a) Assist in expediting~~Expedite~~ the implementation of the World Area Forecast System (WAFS) in the Asia and Pacific Regions;

(b) Maintain awareness of current and future requirements with respect to the World Area Forecast System (WAFS);

(c) Maintain awareness of the implementation of WAFS within the Asia and Pacific Regions and any deficiencies;

(d) Continually seek ways to improve the operational effectiveness of the WAFS and products generated from WAFS datasets; and

(e) Provide advice to the CNS/MET Sub-group on the above issues.

2. Work Programme

The work to be addressed by the ASIA/PAC WAFS Implementation Task Force (WAFS/I TF) includes:

(a) ~~Coordinating the outstanding implementation of SADIS 2G service in the Asia and Pacific Regions~~ Responding to the needs of States for guidance and information related to the implementation of WAFS within the Asia and Pacific Regions.

(b) ~~Coordinating the migration of ISCS G2 service to ISCS G3 service in the Asia and Pacific Regions~~ Monitoring the migration from ISCS-G2 service to other WAFS services in the Asia and Pacific Regions.

(c) Coordinating the arrangement of training and providing user's feedback on the utilization of gridded forecasts of icing, turbulence and cumulonimbus clouds.

(d) Coordinating the migration of GRIB1 to GRIB2 WAFS data.

(e) Coordinating the provision of assistance to States to ensure that WAFS can be effectively implemented in the Asia and Pacific Regions.

(f) Providing inputs (via the CNS/MET SG) to APANPIRG on the regional planning and development of WAFS for coordination with the WAFSOPSG.

(g) Keeping the ASIA/PAC WAFS Implementation Plan and Procedures up to date.
The work is expected to be carried out primarily by correspondence.

3. Composition

The Task Force is composed by experts from:
Australia; Hong Kong, China (Chairman); India; Japan; New Zealand; Singapore; Thailand; United Kingdom (SADIS Provider State); United States (ISCS Provider State), and IATA.

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ACC AFTN addresses used by VAACs

Volcanic Ash Advisory Center	ACC to which advisory information is to be sent (for ASIA/PAC Region)	ICAO location indicator	AFTN address	State to provide ACC AFTN address
Anchorage	Tokyo	RJTG	RJAAYMYX	
Darwin	Adelaide	YPAD	YMMMZRZX	
	Bangkok	VTBB	VTBBYPYX	
	Brisbane	YBBN	YBBBZRZX	
	Cairns	YCBS	YBBBZRZX	
	Chennai	VOMF	VOMMZRZX	
	Darwin	YPDN	YBBBZRZX	
	Hanoi	VVNB	VVNBZRZX	
	Ho-Chi-Minh	VVTS	VVTSZRZX	
	Hobart	YMHB	YMMMZRZX	
	Honiara	AGGH	AGGGZQZX	
	Jakarta	WIIF	WIIIZQZX	
	Kota Kinabalu	WBFC	WBFCZQZX	
	Kuala Lumpur	WMFC	WMFCZQZX	
	Manila	RPHI	RPHIZRZX	
	Melbourne	YMMM	YMMMZRZX	
	Perth	YPPH	YMMMZRZX	
	Port Moresby	AYPM	AYPMZRZX	
	Singapore	WSJC	WSJCZRZX	
	Sydney	YSSY	YMMMZRZX	
	Townsville	YBTL	YBBBZRZX	
	Ujung Pandang	WAAF	WAAAZRZX	
	Yangon	VYYF	VYYFZRZX	
Tokyo	Bangkok	VTBB	VTBBYPYX	Thailand
	Beijing	ZBAA	ZBBBYPYX	
	Hohhot	ZBHH	ZBHHYMYX	
	Taiyuan	ZBYN	ZBYNYMYX	
	Hanoi	VVNB		Viet Nam
	Ho-Chi-Minh	VVTS		Viet Nam
	Guandzhou	ZGGG	ZGGGYMYX	
	Changsha	ZGHA	ZGHAYMYX	
	Guillin	ZGKL	ZGKLYMYX	
	Nanning	ZGNN	ZGNNYMYX	
	Hong Kong	VHHH	VHHHZQZA	Hong Kong-China
	Incheon	RKRR	RKRRZQZX	

Volcanic Ash Advisory Center	**ACC to which advisory information is to be sent (for ASIA/PAC Region)**	**ICAO location indicator**	**AFTN address**	**State to provide ACC AFTN address**
	Kunming	ZPPP	ZPPPYMYX	
	Chengdu	ZUUU	ZUUUYMYX	
	Chongqing	ZUCK	ZUCKYMYX	
	Lanzhou	ZLLL	ZLLLYMYX	
	Xi'an	ZLXY	ZLXYYMYX	
	Manila	RPHI		Philippines
	Phnom-Penh	VDPP	VDPPZRZX	Cambodia
	Pongyang	ZKKK		DPR Korea
	Sanya	ZJSY	ZJSYYMYX	
	Shangai	ZSSS	ZSSSYMYX	
	Hefei	ZSOF	ZSOFYMYX	
	Jinan	ZSJN	ZSJNYMYX	
	Nanchang	ZSCN	ZSCNYMYX	
	Nanjing	ZSNJ	ZSNJYMYX	
	Qingdao	ZSQD	ZSQDYMYX	
	Xiamen	ZSAM	ZSAMYMYX	
	Shenyang	ZYTX	ZYTXYMYX	
	Dalian	ZYTL	ZYTLYMYX	
	Hailar	ZBLA	ZBLAYMYX	
	Harbin	ZYHB	ZYHBYMYX	
	Taibei	RCTP		China
	Tokyo	RJTG		Japan
	Fukuoka	RJDG		Japan
	Naha	RORJ		Japan
	Saporo	RJCG		Japan
	Ulan-Bator	ZMUB		Mongolia
	Urumqi	ZWWW	ZWWWYMYX	
	Wuhan	ZHHH	ZHHHYMYX	
Toulouse	Chennai	VOMF	VOMMZRZX	
	Delhi	VIDF	VIDPZRZX	
	Dhaka (+Tokyo)	VGFR		Bangladesh
	Kabul	OAKX		Afghanistan
	Karachi	OPKR		Pakistan
	Kathmandu	VNSM		Nepal
	Kolkata (+Darwin)	VECF	VECCZRZX	
	Lahore	OPLR		Pakistan
	Male	VRMF	VRMFZGZX	
	Mumbai	VABF	VABBZRZX	
	Urumqi (+Tokyo)	ZWUQ		China

Volcanic Ash Advisory Center	ACC to which advisory information is to be sent (for ASIA/PAC Region)	ICAO location indicator	AFTN address	State to provide ACC AFTN address
Washington	Honolulu	PHZH	PHZHZRZX	United States
	Oakland	KZOA	PAZAZRZX	United States
	Guam	PGZU	PGUMZRZX	United States
	Tokyo	RJTG	RJAAYMYX	Japan (above)
Wellington	Brisbane	YBBB	YBBBZQZX	
	Honiara	AGGH	AGGGZQZX	
	Honolulu	PHZH	PHZHZQZX	
	Melbourne	YMMM	YMMMZQZX	
	Nadi	NFFF	NFFFZRZX	
	Tahiti	NTTT	NTTTZQZX	
	Auckland	NZZO	NZZOZQZX	
	Christchurch	NZZC	NZZCZQZX	

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ICAO APANPIRG CNS/MET
METEOROLOGICAL WARNING IMPLEMENTATION
TASK FORCE (METWARN I/TF)

1. TASK TEAM – TO CONFIRM NOMINEES AND CONTACT INFORMATION		
Secretariat	**Address**	**Contact**
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Member Name INDONESIA	(transferred from OPMET/M TF membership – no contact information declared – to confirm)	
Member Name MALAYSIA	(transferred from OPMET/M TF membership – no contact information declared – to confirm)	
Member Name MALDIVES	(transferred from VA/TC I TF membership – no contact information declared – to confirm)	
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Member Name THAILAND	(to obtain contact information)	
Member Name TONGA	(transferred from VA/TC I TF membership – no contact information declared – to confirm)	
Member Name UNITED KINGDOM	(to obtain contact information)	
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Member Name VIET NAM	(transferred from OPMET/M TF membership – no contact information declared – to confirm)	

2. DESCRIPTION	
Objective	Improve the quality of meteorological advisories and warnings and implement the International Airways Volcano Watch (IAVW) and International Tropical Cyclone Watch (ITCW).
Benefits	a) Improve in-flight safety by providing information on volcanic ash, tropical cyclone ~~or~~ and other hazardous weather. b) Improve pre-flight planning by optimizing flight routes with respect to volcanic ash, tropical cyclone and other hazardous weather phenomena.
Terms of Reference	Under guidance from ICAO Secretariat: a) Maintain awareness of current and future requirements with respect to the issuance of meteorological advisories and warnings; b) Maintain awareness of the implementation of meteorological advisories and warnings within the ASIA/PAC Region and any deficiencies; c) Continually seek ways to improve the operational effectiveness of the meteorological advisory and warning system; d) Provide advice to the CNS/MET Sub-group on the above issues.
Work Program	The work to be addressed by the ASIA/PAC METWARN/I TF includes: a) Review procedures for the issuance of meteorological advisories and warnings in the region and propose actions for their improvement to related performance objectives; b) In conjunction with OPMET Management Task Force, investigate the deficiencies in the format and dissemination of meteorological advisories and warnings (e.g. conducting routine SIGMET tests) and propose remediation plans; c) Respond to the needs of the States for guidance and/or training related to the implementation of meteorological advisories and warnings, including the SIGMET Guide; d) In conjunction with MET/ATM TF, provide meteorological input for contingency planning for specific phenomenon including Volcanic Ash, Radioactive Cloud, Tropical Cyclone and Tsunami; e) Follow the developments in the States related to the improvement of meteorological advisories and warnings and provide regional input on these matters to relevant ICAO and WMO groups; f) Report on its work to the CNS/MET Sub-group of APANPIRG.

3. COMMUNICATION STRATEGIES				
Description	**Target Audience**	**Delivery Method**	**Frequency / Date**	**Responsibility**
Work Plan	Task Force Members	Document via email and posted on ICAO Bangkok website	As required but reviewed at least quarterly	Co-Chairs
General correspondence	Task Force Members	Email	As required	Task Force Members
Task Force Meeting	Task Team Members	Meeting in conjunction with OPMET M/TF	Yearly in March	Co-Chairs
Status & Milestone Reports	ICAO Secretariat and Task Team Members	Report via email	Quarterly	Co-Chairs
Task Force Report	METWARN I/TF and OPMET M/TF	Working Paper	Yearly	Co-Chairs
Task Force Report	APANPIRG CNS/MET SG	Working Paper	Yearly	Secretariat

4. MILESTONES			
Milestone	**Accountability**	**Dates**	**Status**
Milestone 1a: SIGMET Guide available on web	*Secretariat*	*15/02/11*	
Milestone 1b: Report (or Input) to METWSG/3 as to the establishment of METWARN I/TF	*Co-Chairs*	*11/11/10*	
Milestone 2: Report(or Input) to MET/ATM coordination Seminar in Fukuoka, Japan	*Co-Chairs*	*24/01/11*	
Milestone 3: Report to METWARN I/TF	*Co-Chairs*	*01/03/11*	
Milestone 4: Report to CNS/MET Sub-Group 15th Meeting	*Secretariat*	*17/07/11*	
Milestone 5:			
Milestone 6:			
Milestone 7:			

5.1 WORK PLAN				
Task / Milestone	**Accountability**	**Predecessors**	**Date**	**Status**
Activity 1: SIGMET GUIDE				
Task 1.1: Review amendment 75 to Annex 3 to identify relevant changes	Task Force		01/10/10	Commenced
Task 1.2: Review SIGMET Guide	Task Force		01/10/10	
Task 1.3: Submit SIGMET Guide amendments to Co-chairs	Task Force	1.1 and 1.2	01/11/10	
Task 1.4: Propose updates to the Regional SIGMET Guide to the Secretariat	Co-Chairs	1.3	15/11/10	
Task 1.5: State Letter	Secretariat	1.4	01/12/10	
Task 1.6: SIGMET Guide updated	Secretariat	1.5	01/02/11	
Milestone 1a: SIGMET Guide available on web	*Secretariat*	*1.6*	*15/02/11*	
Milestone 1b: Report to METWARN I/TF	*Co-Chairs*	*1.6*	*01/03/11*	

5.2 WORK PLAN				
Task / Milestone	**Accountability**	**Predecessors**	**Date**	**Status**
Activity 2: SIGMET TESTS				
Task 2.1： Identify deficiencies according to SIGMET Tests	Co-Chairs OPMET M/TF	SIGMET Tests	Nov 2011	
Task 2.2: Condider remediation plan	Task Force	2.1	Jan 2011	
Task 2.3: Draft remediation plan at METWARN I/TF	Co-Chairs	2.2	Mar 2011	
Task 2.4： Propose draft actions to CNS/MET SG/15	Secretariat	2.3	Jul 2011	
Task 2.5:				
Milestone 2: Successful completion of SIGMET test			*Nov 2010*	

5.3 WORK PLAN				
Task / Milestone	**Accountability**	**Predecessors**	**Date**	**Status**
Activity 3: EDUCATIONAL MATERIAL				
Task 3.1:Identify the needs for educational material and training	Task Force			
Task 3.2: Coordinate draft actions	Task Force			
Task 3.3: Draft actions at METWARN I/TF	Co-Chairs	3.2	Mar 2011	
Task 3.4: Propose draft actions to CNS/MET SG/15	Secretariat	3.3	JUL 2011	
Task 3.5:				
Milestone 3a: SIGMET posters published to web				

Milestone 3b: SIGMET seminars (work with WMO/CAeM				

5.4 WORK PLAN				
Task / Milestone	**Accountability**	**Predecessors**	**Date**	**Status**
Activity 4: REGIONAL VOLCANIC ASH CONTINGENCY PLANS				
Task 4.1: Review outcomes of IVATF 1st meeting in Montreal	Task Force	IVATF 1st meeting		
Task 4.2 Review EUR/NAT contingency plan	Task Force			
Task 4.3: Review current status of VA detection and forecasting in the region	Task Force			
Task 4.4: Consider draft proposal to METWARN I/TF	Co-Chairs		Mar 2011	
Task 4.5: Propose draft contingency plan framework to CNS/MET SG/15	Secretariat		JUL 2011	
Milestone 4:deliver framework for AsiaPac Contingency plan			*CNS/MET 15*	

5.5 WORK PLAN				
Task / Milestone	**Accountability**	**Predecessors**	**Date**	**Status**
Activity 7: SIGMET ADVISORY TRIAL				
Task 7.1: Liaise with METWSG to define roles	Co-Chairs			
Task 7.2: Develop procedure	Task Force			
Task 7.3: Develop validation program	Task Force			
Task 7.4: Notification of participants	Secretariat			
Task 7.5: Draft report to METWARN I/TF (if possible)	Co-Chairs		Mar 2011	
Task 7.6: Report (or Input) to CNS/MET SG/15	Secretariat		Jul 2011	
Milestone 7: Milestone Description				

5.6 WORK PLAN				
Task / Milestone	**Accountability**	**Predecessors**	**Date**	**Status**
Activity 5: RADIOACTIVE CLOUD				
Task 5.1: Review outcomes of IAVWOPSG/6 meeting concerning development of guidance material for radioactive SIGMET	Task Force			
Task 5.2: Consider development of regional guidance	Task Force			
Task 5.3: Draft report to METWARN I/TF/2 (if necessary)	Co-Chairs	5.2	Mar 2012	

Task 5.4: Propose draft guidance to CNS/MET SG/16 (if necessary)	Secretariat	5.3	Jul 2012	
Task 5.5:				
Milestone 5: Milestone Description				

5.7 WORK PLAN				
Task / Milestone	**Accountability**	**Predecessors**	**Date**	**Status**
Activity 6: TSUNAMI				
Task 6.1: Coordinate the development of aerodrome Tsunami warning	Task Force			
Task 6.2: Draft proposal to METWSG/3 meeting (if possible)	Co-Chairs	6.1	Nov 2011	
Task 6.3: Review outcomes of METWSG/3	Task Force	6.2		
Task 6.4: Draft report to METWARN I/TF	Co-Chairs	6.3	Mar 2011	
Task 6.5: Draft proposal to CNS/MET SG/15	Secretariat	6.4	Jul 2011	
Milestone 6: Milestone Description				

TERMS OF REFERENCE OF ASIA/PAC OPMET MANAGEMENT TASK FORCE (OPMET/M TF)

1. Terms of Reference

- Review the OPMET exchange schemes in the ASIA/PAC and MID Regions and develop proposals for their optimization taking into account the requirements by the aviation users and the current trends for global OPMET exchange;

- Develop standardized quality control, monitoring and management procedures related to ROBEX exchange and other exchanges of OPMET information;

- Regularly update the regional guidance material related to OPMET exchange;

- Liaise with other groups dealing with communication and/or management aspects of the OPMET exchange in ASIA/PAC and other ICAO Regions (ASIA/PAC ATN Implementation Coordination Group, BMG EUR Region, CNS/MET SG MID Region, SADISOPSG).

2. Work Programme

The work to be addressed by the ASIA/PAC OPMET Management Task Force includes:

(a) to examine the existing and any new requirements for OPMET exchange in ASIA/PAC and MID regions and assess the feasibility of satisfying these requirements, taking into account the availability of the data;

(b) to keep under review the ROBEX scheme and other OPMET exchange schemes and prepare proposal for updating and optimizing of the schemes;

(c) to review and update the procedures for interregional OPMET exchange and ensure the availability of the required ASIA/PAC and MID OPMET data for the AFS satellite broadcasts (ISCS and SADIS);

(d) to keep under review and provide timely amendments to the regional guidance material on OPMET exchange; to ensure that guidance material contains procedures for the exchange of all required OPMET data types: SA, SP, FT, WS, WC, WV, FK, FV, UA;

(e) to conduct trials and develop procedures for quality control, monitoring and management of the OPMET exchange; to foster implementation of quality management of OPMET data by the ROBEX centres and the RODBs; and coordinate with METWARN/I TF in tracking and reporting of deficiencies in the format and dissemination of meteorological advisories and warnings;

(f) to monitor in coordination with the ATN 1C Group, the transition to an alternative code (i.e. XML) for OPMET exchange;

(g) to participate in the regular regional SIGMET tests, in conjunction with the METWARN/I TF;

(h) to further develop quality control guidance material and to promote implementation of quality control for OPMET management.

3. Composition

(a) The Task Force is composed by experts from:
Australia; ~~China;~~ Fiji; Japan; ~~Hong Kong, China; India; Indonesia; Malaysia~~, Singapore; Thailand; United Kingdom (SADIS Provider State); and United States (ISCS Provider State); ~~and Viet Nam;~~

Note that previous members China, Hong Kong China, India, Indonesia, Malaysia, and Viet Nam have been placed on the new METWARN/I TF membership and are also welcome to participate in the OPMET/M TF meeting as observers

(b) Representatives of IATA, EUR BMG and MID OPMET Bulletin Board are invited to participate in the work of the Task Force

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**TERMS OF REFERENCE OF
THE ASIA/PAC MET/ATM TASK FORCE**

TERMS OF REFERENCE

a) Evaluate the current and future requirements for MET in support of ATM (includes ATFM) in the ASIA/PAC Region and update Regional Air Navigation Plan accordingly and provide guidance material to assist States to develop MET services to meet these requirements.

b) Assess aviation meteorological services, systems and architecture in the region and how they can integrate weather information into decision support tools.

c) Investigate sub-regional exchange of MET information and associated agreements that facilitate ATM operations particularly over busy routes that overlap different FIRs.

d) Promote ~~communication~~ coordination between MET and ATM communities in the ASIA/PAC Region to enhance the level of understanding of MET requirements and capabilities in support of ATM.

e) Monitor global policy associated with source data and delivery of MET products for ATM.

f) Coordinate with METWARN/I TF on framework for contingency plan for specific phenomenon including volcanic ash, radioactive cloud, tropical cyclone and Tsunami with reference to developments made by the IVATF and WMO scientific steering committee

g) Report to the CNS/MET Sub-group of APANPIRG for further co-ordination through the ICAO Secretariat with other relevant bodies.

~~Monitor the emerging capabilities and developments of MET and as necessary update regional plans for the implementation of MET services and facilities.~~

MEMBERSHIP

Australia (Chair), China, Hong Kong~~,~~-China, Japan, New Zealand, United States, IATA

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ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

Amended in July 2010

REGIONAL PERFORMANCE OBJECTIVE: - *APAC Objective 8*

IMPLEMENTATION OF AERONUTICAL TELECOMMUNICATION NETWORK (ATN) FOR GROUND – GROUND COMMUNICATION NETWORK

Benefits	
Safety	• Will provide reliable means of communication for Air Navigation Services, with the provision of automatic switching capability, in the event of failure of current media
Efficiency	• Routers will have the capability of choosing between different media based on defined criteria. • Multiplicity of protocols used for different communication requirements will be avoided; • Provision for lower case characters and graphic message included;

Strategy
Implementation strategy, short term (2009-2012)

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

	• States hosting Backbone Boundary Intermediate System hubs to implement dual stack ATN (ATN over OSI and ATN over IPS). APANPIRG, through Conclusion 19/20 urges States to complete the implementation of dual stack ATN by 2011	2011	Asia and Pacific Region States hosting Backbone Boundary Intermediate Systems	States hosting BBIS hubs have been reminded of APANPIRG Conclusion 19/20 and urged to complete the installation by 2011
	• Completion of Networking with the BIS States	2012	Asia and Pacific Regions States	Some States started implementation and conducted operational trials
	• Review if implementation objectives have been met.	2009 - 2012	ATNICG	ATNICG to periodically review the status and direction in which the implementation is progressing and to ensure that the implementation efforts are leading towards the defined objectives
GPIs	GPI/17: Data link applications, GPI/22: Communication infrastructure			
References	• *Annex 10, Aeronautical Telecommunications, Volume III (Part I – Digital Data Communication Systems)* • *Manual on Detailed Technical Specifications for the Aeronautical Telecommunications Network (ATN) using ISO/OSI (Doc 9880)* • *ICAO Aeronautical Telecommunication Network (ATN) Manual for ATN using IPS Standards and Protocols (Doc 9896)* • *Manual on Required Communication Performance (Doc 9869)* • *Comprehensive Aeronautical Telecommunication Network (ATN) Manual (Doc 9739)* • *Manual of Technical Provisions for the Aeronautical Telecommunication Network (Doc 9705)* • *Regional Implementation guidance materials adopted by APANPIRG*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(Amended July 2010)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 9*

ENHANCED COMMUNICATIONS AND SURVEILLANCE CAPABILITY IN OCEANIC AREAS

Benefits

Environment	• reductions in fuel consumption and gaseous emissions as a result of efficiency gains;
Safety	• improved monitoring of airspace will result in safety enhancement
Efficiency	• facilitate utilization of advanced technologies (e.g, area navigation, UPRs, DARPs) and ATC decision support tools (e.g., vertical and lateral adherence monitors, short and medium term conflict detection), thereby enhancing safety and increasing efficiency. • enable aircraft to conduct flight more closely to preferred trajectories; • increase airspace capacity by enabling implementation of RHSM using data link;

Strategy
Short term (2009-2011)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
AOM *(Airspace Organisation and Management)* **CM** *(Conflict Management)* **AUO** *(Airspace Users Operations)*	Improve provision of satellite based communications and surveillance capabilities to enable FANS 1/A data link (ADS-C, CPDLC) to RNP 4 and RCP 240 specifications.			
	• codify/quantify existing anecdotal information and combine with available end-to-end system performance data. to summarise current satellite data link performance;	2009	Regional ANSPS, operators, FITS, CRAs. Communications Service providers (CSP)	Reported to Satellite Operational Continuity Meeting (SOCM/1), Bangkok, Thailand, August 2009

	• identify non conformities in current satellite data link performance against; o specifications in Global Operations Data Link Document (GOLD); o specifications in RCP Manual (Doc 9869); and o specifications in Oceanic SPR)	2009	Regional ANSPS, operators, FITS, CRAs.	reviewed status and identify issues at Satellite Operational Continuity Meeting (SOCM/1), August 2009
	• provide summary information on non conformities in current satellite data link performance to all affected parties in the end-to-end communications chain.	2009	Satellite Operational Continuity Meeting (SOCM) August 2009 to summarize and circulate information to affected parties, including CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	Issues identified have been summarized in the report of the first meeting of Satellite Operational Continuity Meeting (SOCM/1).
	• develop a regional strategy and work programme to identify/design suitable long term mitigations and solutions to non conformities that will enable continuous operational compliance with specifications for RNP4 and RCP 240.	2010	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	2010	Regional ANSPs, operators, FITS, CRAs, CSP	Consider convening SOCM/2 to progress this work
	• Implement mitigations and solutions in accordance with timelines in regional strategy	2010	Regional ANSPS, operators, FITS, CRAs, CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	State Letter dated 12 July 2010 issued conveying mitigation solution suggested by ICAO
	• monitor implementation progress	2011	Regional FITS, CRAs provide feedback to all affected parties	Assess implementation of mitigation solution in the next SOCM meeting
GPIs	GPI/5: RNAV and RNP, GPI/7: dynamic and flexible ATS route management, GPI/17: data link applications and GPI/22: Communication Infrastructure;			

References	• *Manual on Required Communication Performance (Doc 9869)* • *RTCA DO-306/EUROCAE ED-122, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (the "Oceanic SPR')* • *FANS-1/A Operations Manual (FOM)* • *Global Operational Data Link Document (GOLD)* • *Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region* • *CEANS Report(2008) on ANS Infrastructure* • *APANPIRG Conclusion 19/24, 20/31, 20/32/20/33, 20/34 and 20/73*

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(amended July 2010)

<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 11</u>

IMPLEMENTATION OF ATS INTER-FACILITY DATA COMMUNICATION (AIDC) IN ASIA/PACIFIC REGION</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Will provide efficient and more reliable means of communication between ACCs in adjacent FIRs for the exchange of traffic coordination related operational messages.
• Significantly reduce the coordination errors observed in controller to controller verbal communication across FIR boundaries thus enhance flight safety</td></tr>
<tr><td>Efficiency</td><td colspan="4">• Increased efficiency for air traffic handover between ATS units
• Will improve ATS direct communication between ATS units along the major traffic
• Will improve the speed and capacity ;
• Will facilitate inter-automation systems communication.</td></tr>
<tr><td colspan="5">Strategy
Short term (2009-2015)</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>TIME FRAME</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="4">AOM
(Airspace Organisation and Management)

CM (Conflict management)

SDM (ATM service delivery management)</td><td colspan="4">Facilitate implementation of ATS Inter-facility Data Communication in the Asia and Pacific Regions</td></tr>
<tr><td>• Review the Status of Implementation</td><td>2009</td><td>ATNICG.
ADS-B SITF</td><td>The status to reviewed and updated by ATNICG/4 and ADS-B SITF Meetings held in May 2009</td></tr>
<tr><td>o Review the Options available for the implementation of AIDC in the region. Discuss options adopted by different states.</td><td>2009</td><td>ATNICG
AEROTHAI</td><td>Options available were reviewed in ATNICG/4 meeting</td></tr>
<tr><td>• Review implementation issues related to ATS automation systems and recommend methods of mitigating those issues</td><td>2009</td><td>ADS-B SITF
CNS/MET SG</td><td>The automation issues discussed in the ADS-B SIFT/8</td></tr>
</table>

	• AIDC Seminar: A Seminar to be conducted to discuss various implementation issues and promote implementation	2010	ICAO Asia/Pacific Office	SIP Seminar to be conducted and scheduled from 12-13 Oct. 2010 in Bangkok
	• Develop implementation strategy to decide whether to continue pursuing AFTN AIDC or to choose ATN AIDC over OSI or IPS	2010	APANPIRG	ATN AIDC implementation deferred.
	• Trials to be conducted. Monitoring mechanism to be developed	2011	APANPIRG	State Letter be issued urging the States to expedite implementation and status to be monitored.
	• Review to ensure implementation objectives are met.	2009 - 2015	APANPIRG	APANPIRG to periodically review the status and direction in which the implementation is progressing and to ensure that the implementation efforts are leading towards the defined objectives
GPIs	GPI/17: Data link applications, GPI/22: Communication infrastructure			
References	• *Air Traffic Management* (Doc 4444) • *Manual of Air Traffic Services Data Link Applications* (Doc 9694) • *Manual of Technical Provisions for the Aeronautical Telecommunication Network (Doc 9705)* • *Asia/Pacific Regional Interface Control Document (ICD) for ATS Interfacility Data Communication (AIDC)*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(*Amended in July 2010)*

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 10*

IMPROVED SITUATIONAL AWARENESS AND SURFACE SURVEILLANCE-IMPLEMENTATION OF THE ADS-B TO GROUND SURVEILLANCE

Benefits

Environment	• Reductions in fuel consumption and subsequent lower gas emissions
Efficiency	• Increased flexibility and flow of traffic operations • Ultimately, when performing *radar-like* control, potential redesign of airspace taking into account the application of reduced separation minima, integrate use of aircraft navigation and surveillance capability
Safety	• Introduction of surveillance in a non-radar environment • Support to search and rescue operations

Strategy
Medium Term (2011-2015)
Short term (2010)

ATM OC COMPONENTS	TASKS	TIME FRAME STARTED	RESPONSIBILITY	STATUS	REMARKS
AOM *(Airspace Organization and Management)* **CM** *(Conflict Management)* **AUO** *(Airspace Users Operations)*	Implementation of ADS-B based surveillance service in the sub-regions.				
ATM SDM (ATM *Service Delivery Management)*	• Compare current technologies with respect to concept of operations, relative costing, technical and operational performance and maturity of alternative technology/solutions (primary, secondary radar including Mode-S, ADS-B, multilateration, ADS-C)	2009	ADS-B Study and Implementation Task Force (ADS-B SITF)	In progress	COMPLETED Regional Guidance material on comparison of technologies developed and issued

	• Develop an implementation plan for near term ADS-B applications in the Asia Pacific Region including implementation target dates taking into account: o available equipment standards; readiness of airspace users and ATS providers; o identifying sub-regional areas (FIRs) where there is a positive cost/benefit outcome expected for near-term implementation of ADS-B OUT; o developing a standardized and systematic task-list approach to ADS-B OUT implementation; and o holding educational seminars and provide guidance material to educate States and airspace users on what is required to implement ADS-B OUT	2009-10	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; Requirement for avionics specification for the near term application are being 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	To be started	Forty Fifth DGCA Conference, through its Action Item 45/3 invited ICAO APANPIRG ADS-B SITF to develop the guidance material. Regulators Workshop is scheduled for August 2010.

	• Study and identify applicable multilateration applications in the Asia and Pacific Region considering: - Concept of use/operations; - Required site and network architecture; - Expected surveillance coverage; Cost of system; Recommended separation minimas; and - If multilateration can be successfully integrated into an ADS-B OUT system for air traffic control	2011	ADS-B Study and Implementation Task Force	In progress	Concept of using multlateration has been developed; Some states have plan in place to introduce multilateration in particular & integrate it with A-SMGCS and Terminal area and en-route surveillance application
	• Coordinate ADS-B implementation plan and concept of operations with other ICAO regions where ADS-B implementation is going on and with relevant external bodies such as EUROCONTROL, EUROCARE, RTCA and Industry.	2013	ADS-B Study and Implementation Task Force	On- going	Updated information on ADS-B in Europe and North American Regions is provided to Task Force Meeting annually; Some Industry representatives provide input at ADS-B Seminar and meetings
	• Develop **Terms of Co-operation** for SEA which will include: • Establishing model documents for possible use by States when - Agreeing to share ADS-B data and DCPC (such as VHF radio voice communication) capability between adjoining States for various ADS-B applications (including a sample letter of agreement); or -Establishing ADS-B avionics fitment mandates • Identifying optimum coverage for ADS-B ground stations and	2011	South East Asia (SEA) Sub-Regional ADS-B Implementation Working Group	In progress	Terms of co-operation developed; sample agreement of data sharing developed; 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 are

	associated VHF radio voice communication in the sub-regional FIR boundary areas.				being developed by the SEA ADS-B WG.
	Develop an implementation plan for near term ADS-B application in SEA which will deliver efficient airspace and increased safety on a regional basis that includes: • Schedule and priority dates to bring into effect ADS-B based services taking into account: - Timing of any equipage mandates; - Timing of any ATC automation upgrades to support ADS-B; - Timing of commissioning of any ADS-B data sharing and associated VHF radio voice communication facilities; • Consideration of major traffic flows.	2013	South East Asia (SEA) Sub-Regional ADS-B Implementation Working Group	In progress	Major traffic flow from Australia to Singapore through Indonesia and Singapore to Hong Hong along L642 and M771 in South China Sea being progressed.
linkage to GPIs	GSI-12 Use of Technology to Enhance Safety; GPI/9 Situational Awareness; GPI/5: RNAV and RNP, GPI/7: dynamic and flexible ATS route management, GPI/17: data link applications and GPI/22: Communication Infrastructure;				
References	• *Report of AN CONF/11;* • *Global ATM Operational Concept (Doc9854);* • *Global Air Navigation Plan (Doc9750);* • *Technical Provisions for Mode S Services and Extended Squitter (Deco9871)* • *APANPIRG/16/17/19/20 report on ADS-B* • *ADS-B related regional guidance materials adopted by APANPIRG*				

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(Amended July 2010)

REGIONAL PERFORMANCE OBJECTIVE: ***APAC Objective 18*** **IMPLEMENTATION OF ICAO PERFORMANCE BASED NAVIGATION PROVISIONS FOR TERMINAL AREA OPERATIONS**	
Implement ICAO Performance Based Navigation (PBN) provisions for terminal area operations in collaboration with stakeholders based on the Regional PBN Implementation Plan agreed by APANPIRG, to improve terminal area safety and efficiency by use of advanced navigation specifications for SIDs, STARs and instrument approach procedures.	
Benefits	
Environment	• reduction in fuel consumption and resulting emissions
Safety	• enhance safety by use of modern capabilities onboard aircraft; • implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows; • increased airspace safety through the implementation of continuous and stabilized descent procedure using vertical guidance; • improved airport and airspace arrival paths in all weather conditions; and • decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the need for ATC-pilot communication and radar vectoring
Efficiency	• allows for more efficient use of airspace and increase airspace capacity through reduction of lateral and longitudinal separation between aircraft; • increase of predictability of the flight path; • reduced delays in high density airspace and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas; • 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; • clarifies how RNAV systems are used; and • facilitate the operational approval process for operators by providing a limited set of navigation specifications intended for global use.

SAFETY COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
APANPIRG Conclusion 18/52	**Establishment of a Regional Performance Based Navigation Task Force (PBN/TF)** An Asia/Pacific PBN Task Force, with terms of reference as outlined in Appendix A to the APANPIRG/18 Report on Agenda Item 3.5, be established to develop a PBN implementation plan for the Asia/Pacific Region and address related regional PBN implementation issues.	**PBN TF –** As soon as practicable Regional PBN Implementat-ion Plan – by 2008 (Before APANPIRG-19)	APANPIRG PBN Task Force	Regional Performance Based Navigation Task Force (PBN/TF) established Meetings of PBN T/F held as per following schedule 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 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 Version 0.3 was adopted by APANPIRG/20 as Asia/Pac Regional PBN Plan as Ver.1.0 PBN TF/6 proposed revision to the Plan (Ver.2.0)

APANPIRG Conclusion 18/53	**Development of State PBN Implementation Plans** The Regional Office should encourage States to begin development of their State PBN implementation plans in harmony with the development of the Asia/Pacific Regional PBN implementation plan being coordinated by the Asia/Pacific PBN Task Force for submission to APANPIRG/19 (2008).	**State PBN Implementatio n Plan** - 2009	STATES PBN TF APAC Office	State PBN Implementation Plan/Road map has been received from 21 States subject to review by PBNTF/7 States have not done so, are encouraged to provide their plan at earliest. Under development by some States
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 Reminders being regularly sent to States to nominate Focal Points
PBN/TF Report	**Develop detailed Status (database) regarding current and planned implementation of PBN terminal instrument procedures (SIDs and STARs) and Approaches**			ONLY 8 States have provided information Reminders are being sent regularly
	Data Collection – Runway ends /International Aerodromes	30 June 2008	STATE Focal Point	
	Data Collection – Runway ends /Domestic Aerodromes	31 December 2008	STATE Focal Point	
PBN Report	**Template developed by PBN TF for reporting progress:** **- Common Template will help in harmonizing the reporting process;** **- States requested to submit PBN Implementation Progress Report by 15 August 2009 for submission to APANPIRG 20.**	15 August 2009 and prior to each future PBN/TF Meeting	STATE	18 States have submitted PBN Implementation Progress on the new Template.

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

Strategy **Medium Term (2013 – 2016)**				
SAFETY COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
• **TMA– Arrival**	1. Expand RNAV 1 or RNP 1 Application 2. Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	RNAV 1 or RNP 1 STAR for 100% of international airports by 2016 RNAV 1 or RNP 1 STAR for 70% of busy domestic airports where there are operational benefits	STATES PBN TF APANPIRG	
• **TMA- Departure**	1. Expand RNAV 1 or RNP 1 Application 2. Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	RNAV 1 or RNP 1 SID for 100% of international airports by 2016 RNAV 1 or RNP 1 SID for 70% of busy domestic airports where there are operational benefits	STATES PBN TF APANPIRG	
• **Approach**	1. Expansion of RNP APCH (with Baro-VNAV) and APV 2. Expansion of RNP AR APCH where there are operational benefits 3. Introduction of landing capability using GNSS and its augmentations	RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016	STATES APANPIRG PBN TF	

<table>
<tr><td colspan="2">Strategy
Long Term (2016 and beyond)</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>GPIs</td><td>GPI/5: Performance based navigation,
GPI/9: Situational awareness,
GPI/11: RNP and RNAV SIDs & STARs,</td></tr>
<tr><td>References</td><td>• ICAO Asia Pacific Regional Performance-Based navigation Implementation Plan - Version 2
• APANPIRG 18 Decision - ; APANPIRG 19 Decision -
• ICAO Guidance Material – Performance-Based Navigation Manual Doc 9613 AN/937 Third Edition – 2008
• Assembly Resolution 36-23</td></tr>
</table>

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(amended25 July 2010)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 12*

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

Benefits	
Safety Efficiency	• Improve in-flight safety by providing information on volcanic ash, tropical cyclone ~~or~~ 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 (2010-2011)/Medium term (2012 - 2015)

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 ~~SIGMET~~ meteorological warnings and advisories based on current and future requirements	2010 - 2015	~~VA/TC/I TF~~ 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	2010-2015	METWARN/I TF OPMET/M TF	In progress
	• Conduct periodic tests for SIGMET on ~~volcanic ash~~VA, TC~~and tropical cyclones~~, and phenomena other than VA and TC in view of assessing improvements in their implementation	2010 – 2015	METWARN/I TF & RODB & VAACs & TCACs ~~VA/TC/I TF~~ & OPMET/M TF	In progress
	~~• Conduct periodic tests for SIGMET for hazardous weather phenomena other than volcanic ash and tropical cyclone in view of assessing improvements in their implementation~~	~~2010 – 2015~~	~~METWARN/I TF RODB & 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	2010, 2013	METWARN/I TF ~~VA/TC/I TF~~ & OPMET/M TF & RO	In progress
	• Develop framework for contingency plan for specific phenomenon including VA, radioactive cloud, TC and Tsunami with reference to developments made by the IVATF and WMO scientific steering committee	2010-2011	METWARN/I TF & MET/ATM TF	To begin
Linkage to GPIs	GPI/19 – Meteorological Systems			
References	• *Annex 3* • *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds (Doc 9691)* • *Handbook on the International Airways Volcano Watch (IAVW) Operational Procedures and Contact List (Doc 9766)* • *Manual on Low-level Wind Shear (Doc 9817)* • *Asia/Pacific Regional SIGMET Guide*			

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(amended 5 August ~~14 July~~ 2010)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 13* **IMPLEMENT WAFS AND ASSOCIATED DEVELOPMENTS**				
Benefits				
Safety **Efficiency**	• Improve the regional implementation of weather forecasts (including upper-~~level~~ winds and upper-air temperatures, direction, speed and height of maximum winds and tropopause heights, as well as turbulence, icing, cumulonimbus) used by airlines and ATM needed to optimize flight routes which will provide an increase in efficiency and reduced carbon emissions			
Strategy **Short term (2010-2011)/Medium term (2012~~1~~ - 2015)**				
ATM OC COMPONENTS	**TASKS**	**TIME FRAME**	**RESPONSIBILITY**	**STATUS**
MET	• Assist the regional implementation of new gridded products for turbulence, icing and ~~cumulonimbus~~CB forecasts	2010~~09~~-2013	WAFS/I TF	In progress
	• Facilitate in organizing regional training of new gridded products for turbulence, icing and cumulonimbus forecasts	2010-2013	WMO & ICAO	In progress
	• Monitor the implementation of WIFS ~~until~~ noting the planned cessation of ISCS-G2 broadcast in June 2012	2010-2015~~2~~	WAFS/I TF	In progress
	• Monitor the implementation of Secure SADIS FTP service	2010-2015	WAFS/I TF	To begin
	• Develop and distribute WAFS service reference document to ASIA/PAC States	2010	WAFS/I TF	In progress
	• Monitor the implementation status of WAFS within the ASIA/PAC Regions, and report to CNS/MET SG	2010-2011	WAFS/I TF	To begin
	• Report WAFS training needs of ASIA/PAC States to CNS/MET SG	2010-2011	WAFS/I TF	To begin
Linkage to GPIs	GPI/19 – Meteorological Systems			

References	• *Annex 3* • *http://www.icao.int/anb/wafsopsg/* • *http://www.icao.int/anb/sadisopsg/* • *Asia/Pac WAFS Implementation Plan and Procedures*

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(amended 25 July 2010)

REGIONAL PERFORMANCE OBJECTIVE: ***APAC Objective 14***	
DEVELOP REGIONAL MET REQUIREMENTS TO SUPPORT ATM	
Benefits	
Safety **Efficiency**	• Improve efficiency of ATM and airlines by providing tailored regional MET products needed to optimize flight routes in all weather conditions
Strategy **Short term (2010-2011)/Medium term (2012 - 2015)**	

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
MET	• Conduct MET ATM meeting in 2009 to determine actions needed to obtain regional MET requirements to support ATM	2009	MET/ATM TF	~~In progress~~ complete
	• Conduct survey on regional ATM requirements for MET information	2010 - 2011	MET/ATM TF	To commence after MET ATM meeting
	• Conduct MET seminar in coordination with WMO in ~~2010~~ 2011 to further develop list of possible regional MET requirements to support ATM	~~2010~~ Jan 2011	MET/ATM TF	planning
	• Assess aviation meteorological services, systems and architecture in the region and how they can integrate weather information into decision support tools	2010-2015	MET/ATM TF	In progress
	• Investigate sub-regional exchange of MET information and associated agreements that facilitate ATM operations particularly over busy routes that overlap different FIRs	2010-2015	MET/ATM TF	In progress
	• Facilitate implementation of ~~new terminal forecast~~ Meteorological Services for the Terminal Area (under development by WMO)	2013-2015+	MET/ATM TF	future
	• Monitor global policy associated with source data and delivery of MET products for ATM	2010-2015	MET/ATM TF	future

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

ASIA/PACIFIC REGION

PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(amended 2 August 2010)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 15*

IMPROVE OPMET EXCHANGE EFFICIENCY

Benefits	
Safety **Efficiency**	• Increase OPMET availability and reliability needed for flight planning (efficiency) and in-flight re-planning (safety)

Strategy
Short term (2010-2011)/Medium term (2012 - 2015)

ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
MET	• Improve the availability of OPMET data at the Regional OPMET Data Banks (RODB)	2010 - 2015	OPMET/M TF	In progress
	• Improve the inter-regional OPMET exchange	2010 - 2015	OPMET/M TF	In progress
	• Improve the availability of OPMET data in the Pacific	2010 - 2015	OPMET/M TF &TCB & PASO & States	In progress
	• Review and update regional ROBEX tables and guidance material	2010 - 2015	OPMET/M TF & RO	In progress
	• Facilitate and provide guidance to the implementation new/modified standards before applicability date and carry out post implementation review to ensure that standardized procedures are followed	2010 - 2015	OPMET/M TF	In progress
	• Conduct periodic quality checks and OPMET monitoring to improve the quality and timeliness of OPMET in the Asia/Pac Region	2010 - 2015	OPMET/M TF & IATA	In progress
	• *Facilitate and monitor the migration to AIM and new MET codes (e.g. XML) for METAR/SPECI, TAF and SIGMET*	*TBD*	*OPMET/M TF & RO*	*TBD*

Linkage to GPIs	GPI/19 – Meteorological Systems ~~(Note: if sufficient assessment information is available at the OPMET/M TF/7 meeting, use as baseline and provide a target level of improvement in the first 3 bullets)~~ (Note: the OPMETM TF will assist the METWARN/I TF in SIGMET test coordination and deficiency tracking of the format and dissemination of meteorological advisories and warnings and noted in the PFF of the METWARN/I TF)
References	• *SADIS User Guide* • *ROBEX Handbook* • *Asia/Pacific OPMET Data Banks Interface Control Document*

CNS/ATM Implementation Planning Matrix

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
AFGHANISTAN									
AUSTRALIA	ATN tests were conducted. BIS Router and Backbone BIS Router and AMHS implemented.	AFTN based AIDC Implemented between Brisbane and Melbourne, Auckland, Nadi and Auckland. AIDC is also in use between Melbourne and Mauritius.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented	Implemented		16 ADS-B sites are operational. A total of 28 UAP ground stations are expected to become operational throughout 2007. Additional 20 stations have been delivered in 2007 for installation at en-route radar site and other sites. 5NM Separation service has been introduced. NFRM on the carriage and use of ADS-B avionics has been issued. WAM installed in Tasmania. Commissioning expected 2009. Provides radar	FANS 1/A ADS-C implemented.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
AUSTRALIA (Cont'd)							like WAM data and ADS-B data. ASMGCS with multilateration being installed at Melbourne, Sydney, Brisbane and Perth. Operational between 2009 -2010 Multilateration based precision runway monitor to be commissioned in 2010.		
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 2009 and AMHS planned for 2009-2011.								

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
CAMBODIA	BIS Router and AMHS planned for 2011.	Planned 2009	Planned 2009			Procedure developed for NPA.			
CHINA	ATN Router and AMHS deployed in 2008. Tripartite BBIS trial completed with Bangkok and Hong Kong, China in Jan. 2003. ATN trial with Hong Kong using XOT over internet conducted in 2006, Further trials planned in 2009. AMHS/ATN technical tests with Macau completed in 2009. ATN/AMHS tests with ROK, India , Hongkong China planned in 2010.	AIDC between some of ACCs within China has been implemented. AIDC between several other ACCs are being implemented. AIDC between Sanya and Hong Kong put in to operational use in Feb 2007. AIDC between Qingdao and Incheon planned for 2013.	Implemented to ATS Rout. L888 route, Trial on HF data link conducted for use in western China.	Implemented in certain airspace. L888, Y1 and Y2 routes.	RNAV (GNSS) implemented in certain airports. Beijing, Guangzhou, Tianjin.	Ali, Linzhi and Lhasa airports	ADS-B trial has been conducted in 2006. 5 UAT ADS-B sites are operational and used for flight training of CAFUC. Another ADS-B project for ATS route between Chengdu and Jiuzhai using 1090ES conducted since 2008. Will be followed by Chengdu – Lhasa and B215 route.	FANS 1/A based ADS-C implemented. L888 route.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
HONG KONG, CHINA	ATN and AMHS technical trial with Japan conducted in 2003. 64 Kbps ATN Link with Bangkok put into operational use in June 2004. Preliminary ATN/AMHS technical trials with China (Beijing) using VPN over Internet connection conducted in September 2006. Operational AMHS commissioned in July2009. ATN/AMHS circuit with Macao put into operational use in Dec. 2009. ATN/AMHS interoperability tests with other adjacent communications centres commenced in late	AFTN-based AIDC with Sanya put into operational use in February 2007. AIDC trial with other adjacent ATS authorities planned for end 2009/2010. AIDC technical trial with Taibei to be undertaken in 2010. AIDC technical trial with Philippines to be undertaken by end 2010.	FANS 1/A based CPDLC trials completed in 2002. VDL Mode-2 technical trial conducted in 2002. D-ATIS, D-VOLMET and 1-way PDC implemented in 2001. PDC service upgraded to 2-way data link in June 2008.	Implemented in certain airspace	Implemented in certain airspace	RNAV (GNSS) departure procedures implemented in July 2005. RNP AR APCH procedures for 07L/25R runways implemented in June 2010.	A larger-scale A-SMGCS covering the whole Hong Kong International Airport put into operational use in April 2009. Data collection/ analysis on aircraft ADS-B equipage in Hong Kong airspace conducted on quarterly basis since 2004. ADS-B trial using a dedicated ADS-B system was conducted in April 2007. Further ADS-B trial planned for 2010.	FANS 1A trials for ADS-C completed in 2002.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
	2009, viz Taibei (2009), Beijing (2010), Japan (2012) AMHS trial with Philippines in late 2010. ATN/AMHS into operation in end 2009.								
MACAO, CHINA	ATN/AMHS interoperability test with Beijing commenced in Mar 2009. ATN/AMHS circuit with Hong Kong put into operational use in end Dec 2009.								ATZ within Hong Kong and Guangzhou FIRs. In ATZ full VHF coverage exist. Radar coverage for monitoring purposes.
COOK ISLANDS									
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	The ATN BIS Router and AMHS to be implemented in 2011.	With neighboring ACCs to be implemented TBD		Implemented in certain ATS routes G711, B467		RNAV(GNSS) Non-precision approach to be implemented in 2011.	ADS-B has been used as back-up surveillance of SSR since 2008.		

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
FIJI	ATN BIS Router and AMHS implementation by 4th quarter 2010.	AFTN based AIDC implemented between Nadi, Brisbane, Auckland and Oakland.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented		Implemented	ADS-B implementation in 2009/2010.	FANS 1/A ADS-C implemented.	
FRANCE ***(French Polynesia Tahiti)***		Implementation of limited message sets with adjacent centres under discussion.	FANS-1. Implemented since 1996.					FANS 1/A ADS-C implemented since March 1999.	
INDIA	ATN BBIS router and AMHS Physical installation over. SAT in May 2008, Operational trials being conducted with Singapore with live traffic exchange. Coordinating with China, Thailand , Pakistan and Oman for conduct of test.	AFTN Based AIDC Coordinating with Bangladesh and Pakistan and, we are ready.	FANS-1 implemented at Kolkata, Chennai, Mumbai and Delhi.	SBAS Technical development in 2007. Implementation planned for 2009.			Trial planned for 2006. ASMGCS Implemented at IGI Airport New Delhi.	FANS 1/A ADS-C implemented at Kolkata, Chennai, Delhi and Mumbai.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
INDONESIA	ATN BIS Router and AMHS planned for trial in 2009. Trial with Singapore planned. ATNBIS Router and AMHS are still on going trial with Singapore to be finished in 2010 (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.				22 ADS-B ground stations have been installed in 2009. Upgrading ATC automation at Makasar for ADS-B application capabilities in 2009.	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.	MATSC new version with capability for ADS-B and Mode-S will be operated in 2009.
JAPAN	ATN BBIS router and AMHS installed at 2000. Connection tests with USA 2000 - 2004 and put into operational use in 2005. Connection test with Taibei 2008 - ongoing. Connection tests with Australia, China, Hong Kong, Singapore, Republic of Korea, Europe and Russian Federation is TBD.	AFTN based AIDC implemented with Oakland, Anchorage and Incheon. Planned between Fukoka ATMC and Taibei ACC for 2012.	FANS1/A system Implemented in Fukuoka FIR.	SBAS implemented RNAV5 implemented.	RNAV1 implemented	RNP Approach implemented	Two (2) Multilateration will be implemented in January 2010.	FANS 1/A. ADS-C implemented in Fukuoka FIR.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
KIRIBATI									
LAO PDR	ATN BIS Router and AMHS completed planned for implementation with Bangkok in 2010.	AIDC with Bangkok planned for 2010.		Implemented. Planned for 2011.					
MALAYSIA	ATN BIS Router completed 2007. AMHS planned in 2011	AFTN AIDC planned with Bangkok ACC in 2011.	Implemented for Bay of Bengal in July 2008.	Implemented for Oceanic Routes.	Basic RNAV implemented	NPA at KLIA implemented	Implementation of ADS-B proposed in 2010 - 2015.	FANS 1/A ADS-C implemented for Bay of Bengal on July 2008	
MALDIVES	ATN BIS Router/AMHS planned for implementation in the 2011.	Planned for 2011.	FANS1/A installed Trials planned in last quarter of 2007.	Trials planed for 2005-2008. Implementation in later 2008.			Trials planned for 2007-2008. Implementation in late 2008.		
MARSHALL ISLANDS						NPA implemented at Majuro Atoll.			
MICRONESIA (EDERATED STATES OF)									
Chuuk				Implemented					
Kosrae				Implemented					
Pohnpei				Implemented					

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
Yap				Implemented					
MONGOLIA	ATN BIS Router and AMHS planned for 2005 and 2006. Trial with Bangkok conducted.		Function available. Regular trials are conducted.		GPS procedures are being developed and implemented at 10 airports.		ADS-B trial in progress implementation planned for 2006.	FANS 1/A ADS-C implemented since August 1998.	
MYANMAR	Implementation of AMHS to be completed by the end of 2010.	The capability of ATM Automation system to support AIDC by 2011	Implemented since August 1998.				A plan to implement ADS-B by 2011	Implemented since August 1998.	
NAURU									
NEPAL	BIS Router and AMHS planned for 2011.	AFTN/AMHS based AIDC between KTM-CAL, KTM-BAN, KTM-LHASA planned for 2011.			GPS departure and approach has been developed for 8 airports and planned for implementation in 2008.		ADS-B feasibility study planned for 2007.		
NEW CALEDONIA							Tontouta ACC 2009 Tontouta APP 2009.		

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
NEW ZEALAND	BIS Router and AMHS implementation planned for 2010.	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 (ZQN).	Domestic trial was conducted in 2005. Use will be re-evaluated in 2008. Trial of Area MLAT conducted in 2006. ADS-B planned as an element of MLAT at specific sites for domestic use.*	FANS 1/A Implemented	*MLAT being implemented in Auckland (Surface Movement) and Queenstown.
PAKISTAN	Implementation of ATN considered for Phase II (2005-2010).	Implemented between Karachi and Lahore ACCs	Implementation planned from 2005-2010.	Planned for 2005-2010.	RNAV arrival and departure procedure being developed.	NPA procedure are being developed.	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.
PAPUA NEW GUINEA				Implemented		Implemented at certain aerodromes.			
PHILIPPINES	ATN G/G BIS Router/AMHS implemented in 2006. AMHS trials with	Planned for 2011.	CPDLC Planned for 2011.				Included in CNS/ATM Project and scheduled for implementation in 2011.	FANS 1/A ADS-C planned for 2011.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
	Singapore by end 2008 and Hong Kong planned in 2009.								
REPUBLIC OF KOREA	ATN BIS Router/AMHS planned for 2011.	AFTN based AIDC planned for 2009 between Incheon ACC and Fukuoka ATMC. AIDC between Incheon and Qingdao planned for 2013.	PDC & D-ATIS implemented 2003.			NPA procedure developed at Incheon International Airport in 2008.	ADS-B trials planned for 2008-2009 at Incheon International Airport.	FANS 1/A based ADS-C implemented since 2003 for contingency purpose.	
SINGAPORE	AMHS implemented. ATN BIS Router trial with Malaysia commenced in 2007 and with Indonesia in 2009. ATN/AMHS interoperability trial with India completed in Oct 2009. Commenced pre-ops trial in Dec 2009. Co-ordinating with UK and Australia on ATN/AMHS trial in Q4 2010.	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.		FANS 1/A ADS-C implemented since 1997. Integrated with ATC system in 1999.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
SRI LANKA	ATN BIS Router Planned for 2009. AMHS planned along with BIS in 2009.		PDLC in trial operation since November 2000.				ADS-B Trials planned for 2010 and implementation in 2011.	FANS 1 /A ADS-C trial since November 2000.	GPS based domestic route structure being developed.
THAILAND	BBIS/BIS Routers already implemented. Target date for AMHS in 2008.	AFTN based AIDC planned for 2010.	FANS-1/A Implemented.	Under implementation	Implemented at Phuket Airport	Implemented at Phuket	Multilateration implemented in 2006 at Suvarnbhumi Int'l. Airport. 22 ADS-B ground stations will be implemented in 2008.	FANS 1/A ADS-C Implemented.	
TONGA	AMHS planned for 2008.					NPA planned for 2007.	Trial planned for 2010		CPDLC and ADS-C is not considered for lower airspace
UNITED STATES	AMHS implemented. AMHS Atlanta Sept 2009 to serve CAR/SAM,/ North Atlantic/Europe	AFTN based AIDC implemented.	FANS-1/A based CPDLC implemented.	Implemented	Implemented		Implemented	Implemented	
VANUATU									

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
VIET NAM	BIS Routers planned for 2009. ATN/AMHS trial in 2010 and operation in 2012.	AFTN based AIDC implemented in 2009. Trial for ATN based AIDC planned in 2010.	CPDLC operational trial conducted in early 2007.	For en-route TBD.	RNAV		TBD	FANS 1/A ADS-C operational trial conducted for oceanic area of Ho Chi Minh FIR since March 2002.	

* Navigation – Navigation including Performance Based Navigation (PBN), APV and precision approach

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**
~~Provision of ATIS as specified in FASID Table CNS 2 (Doc 9673)~~	~~Bangladesh~~	~~To broadcast current, routine terminal information to arriving and departing aircraft to ease congestion on the Tower and Approach channels affecting safety of aircraft operation.~~	~~May 2007~~	~~**Provide aerodrome Terminal Information broadcast system to ease congestion on VHF and to reduce controllers work load**~~ **Notification from Bangladesh received on 17 Sep. 2009**	~~**The ATIS equipment installed has been out of service due to maintenance problem and is beyond repair. It is required to provide a new equipment.**~~ ~~**New ATIS equipment had already been installed and put into trial operation on 14 May 2008. Effort is required to resolve the technical problem and provide ATIS for operational use within shortest possible time. Further updates on the Status are required. The ATIS equipment has been installed and operational since August 2008**~~	~~**Civil Aviation Authority of Bangladesh**~~	~~**September 2009**~~ ~~**Official notification of the normal operation of the ATIS and request for removal this deficiency from the deficiency list is expected from Bangladesh**~~ **Corrective Action Plan Implemented, Deficiencies is removed**	~~A~~
Adequate and reliable VHF COM	Myanmar	Quality and reliability of RCAG VHF inadequate and unavailability of required coverage. Improvement has been observed and pilot reports continued to indicate occasional communication difficulties. Further improvement has been observed with occasional poor communication problems reported.	1998 Early 2008 July 2010	Improvements in the quality of link to RCAG stations and power supply system at some remote stations are required.	Action should be taken to provide reliable links between the RCAG stations and Yangon ACC. An action plan was developed to upgrade equipment at RCAG stations, provide VSAT link at all RCAG stations, to improve power supply system. ICAO missions were conducted. DCA Myanmar has replaced equipments at all 6 RCAG sites with digital VHF system and has provided VSAT links and solar power supply system at all sites.	DCA Myanmar	Revised target date is end of 2009 This deficiency will be removed from the list upon receipt of official report providing full details of action taken by Myanmar and confirmation by the users.	A

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
					New HF transmitters were used to provide service to aircraft flying beyond VHF coverage in a small portion of Yangon FIR			
Requirements for provision of AFS circuits between Hong Kong and Manila is specified in FASID Table CNS 1A and 1D (Doc.9673 Vol.II)	Philippines	Total disruption of the AFTN circuit between Manila and Hong Kong after Philippines Long Distance Telephone Company (PLDT) failed to provide communication link between Manila and Hong Kong. The fluctuation of service availability of AFTN circuit and ATS direct speech circuit were recently observed from total outage of 4,000 minutes in June to over 13,000 minutes in August 2009	February 2007 June 2009 The normal operation fully restored in February 2010.	It is urgently required to improve the performance of the AFTN circuit to meet the requirement for the exchange of safety messages between Manila and Hong Kong within the established transit time of 5 minutes.	Prolonged delay in rectification of problem experienced at Manila has resulted in diversion of message traffic for a long time via Taipei with alternate routing via Hong Kong/Fukuoka/Singapore/Manila causing traffic congestion as well as higher transit time of AFTN message. Remedial actions for improvement of the circuit performance were discussed among ICAO Secretariat, Hong Kong CAD and the CAAP Philippines. ICAO mission was carried out and action plan was developed.	Civil Aviation Authority of the Philippines (CAAP)	By the end of September 2009 The circuit was resumed fully normal operational in February 2010. Latest monthly performance report indicates its serviceability meets the operational requirements. The CAAP is invited to notify Regional Office to remove the deficiency from the list.	U

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
Requirements for provision of navigation facilities specified in FASID Table CNS 3 (Doc.9673 Vol.II)	Philippines	Disruption of Air Traffic Services in Manila FIR was reported on 13 September 2009 for about two hours because the Standby Power source failed to takeover the load when the main power failed. On 19 June 2010, DVOR at Manila broke down at 05:30 leading to non availability of instrument approach procedures at the Airport (NAIA) till early July. Both the ILSs provided to serve the instrument runway were unserviceable. Both ILSs and DVOR are quite old and have become unreliable. Moreover, difficulty is being faced in getting spares for the equipment.	September 2009	The instrument approach procedures using these two equally vital radio navaids It is urgently required to improve the performance of the radio navigation aids and power supply system,	Action for the new CNS/ATM project is in procurement stage and is expected to be operational by 2013. Interim project of replacement of the 14 year old ATM System in Manila has also been taken up. The site installation and system commissioning for new ILS is scheduled for August 2010. The proposal is being developed to complete fully restoration of DVOR facility	The Civil Aviation Authority of Philippines (CAAP)	Dec. 2010 The CAAP has been urged to take necessary remedial action at the earliest.	A

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Meteorological observations and reports. (Annex 3, Chapter 4)	Solomon I.	Weather information is inadequate and not provided on a regular basis	1996 Confirmed 2006 SOA	Reported by airlines operating to Solomon I.	Equipment to be upgraded and arrangements to be made for regular observations TC expert recommendation to replace and/or calibrate MET obs. equipment AGGH – 2008 State made aware of MET Services gaps identified by ICAO TC Project, CAEMSA-SP, in late 2008 CAEMSA-SP Phase II plan for Donors and associated remedies	Ministry of Transport, Works and Aviation, Solomon I. *Note: OPMET/M TF to carry out survey*	2010	A
Meteorological observations and reports. (Annex 3, Chapter 4)	Kiribati	METAR from Kiribati not available on regular basis.	1998 Confirmed 2005 SIP	Reported by airlines	State's MET authority to consider urgent action to be taken for providing regular observations and reports TC expert recommendation to purchase/install AWOS – 2008 ICAO SIP conducted in 2005 State made aware of MET Services gaps identified by ICAO TC Project CAEMSA-SP, in late 2008 CAEMSA-SP Phase II plan for Donors and associated remedies	Directorate of Civil Aviation, Kiribati. *Note: OPMET/M TF to carry out survey*	2009/2010	A

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Indonesia	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Three-party LOA to be signed between the MGA, DGCA and DVGHM Information exchange between CVGHM & ABA in draft form. VSAT comms installed to improve the monitoring in E Nusa Tenggara – provides direct transfer of data to CVGHM HQ full time. (AusAID-funded project) Bilingual reporting form based on VONA to improve comm. to VAAC in Sulawesi	DGCA, MGA Indonesia	TBD (no action plan submitted to RO)	A
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Papua New Guinea	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Procedures to be set up for exchange of data between NWS, ATS and Rabaul Volcano Observatory (RVO) and a LOA to be signed Discussion of an agreement between RVO & PNG CAA to provide volcanic information to aviation through cost recovery is underway.	NWS, ATS Papua New Guinea *Note: ICAO Regional Office to monitor*	TBD (no action plan submitted to RO)	A
Provision of SIGMET for volcanic ash (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Indonesia Philippines Papua New Guinea	Requirements for issuance and proper dissemination of SIGMET, including SIGMET for volcanic ash, have not been fully	ICAO SIP mission Dec 2003	a) Reported by airlines b) Noted by Volcanic Ash Advisory Centres	a) ICAO to carry out a Special Implementation Project (SIP) with the primary objective to improve implementation of SIGMET procedures, especially for VA. b) State to take urgent actions to implement the SIGMET procedures. Note. ICAO SIP carried out in 2003, progress in issuance of SIGMET for VA is noted; the	a) State's Met authorities b) ICAO to implement the SIP.	To be advised	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
		implemented			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 17Nov2009	c) ICAO Regional Office to co-ordinate and monitor.		
a) Service for operators and flight crew members. (Annex 3, Chapter 9). b) WAFS products for flight documentation. (ASIA/PAC FASID Table MET 1A).	Cambodia Myanmar	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 Myanmar SADIS FTP approved in 2008, needs to acquire hardware associated with SADIS FTP	State's MET authorities	TBD	A
MWO for Phnom Penh FIR and SIGMET (Annex 3, Chapter 3 & 7; ASIA/PAC FASID Table MET 1B)	Cambodia	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	Establishment of MWO currently not feasible. Urgent need for bi-lateral agreement for SIGMET service by a neighboring State. A TC project proposal submitted to SSCA, Cambodia (note SIGMET deficiency removed due to bilateral agreement with China)	SSCA, Cambodia	TBD	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
				FIR				
Provision of SIGMET information (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Lao PDR Myanmar Nepal	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. ICAO issued new version of ASIA/PAC Regional SIGMET Guide in September 2003 *Note: ICAO Regional Office to enquire action plans with fixed target dates from the listed States* Bi-lateral agreement on provision of SIGMET by Kunming MWO (China) on behalf of Phnom Penh (Cambodia) effective 1 June 2009. Deficiency for Cambodia removed - APANPIRG/20. Lao PDR expects to issue SIGMET the end of 2010 – participated in SIGMET tests in Nov 2009 Myanmar issues SIGMET and successful verification process (State and airline verification) expected in early Aug 2010. In addition, participated in SIGMET test in Nov 2009	State's MET authorities	CLOSED as of 1 June 2009 Cambodia Dec 2010 Lao PDR 2009/10 Myanmar	U
MWO for Pyongyang FIR and SIGMET (Annex 3, Chapter 3 & 7; ASIA/PAC FASID Table MET 1B)	DPR Korea	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	Aerodrome MET Office in place can also serve as MWO in future. *ATMB/GACA Immediate consideration of action plan – establish MWO and provide required regular MET service for Pyongyang FIR.* MWO established in February 2009 as reported by State. It is necessary to send SIGMET to RODBs in Region for access by the users. Verification of reception will allow for removal of deficiency.	General Administration of Civil Aviation (GACA) DPR Korea	Est. of MWO Feb 2009 Real time SIGMET have to reach RODBs	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
				mission	Participated in SIGMET tests in Nov 2009 – however RODBs not receiving real time SIGMET			
Volcanic activity information to be provided to ATS units, MWOs, and VAAC (Annex 3, 3.6 and 4.8)	Tonga	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)	2010	U
Briefing and flight documentation (Annex 3, Chapter 9, Appendix 2 & 8)	Kiribati Nauru Solomon Islands	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	2010	U
Provision of meteorological observations (Annex 3, 4.3.1, 4.5, 4.6)	Nauru	No METAR/SPECI observing programme in place	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	MET Service, TCB, Donor	2010	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
		(no calibrated and maintained equipment available)			CAEMSA-SP Phase II			

SUBJECT/TASKS LIST IN THE CNS/MET 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 31 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 (32)	RAN/3 C.8/14 APANPIRG/14 (TOR 3)	A-Safety E-Continuity 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 ~~international airways volcano watch (IAVW) and tropical cyclone advisories and SIGMETs~~ meteorological advisories and warnings which includes VA and TC	A	Monitor and provide assistance in the implementation of ~~volcanic ash and tropical cyclone advisories and SIGMETs~~ meteorological advisories and warnings procedures to ensure provision of timely information on ~~volcanic ash and tropical cyclones~~ weather hazardous to aircraft. Monitor outcomes of IVATF and WMO Scientific Steering Committee for developing framework of contingency plan for specific phenomenon including VA, TC, radioactive cloud and Tsunami for the Region (coordinate with MET/ATM TF when necessary)	CNS/MET SG Task Force on the implementation of ~~Volcanic Ash and Tropical Cyclone advisories and SIGMETs~~ meteorological advisories and warnings ~~(VA/TC/I TF)~~ (METWARN/I TF)	On going
2 (35)	(TOR 3)	D – Efficiency All GPIs	Subject: To facilitate regional implementation of CNS/ATM Tasks: a) coordinate training/workshops to allow States to develop and	A	1) Identify topics for training, develop syllabi and plan training programme;		On going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
			implement new CNS/ATM procedures; b) encourage States to participate in the evaluation and training of new CNS/ATM systems;		2) Encourage States in the evaluation and training of new CNS/ATM systems; 3) Co-ordinate with States and monitor progress;	CNS/MET SG	On-going On-going
			c) progress the adoption of WGS-84 co-ordinate system and introduction of high integrity systems for the management of the co-ordinate data.		4) Collect information and suggest methods of resolving problems commonly faced by the States.	ATM/AIS/SAR CNS/MET SG	On-going
3 (36)	APANPIRG D. 4/46 RAN/3 C.12/3 APANPIRG 5/3 (TOR 3)	D – Efficiency All GPIs	Subject: Provision of adequate CNS/MET services Task: Monitor CNS/ATM systems research and development, trials and demonstrations in the fields of CNS/MET and facilitate the transfer of this information and expertise between States.	A	1) Encourage States to conduct R&D, trials & demonstrations of new CNS/MET 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/MET; 5) Provide for coordinated	CNS-MET	On-going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
					training/seminars to keep all States informed on developments of trials and demonstrations.		
4 (37)	C 12/24	D – Efficiency GPI-19	Subject : Transition to the GRIB and BUFR coded WAFS products	A	1) Monitoring of implementation of BUFR coded SIGWX forecasts	CNS/MET SG	Completed
			Task : Implementation of the transition to the GRIB and BUFR coded WAFS products		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 ~~ISCS G3~~ WIFS until cessation of ISCS G2 broadcast	WAFS Implementation Task Force WAFS/I TF WAFS/I TF	Completed 2013 ~~2009~~ 2012
5 (38)	C12/36 APANPIRG C14/45	D – Efficiency 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	CNS/MET SG with assistance of MET WG on CNS/ATM Plan CNS/MET SG	Completed Completed Completed Completed

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
					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)	METATM TF METATM TF MET ATM TF MET ATM TF	 Reconvene ~~2009~~ Completed ~~2010~~ Jan 2011
6 (39)	APANPIRG/13 D 13/28	A - Safety D – Efficiency 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 OPMET exchanges; introduce monitoring and management procedures for the ROBEX centres and Regional OPMET data banks	A	1) Review and update regional ROBEX tables and relevant documents; 2) Propose optimization changes to the ROBEX scheme; 3) Improve the availability 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.	CNS/MET SG OPMET Management Task Force (OPMET/M TF)	Recurrent task Completed On-going On-going Completed
7 (43)		D- Efficiency 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	CNS/MET SG	Continuous SIP Seminar on DFIS conducted. in 2008 - and first SOCM meeting

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
							held in 2009
8 (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.	CNS/MET SG ~~VA/TC/I TF~~ METWARN/I TF in coordination with OPMET/M TF	Recurrent task Recurrent task Recurrent task Recurrent task
9 (46)	APANPIRG/17 C 17/23	D-Efficiency 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/MET SG ATM/AIS/SAR SG CNS/MET SG	Seminar and Workshop on PBN were Conducted in 07/08 and in 03/2009 Regional PBN plan was adopted in 2009.
10 (48)		D-Efficiency GPI22 GPI9	Subject: FASID Task: Updating of FASID Table CNS-1B, CNS-1C, CNS-1E, CNS-4A and CNS 4B.	A	Seek State revision of Tables prior to March 2010. Review and update FASID Tables with the assistance of the Secretariat	CNS/MET SG	Completed Amendment proposal processed.
11 (49)		A-Safety D-Efficiency E-Continuity GPI23	Subject: WRC-2011 (2012) Task: Supporting ICAO position for ITU WRC-2011 on agenda items related to civil aviation	A	Seek States to support ICAO position at regional telecommunity – APT APG and at WRC.	CNS/MET SG	On-going till 2012 RPG/1 was held in Dec. 09. APG2012-3 in

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
							March 2010.
12 (50)	CNS/MET SG/13 Decision 13/7 ToR (5)	D-Efficiency 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/MET SG PBNTF	2011
13 (51)	TBD by APANPIRG/20	A-Safety D-Efficiency 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/MET SG ADS-B SITF	2012
14 (52)	ToR of CNS/MET SG (4)	D-Efficiency 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/MET Sub-group.	CNS/MET SG	2013
15 (53)	ToR of CNS/MET SG (5) and APANPIRG Conclusion 20/72	A-Safety D-Efficiency GPI-5, 9 GPI-11	Subject: Develop a standard ionospheric model to facilitate implementation of GNSS; Task: Nominate focal point of contact and exchange of ionospheric data with objective of establishing a standard ionospheric model	A	Nominate focal point of contact and coordinate for measurement campaign	CNS/MET SG	2013
16 (54)	APANPIRG Conclusion 19/24 and Conclusion 20/32	A-Safety D-Efficiency 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/2 was held in Aug.09	CNS/MET SG	2013

*** Number in bracket indicates sequential number since establishment of the Sub-group.**

Fourteenth Meeting of the Communications/Navigation/Surveillance and Meteorology Sub-group (CNS/MET SG/14) of APANPIRG

Jakarta, Indonesia
19 -22 July 2010

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International Civil Aviation Organization

FOURTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND METEOROLOGY SUB-GROUP OF APANPIRG (CNS/MET SG/14)

Jakarta, Indonesia, 19 – 22 July 2010

LIST OF WORKING AND INFORMATION PAPERS

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
WP/1	-	Provisional Agenda	Secretariat	A
WP/2	5 (2)	Global Navigation Satellite System Manual (Doc 9849) – Revision	Secretariat	C
WP/3	5 (2)	Report on Outcome of Seminar on Testing of Navigation and Surveillance Facilities and Validation of Flight Procedures	Secretariat	C
WP/4	3 (1)	Aeronautical Telecommunication Network Implementation Coordination Group Meeting (ATNICG/5)	Secretariat	C
WP/5	16 (3)	CNS/ATM Implementation and Planning Matrix	Secretariat	C
WP/6	2 (1)	Review of Actions on the Report of the Thirteenth CNS/MET Sun-group and APANPIRG/20 Meetings	Secretariat	A
WP/7	7 (1)	Regional Preparation for the International Telecommunication Union (ITU) World Radiocommunication Conference (2012) (WRC-12)	Secretariat	C
WP/8	5 (3)	Ionospheric Data Collection for GNSS Implementation	Secretariat	C
WP/9	5 (1)	Report of the Performance Based Navigation (PBN) Task Force	Chair of PBN Task Force	C
WP/10	8 (3)	Summary of Recent and Forthcoming Developments to the WAFS	WAFC Provider States	M

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
WP/11	9	Status of ACC AFTN Addresses for the Reception of Information Concerning the Release of Radioactive Material in the Atmosphere	Secretariat	M
WP/12	9	Volcanic Ash Development	Secretariat	M
WP/13	10	Updates on Tropical Cyclone Advisories and SIGMET	Secretariat	M
WP/14	11 (4)	SIGMET Guide Update	Secretariat	M
WP/15	12 (1)	Eight Meeting of the OPMET Management Task Force	Secretariat of OPMET /M TF	M
WP/16	12 (2)	Review the Implementation of 30-H TAF in the ASIA/PAC Region	Secretariat	M
WP/17	12 (4)	ROBEX Handbook and ICD Updates and Recent Developments	Secretariat	M
WP/18	13	Review MET Part of ASIA/PAC Basic ANP and FASID Tables	Secretariat	M
WP/19	14 (1)	First Meeting of the MET/ATM Task Force	Secretariat of MET/ATM TF	M
WP/20	14 (2)	Air Traffic Management (ATFM) Survey for Asia/Pacific	Secretariat	M
WP/21	16 (2)	Review of Performance Framework Forms (MET Related)	Secretariat	M
WP/22	17 (2)	Status of MET Deficiencies	Secretariat	M
WP/23	17 (2)	Cost Recovery Proposal	Secretariat	M
WP/24	14 (2)	Use of Doppler Weather Radar for Low Level Wind Shear Warning and the Necessity of Input/Feedback from Air Crews	India	M
WP/25	14 (2)	Online Aviation MET Briefing in India with Special Reference to Low Level Flights	India	M
WP/26	14 (1)	Some Views on Discussion at MET/ATM TF/1 Meeting	Hong Kong, China	M

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
WP/27	11 (2)	Adjusting of Meteorological Watch Offices for Two FIRs in China	China	M
WP/28	12 (1)	IATA OPMET Data Monitoring (SADIS)	IATA	M
WP/29	12 (1)	IATA OPMET Data Monitoring (ISCS)	IATA	M
WP/30	12 (1)	Timeliness, Availability and Regularity of OPMET	IATA	M
WP/31	8 (3)	Regional Progress in WAFS Implementation	Chairman, WAFS Implementation Task Force	M
WP/32	11 (1)	Progress with SIGMET Tests – WC and WV	Japan	M
WP/33	11 (3)	Web-Based Display of Global SIGMETS and Advisories	Hong Kong, China	M
WP/34	15 (1)	Special Aircraft Observation and Special Air Report	Hong Kong, China	M
WP/35	14 (2)	Meteorological Services (MET) in Support to Global Air Traffic Management (ATM) and Performance – Based Navigation (PBN)	USA	M
WP/36	8 (1)	WAFS Internet File Server (WIFS) – Update	USA	M
WP/37	2 (2)	ICAO Asia and Pacific Seamless ATM Workshop	Japan and USA	C
WP/38	9	Darwin VAAC Report (July 2009 – June 2010)	Australia	M
WP/39	9	Volcanic Activity Reports Collection and Dissemination	Australia	M
WP/40	9	MET Task Forces	Australia	M
WP/41	8 (3)	Summary of Recent and Forthcoming Developments to the SADIS	SADIS provider States	M
WP/42	8 (3)	SADIS Strategic Assessment Tables 2010-2014	SADIS provider States	M

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
WP/43	5 (3)	Resolution for Ionosphere Issues in Implementation GNSS	Japan	C
WP/44	2	Action Items of the 46th DGCA Conference	Secretariat	A
WP/45	5	PBN State Plan Harmonization Analysis Report	IATA	C
WP/46	5 (1)	Outcome of Sixth Meeting of PBN Task Force (PBN TF/6)	Chair of PBN Task Force	C
WP/47	5 (4)	Navigation Strategy for the Asia/Pacific Region	Secretariat	C
WP/48	6 (2)	Review Surveillance Strategy for Asia/Pacific Region	Secretariat	C
WP/49	5 (1)	Regional Support Strategy for PBN Implementation	IATA	C
WP/50	5 (1)	PBN/TF 7 Working Paper for Review and Comment	IATA	C
WP/51	3 (1)	Proposed AMHS Implementation Plan	Hong Kong, China	C
WP/52	4	Updated on Use of Satellite Voice Communications for ATC Purposes	Australia	C
WP/53	5	Ionosphere Characterisation in Australia to Support GBAS Implementation	Australia	C
WP/54	3 (2)	Clarification of 9896 Internet Protocol Suite IPv6	USA	C
WP/55	3 (2)	Network Protocols Incompatibility Issues and Solutions	USA	C
WP/56	18	Terms of Reference and Tasks List of the CNS/MET Sub-Group	Secretariat	A
WP/57	2 (3) & 4	Review Outcome of the NAT SPG/46 Report	Secretariat	C
WP/58	17 (1)	Status of CNS Deficiencies	Secretariat	C

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
WP/59	4 (3)	Regional HF Management Guidance Material	Prepared by Chair of the South Pacific HF WG and presented by the Secretariat	C
WP/60	2 (3)	Outcomes from the ATM/AIS/SAR/SG/20 Meeting	Secretariat	A
WP/61	16 (1)	Performance-Based Approach and Measurement and CNS Related PFF	Secretariat	C
WP/62	3 (1)	Review ATN Implementation Strategy in the Asia/Pacific Region	Singapore	C
WP/63	3 (2)	Planned Packet Switching Network (X.25) Decomission	USA	C
WP/64	14	Meteorological Services (MET) in Support to Global Air Traffic Management (ATM) and Performance-Based Navigation (PBN)	USA	M
INFORMATON PAPERS				
IP/1	-	Meeting Bulletin	Secretariat	A
IP/2	5 (5)	Outcome of NSP Working Group of the whole Meeting – November 2009	Secretariat	C
IP/3	6 (3)	Update on the Work of the Organization on Surveillance and Collision Avoidance – June 2010	Secretariat	C
IP/4	5	Ninth Edition of Catalogue of Flight Inspection Units – Asia and Pacific Regions	Secretariat	C
IP/5	11 (3)	SIGMET Advisory	Rapporteur METWSG SIGMET Advisory Ad Hoc Group	M

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
IP/6	15	A Meteorological Satellite Named *COMS* Launched by Korea	Republic of Korea	M
IP/7	8 (1)	WIFS Impact to ISCS and SADIS Users	WAFC Washington and London	M
IP/8	6 (1)	The Fifth Meeting of the South East Asia Sub-regional ADS-B Implementation Working Group	Secretariat	C
IP/9	15 (2)	Real Time Quality Control of the Aerodrome Meteorological Observation System (AMOS) and Aviation Meteorological Information	Republic of Korea	M
IP/10	5	Outcomes from the ICAO Navigation Systems Panel	Australia	C
IP/11	8	Reference of Global Programmes	Secretariat	M
IP/12	12 (3)	Review Status of OPMET Data Representation	Secretariat	M
IP/13	15 (1)	Status and Highlights of Amendment 75 to Annex 3	Secretariat	M
IP/14	17 (2)	Review of the Co-Operative Agreement for the Enhancement of Meteorological Services for Aviation in the South Pacific (CAEMSA-SP)	Secretariat	M
IP/15	9	5th International Workshop on Volcanic Ash	New Zealand	M
IP/16	9	Wellington VACC Report – 2009/10	New Zealand	M
IP/17	9	New Zealand Participation on the International Volcanic Ash Task Force	New Zealand	M
IP/18	14 (2)	Trial Operation of the Aviation Thunderstorm Now Casting System (ATNS) in Support of ATM	Hong Kong, China	M
IP/19	14 (2)	Development of New Significant Convection Forecast Product and Service for Air Traffic Flow Management in Hong Kong, China	Hong Kong, China	M

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
IP/20	10	Pilot Project on Aviation – Weather Disaster Risk Reduction (ADRR)	Hong Kong, China	M
IP/21	11 (2)	Oakland Oceanic for Change Kzoa Affect SIGMET Collection for Airlines	USA	M
IP/22	8 (3)	The International Flight Folder Documentation Programme (IFFDP)…Current and Future	USA	M
IP/23	11 (2)	Applying Global Anomalies to Aeronautical Climatological Information and a Linkage to Convective SIGMET Frequency	USA	M
IP/24	15	Aerodrome Climatological Summaries	Australia	M
IP/25	4 (3)	Update Status of the Communication Implementation in Indonesia	Indonesia	C
IP/26	11 (3)	Development of a New Turbulence Index	Japan	M
IP/27	14 (2)	Introduction of Significant Weather Briefing Sheet for ATMC	Japan	M
IP/28	6 (3)	The Federal Aviation Administration's Automatic Dependent Surveillance – Broadcast (ADS-B) Programme	USA	C
IP/29	4	Global Operational Data Link Document (GOLD)	USA	C
IP/30	4 (1)	Outcome of First Satellite Operational Continuity Meeting	Secretariat	C
IP/31	3 (2)	Status of Doc 9896 and Notes on IPv6 Implementation	Secretariat	C
IP/32	6	ADS-B Data Sharing: Indonesia – Australia	Indonesia	C
IP/33	8 (1)	Update to the WIFS Registration Process	USA	M
IP/34	4	FAA Data Link Harmonization Policy Statement	USA	C

WP/IP No.	Agenda Item	Subject	Presented by	Particular Agenda referred for CNS, MET and ALL
IP/35	18	U.S. Next Generation Air Transportation System (NextGen)	USA	C
IP/36	3	Overview of WIFS Internet Sites	USA	M
IP/37	14 (2)	Routine of TAF Amendments	USA	M
IP/38	4 (1)	Data Link Performance Monitoring Results	New Zealand	C
IP/39	19	AIS/AIM Automation in India	India	C
IP/40	16	Expansion of the Republic of Korea – ICAO Fellowship Training Programme	Republic of Korea	C
IP/41	5 & 6	The R & D Activities on ADS-B, GBAS System Technologies in the Republic of Korea	Republic of Korea	C

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