ACTION TAKEN ON DECISIONS/CONCLUSIONS OF CNS/MET SG/6

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
Report	Concl. 13/11	APANPIRG	**Conclusion 13/11 – Amendment to the Table CNS-1A - AFTN Plan** That, the Table CNS-1A contained in ASIA/PAC FASID be replaced with an updated Table CNS-1A provided in Appendix A to the Report on Agenda Item 2.2 in accordance with established procedure.	Amendment proposal APAC 02/7-COM was processed to replace the existing Table CNS-1A contained in Part IV of the ASIA/PAC FASID. Comments provided by States in response to the amendment proposal were incorporated in the Table. States were notified of the approval of the proposal in December 2002
D. Deci. 6/2	Concl. 13/12	APANPIRG	**Conclusion 13/12 - Need to monitor AFTN circuit performance** That, States concerned closely monitor performance of the following AFTN circuits and coordinate upgrading the circuit capacity within the target date established in the AFTN Plan. 1. Colombo/Male 2. Colombo/Singapore 3. Mumbai/Colombo 4. Mumbai/Nairobi 5. Kuala Lumpur/Chennai 6. Tokyo/Singapore 7. Tokyo/Moscow	States concerned were requested to monitor loading condition and upgrade circuit capacity as specified in Table CNS-1A AFTN Plan. Consequently, - Colombo/Male – upgrading planned for 12/03 - Colombo/Singapore – upgraded to 9600bps 12May03 - Mumbai/Colombo – upgraded to 64 kbps 19Mar.03 -Mumbai/Nairobi – India is ready to upgrade. International coordination is being under taken. - Kuala Lumpur/Chennai – upgraded to 9600 bps in April 03. - Tokyo/Singapore – upgraded to 9600bps 15Jan03; - Tokyo/Moscow – States closely monitoring circuit loading. Coordination being carried out between States concerned for upgrading the circuit.
D. Deci. 6/3	Concl. 13/13	APANPIRG	**Conclusion 13/13 - Use of VSAT Technology for AFS** That, States in the Bay of Bengal area, implement AFS circuits using VSAT technology as a matter of high priority to enhance safety and efficiency of aircraft operations and to meet AFS communication requirements for data/voice communications.	The Conclusion was presented to States concerned at COM Coordination meeting for Bay of Bengal area. VSAT technology is being used by several States and between States concerned. Regulatory restriction is still a problem for a State to use VSAT to provide AFS communications.

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
	Concl. 13/14	APANPIRG	**Conclusion 13/14 – ATN Documentation Tree** 1. Publish, planning document in 2. Include ATN Documentation Tree in the planning document.	Documentation tree was further updated by the Fifth ATN Transition Task Force meeting held in June 2003. It will be included in the ATN Planning Document after the Draft Conclusion 7-10/2 formulated by the CNS/MET SG/7 and CNS/ATM/IC/SG/10 is adopted by APANPIRG/14
D.Concl. 6/5	Concl. 13/15	APANPIRG	**Conclusion 13/15 - ASIA/PAC Interface Control Document (ICD) for ATS Message Handling System (AMHS)** That, the ASIA/PAC ICD for AMHS be adopted and published as Issue 1.	AMHS ICD has been published.
D. Concl. 6/6	Concl. 13/16	APANPIRG	**Conclusion 13/16 - Checklist for Implementation of Ground to Ground ATN Infrastructure** That, the Checklist provided in Appendix C to the report on Agenda Item 2.2 be adopted and circulated to States to assist in implementation of the Ground-to-Ground ATN infrastructure.	The Checklist was circulated to States.
D. Concl. 6/7	Decision 13/17	APANPIRG	**Decision 13/17 - Revision of the Subject/Tasks List of the ATN Transition Task Force** That, the updated Subject/Tasks List of the ATN Transition Task Force provided in the Appendix D to the report on Agenda Item 2.2 be adopted.	The updated Subject/Tasks List was presented to ATNTTF/5 which was held 9-13 June 03.
D. Concl. 6/8	Concl. 13/18	APANPIRG	**Conclusion 13/18 - Revision of the Strategy for Precision Approach and Landing Guidance Systems and the Strategy for the Implementation of GNSS Navigation Capability in the Asia/Pacific Region**	The updated Strategies were provided to the States as part of the APANPIRG report. No substantial changes were made to the Strategies which was adopted by APANPIRG/12.

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
			That, the updated Strategy for Precision Approach and Landing Guidance Systems and the Strategy for the Implementation of GNSS Navigation Capability in the ASIA/PAC region provided in Appendices E and F respectively, to the report on Agenda Item 2.2 be adopted and provided to States.	
Concl.6/9	Concl. 13/19	ANC	**Conclusion 13/19 – ADS-B Study and Implementation Task Force** That, a) a multidisciplinary Task Force be established consisting of members from Australia, China, Hong Kong China, Fiji, India, Japan, Mongolia, Singapore, United States, IATA, IFALPA, IFATCA and SITA with the Term of Reference provided in Appendix G to the report on Agenda Item 2.2; and b) the result of the study to be presented to APANPIRG/14 meeting in 2003.	The Task Force meeting was held in Brisbane, Australia 24-26 March 2003. The result of the meeting was represented to the ATS/AIS/SAR SG/13 held in Bangkok 23-27 June 03 as well as CNS/MET SG/7 and CNS/ATM IC SG/10 meetings. The result of the study is presented to APANPIRG/14 through the report of CNS/MET/SG/7 and CNS/ATM/IC SG/10
D. Concl.6/10	Concl. 13/20	ANC	**Conclusion 13/20 – 24 bit aircraft address** That, a) the ICAO issue a State Letter reminding States of the requirement to maintain aircraft address allocations in accordance with provisions laid down in Annex 10, Volume III and provide 24bit address allocation procedure; b) Japan be encouraged to undertake additional monitoring in the twelve-month period after the issue of State letter to observe changes in the level	State Letter AP-CNS0105 was issued on 8 May 2003. Procedures to be followed for allocation of 24 bit address were provided to States. Japan continued to monitor the use of 24 bit address and reported findings to the CNS/MET SG/7 and CNS/ATM/IC SG/10 meeting

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
			of compliance; and c) the need to enforce the procedure a working paper be presented to the 39th DGCA Conference.	A working paper outlining detailed procedure was presented to the 39th DGCA Conference. Follow up action was tAn action item was agreed by 39th DGCA Conference.
D. Concl.6/11	Concl. 12/45	Council	**Conclusion 13/21 - Preparation for World Radiocommunication Conference-2003 (WRC2003)** That States, a) assign high priority to the aeronautical spectrum management; b) participate in the development of States' position for WRCs at the national level to ensure support to ICAO position; c) ensure, to the extent possible, aviation representatives are included in States delegation to the Asia-Pacific Telecommunity (APT) Conference Preparatory Group meetings and at WRC-2003; and d) ICAO convene a meeting of designated contact persons before the end of 2002 or early 2003 to review the result of the fourth APT Preparatory Group meeting and to finalize input to the fifth and the last APT Preparatory Group meeting for WRC 2003. e) publish the list of contact persons at the ICAO APAC webpage.	a) States have assigned high priority to the spectrum management; b) Aviation administrations actively participated in the development of States's position; c) Many aviation administrations included their representatives in their national delegations at the APT APG meetings and at WRC2003. d) The Second Regional Preparatory Group Meeting for ITU World Radiocommunication Conference – 2003 (WRC-2003) was held in Bangkok, Thailand from 8 – 10 January 2003. e) A list of designated contact persons in each administration is posted in at the ICAO APAC webpage.

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
D. Concl.6/22	Concl. 13/22		**Conclusion 13/22 - ATN related procedures for Basic ANP and FASID** That, the amendments proposed to the regional procedures contained in the Part IV-CNS of the ASIA/PAC Basic ANP and FASID relating to ATN materials provided in Appendix H and Appendix I, respectively to be report on Agenda Item 2.2 be adopted and incorporated in the respective documents in accordance with the established procedure.	The amendment proposal APAC 03/8 –CNS was processed in June 2003.
D. Concl.6/25	Concl. 13/23	Council	**Conclusion 13/23 - Process of review and Notification of difference** That, States establish a procedure with assistance of a database for review of SARPs and notification of differences to Annexes in a timely and comprehensive manner.	A possibility of conducting a special implementation programme (SIP) is being explored.

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
D. Concl. 6/12	Concl. 13/24	APANPIRG	**Conclusion 12/21 – SADIS strategic assessment tables** That, a) the ASIA/PAC SADIS strategic assessment tables, as given in Appendix N to the Report, be adopted and forwarded to the SADISOPSG for planning the future SADIS bandwidth requirements; and b) invite the SADISOPSG to consider amendment to the format of the SADIS strategic assessment table so as to include explicitly the requirements for the Volcanic Ash (FV and Tropical Cyclone (FK) advisory messages.	The subject matter was discussed by the SADISOPSG/8.
D. Concl. 6/13	Concl. 13/25	APANPIRG	**Conclusion 13/25 - Regional survey on the States' plans for transition to GRIB and BUFR coded WAFS products** That, ICAO carry out a regional survey to assess the plans of the SADIS and ISCS user States in the ASIA/PAC Regions to upgrade/replace their workstations and software used for handling WAFS data, and the dates the new equipment and the software capability to decode and display GRIB and BUFR data is expected to be operational. ***Note. - The survey would be undertaken by the WAFS/T TF of the CNS/MET SG*** .	Regional Survey was carried out and report presented at CNS/MET SG/7
D. Concl. 6/14	-		**Draft Conclusion 6/14 - BUFR Training Workshop** That, the SADIS provider State be invited, in coordination with ICAO and WMO, to arrange the necessary BUFR training for SADIS user States in the ASIA/PAC Regions in 2003.	GRIB/BUFR Training was provided by UK in November 2002.

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
D. Concl. 6/15	Concl. 13/26	APANPIRG	**Conclusion 13/26 - Amended ASIA/PAC WAFS Transition Plan and Procedures** That, the ASIA/PAC WAFS Transition Plan and Procedures be amended as shown in Appendix L to the report to reflect the changes in the plans and schedules of the two WAFCs in transition to the final phase of WAFS.	The WAFS Transition Plan has been amended.
D. Deci. 6/16	Deci. 13/27	APANPIRG	**Decision 13/27 - TORs of ASIA/PAC WAFS Transition Task Force** That, the TORs and Work Programme for the ASIA/PAC WAFS Transition Task Force be agreed as given in Appendix Q to this report.	The TORs of the WAFS/T TF have been amended.
D. Deci. 6/17	Deci. 13/28	APANPIRG	**Decision 13/28 – ASIA/PAC OPMET Exchange Task Force (OPMET/E TF)** That, an OPMET Exchange Task Force (OPMET/E TF) be established with the terms of reference, work programme and composition as given in the Appendix N to the Report.	The OPMET/E TF has been established and held its first meeting in February 2003.
D. Concl. 6/18	Concl. 13/29	ANC	**Conclusion 13/29 - Inclusion of SIGMET in VOLMET** That, States be encouraged to fully implement D-VOLMET to permit suitably equipped aircraft to receive timely SIGMET information amongst other requisite meteorological information. **ANC:** *Noted the conclusion and requested the Secretary General to encourage States to implement VOLMET data link service (D-VOLMET) to permit suitably equipped aircraft to receive timely SIGMET information amongst other requisite meteorological information.*	The follow-up action has been taken by the HQs, since the subject of the conclusion was of concern of all ICAO regions.

Report Ref. Deci./Concl. of Sub-Group	Report Ref. Deci./Concl. No.	Action Taken by	Decision/Conclusion/Action Taken	Action Taken by States/ICAO
D. Concl. 6/19	Concl. 13/30	APANPIRG	**Conclusion 13/30 - Regional survey on the current status and future plans of States to process the MET component of ADS Reports** That, ICAO carry out a regional survey to assess the current status and future plans of the States in the ASIA/PAC Regions to process the MET component of the ADS message and forward the data to the WAFCs and to assess if the data is quality controlled. *Note. - The survey would be undertaken by the METATM TF of the CNS/MET SG.*	On going
D. Deci. 6/20	Deci. 13/31	APANPIRG	**Decision 13/31 – ASIA/PAC Volcanic ash Task Force (VA TF)** That, a Volcanic ash Task Force (VA TF) be established with terms of reference and work programme as given in the Appendix O to the Report.	The Volcanic Ash TF has been established and will report to CNS/MET SG/7.
D. Concl. 6/21	Concl. 13/32	C	**Conclusion 13/32 – QA MET seminar for ASIA/PAC Region** That ICAO, in coordination with WMO, organizes a seminar on the quality assurance in the provision of meteorological services to aviation in the ASIA/PAC Region during 2003. **Council:** *Noted the conclusion and recognizing that in accordance with the Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization (WMO) (Doc 7475) this conclusion should be addressed to WMO, requesting the Secretary General of WMO to arrange, in coordination with ICAO, training on quality assurance for provision of meteorological services to aviation in the ASIA/PAC Region after 2003.*	Action taken by the HQs.

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

DRAFT

ASIA/PACIFIC REGIONAL ROUTER INTERFACE CONTROL DOCUMENT FOR AERONAUTICAL TELECOMMUNICATION NETWORK GROUND-GROUND ROUTER FOR THE ISO/IEC 8208 SUB-NETWORK

ISSUE 1 - MARCH 2003

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EXECUTIVE SUMMARY

The Aeronautical Telecommunication Network (ATN) is a global inter-network that provides digital communications to satisfy the increasing telecommunications demand of air traffic service communication, aeronautical operational control, aeronautical administrative communication , and aeronautical passenger communication.

The ATN is composed of an ATN network infrastructure and ATN applications that provide the global communication for ground-ground (G/G) and air-ground (A/G) services. The ATN network infrastructure includes the ATN backbone communication link, ATN router, and end system. The ATN applications include among others, context management (CM), controller-pilot data link communication (CPDLC), air traffic service message handling service (ATSMHS).

The Asia/Pacific region is undertaking the implementation of an ATN network to support regional and global ATN services. This Interface Control Document (ICD) specifies the interface requirements for the ATN G/G Routers that form nodes of the Asia/Pacific ATN regional backbone network and/or have inter-State connectivity, to ensure interoperability between States. This ICD applies to an ISO/IEC 8208 connection over point-to-point circuit.

1.0 Introduction

1.1 Purpose and Scope

This document provides G/G router ICD guidelines for the routers that form nodes of the Asia/Pacific regional network Backbone and/or have inter-State/organization connectivity within the Asia/Pacific region, to assure interoperability. The ICD guideline provisions include:

1. ISO layer 1 to layer 3 interface requirements between G/G routers;

2. G/G router functional requirements associated with ATN Protocol Requirements Lists (APRLs) relevant to support layer 1 to layer 3 interface requirements.

This ICD applies to the ISO/IEC 8208 connections over point-to-point circuit.

1.2 Organization

This ICD addresses the physical, data link, and network layers of the ATN G/G router using the International Organization for Standardization (ISO) Information Processing Systems Open Systems Interconnection (OSI) Basic Reference Model. This document is based on the standards and recommended practices (SARPs) specified in ICAO Doc. 9705 Edition 2. The SARPs paragraph numbers in the APRLs are referred to ICAO Doc. 9705, Edition 3.

This document is organized as follows:

- **Section 1, INTRODUCTION,** summarizes the contents of this document and reference documents.

- **Section 2, PHYSICAL LAYER,** provides the physical interface requirements for a point-to-point circuit.

- **Section 3, DATA LINK LAYER,** provides the data link layer interface requirements using link access procedure balanced (LAPB) to support the interface between G/G routers.

- **Section 4, NETWORK LAYER,** provides the interface requirements to support the network layer including the sub-networks, sub-network dependent convergence functions (SNDCF), connectionless network protocol (CLNP) and inter-domain routing protocol (IDRP).

1.3 ATN Documentation Tree and Reference Documents

1.3.1 ATN Documentation Tree

Figure 1-1 shows the ATN documentation tree for the Asia/Pacific ATN documents. This figure provides a hierarchical representation of the relationship between the various ICAO, ATN documents and Asia/Pac regional ATN ICD. From this documentation tree, the relationship between this ICD and other documents is clearly defined.

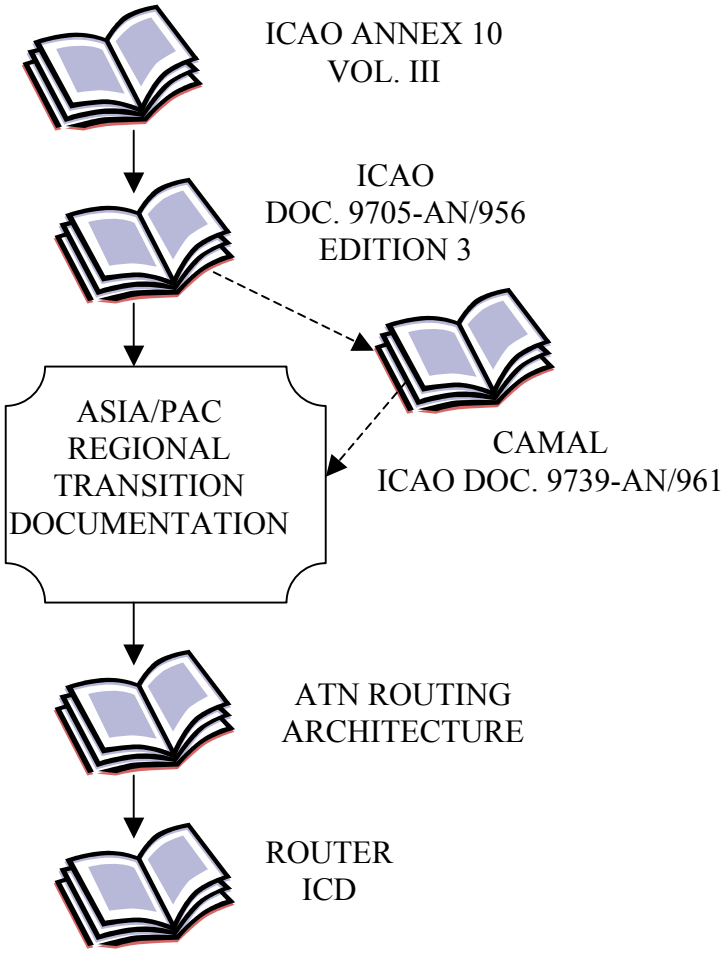

Figure 1-1: ATN Documentation Tree

1.3.2 Documents

1.3.2.1 Applicable Documents

The following documents, with specific editions and/or versions , contain requirements which, through reference in this text, constitute requirements of this document. The requirements for the Asia/Pacific Regional Router ICD for ATN G/G Router are found in the following documents:

1. ITU-T Rec. X.25, (1984), Interface Between Data Terminal Equipment (DTE) and Data Circuit-terminating equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks by Dedicated Circuit, Section 2, 3 and 4.

2. ISO/IEC 8208: 1995, Information Technology – Data Communications – X.25 Packet Level Protocol for Data Terminal Equipment (Revision of ISO/IEC 8208:1990).

3. ICAO Doc. 9705-AN/956. Manual of Technical Provisions for the Aeronautical Telecommunication Network, Edition 3 – 2001, Volume V.

4. ISO/IEC 10747:1994 Information Technology – Telecommunications and Information Exchange between Systems – Protocol for exchange of inter-domain routing information among intermediate systems to support forwarding of ISO 8473 PDUs.

5. ISO/IEC 8473-1:1994 Information Technology – Protocol for providing the connectionless-mode network service Part 1 – Protocol Specification.

6. ISO/IEC 8473-3:1995 Information Technology – Protocol for providing the connectionless-mode network service Part 3 – Provision of the underlying service by an X.25 sub-network.

7. Asia/Pacific ATN Addressing Plan.

8. Asia/Pacific ATN IDRP Routing Policy.

9. Table CNS-1B of the Asia/Pacific FASID.

1.3.2.2 Supporting Documents

The following documents are supporting documents applicable to the Asia/Pacific Regional Router ICD for ATN G/G Router. These documents do not form a part of this ICD and are not referenced within the document, however, these documents provide supporting background information for better understanding of this ICD.

1. ICAO Annex 10 - Volumes I and II, Fifth Edition, Incorporating Amendment 70.

2. ISO/IEC TR 9575:1995 Information Technology – Telecommunications and Information Exchange between Systems -- OSI Routing Framework.

3. Asia/Pacific ATN Routing Architecture.

2.0 Physical Layer (Layer 1)

The physical layer of the G/G router in this document supports the connection of a point-to-point circuit. The physical layer characteristics are based on mutual agreement between States and service providers.

3.0 Data Link Layer (Layer 2)

The data link layer of ATN G/G router defined in this document uses Link Access Procedure Balanced (LAPB). The following sections provide the requirements for LAPB. LAPB shall comply with ITU X.25, 1984.

3.1 Procedures

3.1.1 Link-level control procedures between the routers shall comply with LAPB procedure.

3.1.2 Link-level control procedures between the routers shall be configured in an Asynchronous Balanced Mode (ABM) defined in ITU X.25, section 2.3 and 2.4.

3.1.3 The router shall be as a logical Data Terminal Equipment (DTE) or Data Communication Equipment (DCE), as specified in ITU X.25 for a point-to-point circuit or under mutual agreements between States/organizations.

3.2 Frame Structure

The unit of transmission is the frame that shall comply with the LAPB frame structure as defined in ITU X.25, section 2.2.

3.3 Link Control Parameter Setup

Table A-1 in Appendix A defines the recommended X.25 data link layer level parameter values, which are highlighted in the following paragraphs.

3.3.1 Time-out functions are necessary to ensure recovery action is taken by a combined station to respond to I-frames, S-frames, and U-frames that require acknowledgment. Timers shall be adjustable in one-second increments within a range of 2 to 120 seconds.

3.3.2 The retransmission attempts parameter shall indicate the maximum number of unsuccessful transmission attempts to complete successful transmission. The value in the range 3 to 7 is recommended for private interfaces for low to medium circuit speed.

3.3.3 The maximum number of sequentially numbered outstanding I frames shall be seven for private terrestrial interfaces.

3.3.4 The DTE and DCE shall use the same value for maximum number of sequentially numbered outstanding I frames in all cases.

3.3.5 Interfaces operating over satellite circuits shall use modulo 128 numbering for the maximum number of sequentially numbered outstanding I frames, and select a value appropriate for the frame size and signalling speed.

4.0 Network Layer (Layer 3)

The first sub-layer is the sub-network, which is X.25 PLP layer complying with ISO/IEC 8208. The second sub-layer is SNDCF complying with ISO/IEC 8473-3. The third sub-layer includes CLNP and IDRP, which respectively comply with ISO/IEC 8473-1 and 10747 with specific requirements defined by ICAO Doc. 9705.

4.1 ISO/IEC 8208 Sub-Network

The router is capable of establishing one or more connections to other ATN routers via a point-to-point circuit. For a point-to-point circuit, the sub-network layer shall use ISO/IEC 8208 to access the services of the data link layer.

4.1.1 Procedures

Packet level procedures between the sub-networks are described herein and in accordance with ISO/IEC 8208, section 4 through section 11.

4.1.2 Packet Structure

The packet structure shall comply with the packet structure described in ISO/IEC 8208 section 12.

4.1.3 Functionality and Specific Setup

The sub-network layer shall support the functions defined in ISO/IEC 8208. The functions and specific setup are highlighted as follows.

4.1.3.1 Each router shall be capable of initiating an ISO/IEC 8208 sub-network connection.

4.1.3.2 The usage of diagnostic codes shall be established by mutual agreement between States/organizations.

4.1.3.3 Table A-2 in Appendix A provides ISO/IEC 8208 recommended interface parameters for point-to-point circuit.

The values of parameter in Appendix A are recommended values only for guidance. However, the actual values used for the circuit shall be defined by mutual agreement between States/organizations.

4.1.3.4 When connectivity is provided by a point-to-point circuit, the DTE addresses shall be 10 decimal digits and be agreed between States/organizations during the implementation planning.

4.1.3.5 Each router shall be capable of terminating a sub-network connection.

4.1.3.6 The M-bit shall be supported to indicate a message transfer that consists of more than one packet.

4.1.3.7 Q-bit and D-bit shall be both set to 0.

4.1.4 Use of Switched Virtual Circuits

The use of Switched Virtual Circuits (SVCs) is preferred. The use of Permanent Virtual Circuits (PVCs) shall be taken into the consideration of the service availability.

4.1.4.1 CR Packet Transmission at Call

1. In the case that two-way virtual circuit is an SVC, although not essential it is desirable to tune the transmission of CR packets when call are made between two peers for the following reasons:
   - To avoid collisions between transmitted and received calls, avoiding excessive protocol exchanges;
   - To make for more easily comprehensible communications logs.
2. In the case of PVCs, calls are made directly without the transmission of CRV packets.

4.2 Sub-Network Dependent Convergence Functions (SNDCF)

Sub-Network Dependent Convergence Functions (SNDCF) must be implemented in the router for each type of underlying sub-network. The purpose of a SNDCF is to provide the connectionless sub-network service assumed by the ATN Internet Protocol over real sub-network.

When a G/G router interfaces with another G/G router via a point-to-point circuit, the SNDCF shall comply with the following requirements:

1. The SNDCF shall provide byte- and code-independent service to the CLNP as specified in ICAO Doc. 9705, section 5.7.2;

2. The SNDCF that is used with the ISO 8208 sub-network for the G/G router shall comply with the APRLs given in Appendix B.

4.3 Connectionless Network Protocol (CLNP)

The G/G router interprets the CLNP protocol data unit (PDU) header and forwards the PDU to another G/G router without flow control or connection setup. The CLNP protocol functions shall be as specified in

ISO/IEC 8473-1 and section 5.6.2 and 5.6.3 of ICAO Doc. 9705 in accordance with the APRLs in Appendix C.

4.4 Inter-Domain Routing Protocol (IDRP)

The IDRP protocol function shall be specified as in ISO/IEC 10747 in accordance with APRLs in Appendix D.

APPENDIX A - X.25 RECOMMENDED INTERFACE PARAMETERS FOR POINT-TO-POINT CIRCUIT

A.0 X.25 Minimum Recommended Interface Parameters for a Point-to-Point Circuit

This appendix provides the X.25 minimum recommended interface parameters for point-to-point circuit. Other values may be established by mutual agreement

A.1 Data Link Layer Interface Parameters

Table A-1 provides the data link layer (LAPB) interface parameters.

Table A-1: Data link Layer (LAPB) Interface Parameters

Parameter	G/G Router A	G/G Router B	Comments
Max Outstanding Frames (k)	7	7	127(satellite and high circuit speed)
ACK Receipt Timer (T1)	6	6	Based on 9.6Kb and 256 byte packets.
ACK Send Timer (T2)	500 milliseconds	500 milliseconds	T2 < T1
Idle Channel State Timer (T3)	18-60 seconds	12-60 seconds	T3 > T4
Idle Probe Timer (T4)	3 seconds	3 seconds	
Maximum Number Bits in I-Frame (N1)	2104	2104	N1 > Maximum Packet Size X 8
Frame Retry Counter (N2)	3-7	3-7	
Frame Sequence	Modulo 8 or 128	Modulo 8 or 128	

A.2 Layer Interface Parameters

Table A-2 provides the packet layer (ISO/IEC 8208) Packet interface parameters.

Table A-2: Packet Layer (ISO 8208) Interface Parameters

Parameter	G/G Router A	G/G Router B	Comments
Reference Standard (Packet/Network layer)	ISO 8208	ISO 8208	
Packet Sequence	Modulo 8	Modulo 8	128 for Satellite and high circuit speed
Packet Negotiation	No	No	
Packet Data Size	256	256	
Allowed Packet Data Size during Negotiation	None	None	
Allowed Packet Data Size (agreed in advance)	64, 128, 256	64, 128, 256	
Window Size Negotiation	No	No	
Window Size, W (Receive/Send)	7/7	7/7	1 to 7 1 to 127 (satellite and high circuit speed)
Total LCNs	5	5	
LCN Order			DCE-ascending DTE-descending Note 1
LCN Base	1	1	
Total PVCs	3	3	
Total two way Virtual Circuits			Note 1
Total Outgoing Virtual Circuits			Note 1
Total Incoming Virtual Circuits			Note 1

Parameter	G/G Router A	G/G Router B	Comments
Total SVCs	2	2	
Delivery Confirmation Bit (D-bit)	Not supported	Not supported	
More Bit (M-bit)	Yes	Yes	
DTE Restart Request Timer (T20)	180 seconds	180 seconds	
DTE Call Request Timer (T21)	200 seconds	200 seconds	
DTE Reset Confirmation Timer (T22)	180 seconds	180 seconds	
DTE Clear Confirmation Timer (T23)	180 seconds	180 seconds	
DTE Window Transmission Timer (T24)	60 seconds	60 seconds	
DTE Packet Acknowledgement Timer (T25)	200 seconds	200 seconds	
DTE Interrupt Timer (T26)	180 seconds	180 seconds	
DTE Reject Timer (T27)	180 seconds	180 seconds	
Restart Request Retransmission Counter (R20)	2	2	
Restart Request Retransmission Count (R22)	2	2	
Clear Request Retransmission Count (R23)	2	2	
Data Packet Retransmission Count (R25)	2	2	
Reject Retransmission Count (R27)	2	2	
Restart Request Timer (T10)			DCE-60 seconds Note 1
Call Request Timer (T11)			DCE-180 seconds Note 1
Reset Confirmation Timer (T12)			DCE–60 seconds Note 1
Clear Confirmation Timer (T13)			DCE-60 seconds Note 1
Window Transmission Timer (T14)			DCE-60 seconds Note 1
Packet Acknowledgement Timer (T15)			DCE-60 seconds

Parameter	G/G Router A	G/G Router B	Comments
			Note 1

Note 1: Selection of the values to be established by mutual agreements.

APPENDIX B- SNDCF (ISO/IEC 8473-3) APRLS

B.0 SNDCF (ISO/IEC 8473-3) APRLs

An implementation of the SNDCF for ISO/IEC 8208 sub-networks shall be used in ATN G/G router and the SNDCF implementation shall be in compliance with the ATN Protocol Requirements Lists (APRLs) given in this appendix.

The APRLs use the following conventions and symbols:

M	[M]andatory - the capability must be supported
MO	Mandatory to implement but optional for use
O	[O]ptional - The capability may optionally be supported
O.<n>	[O]ptional, but support of at least one of the group of options labeled by the numeral <n> is required
X or P	prohibited/precluded i.e. the capability must not be supported.
OX or OP	Optional to implement but precluded for use
<pred>:	Condition item symbol, including predicate identification
^	Logical negation, applied to a condition item's predicate
<r>	Receive aspects of an item
<s>	Send aspects of an item
Y	[Y]es, indicates that an implementation must support the item
N	[N]o, indicates that there is no requirement for the an implementation

B.1 SNDCF for use with ISO 8208 Sub-networks - Function

Table B-1 provides the functions of SNDCF for use with ISO 8208 sub-network.

Table B-1: SNDCF for use with ISO 8208 Sub-networks - Function

Item	Function	ISO/IEC 8473-3 Reference	Status	ATN Support	G/G Router Support
XSNUD	Is Sub-network User Data of at least 512 octets transferred transparently by the SNDCF ?	5.2	M	M	Y
XSNTD	Is Transit Delay determined by the SNDCF prior to the processing of user data ?	5.2	M	M	Y
	Call Setup Considerations Is a new call setup:	5.3.1			
XCalla	a. when no suitable call exists ?	5.3.1 a.	O.3	O.3	Y

Item	Function	ISO/IEC 8473-3 Reference	Status	ATN Support	G/G Router Support
XCallb	b. when queue threshold reached ?	5.3.1 b.	O.3	O.3	N
XCallc	c. by systems management ?	5.3.1 c.	O.3	O.3	Y
XCalld	d. when queue threshold reached and timer expires ?	5.3.4	O.3	O.3	N
XCalle	e. by other local means?	5.3.1	O.3	O.3	N
	Call clearing considerations Are calls cleared:	5.3.2			
XClra	a. when idle timer expires	5.3.2 a., 5.3.4	O	O	Y
XClrb	b. when need to re-use circuit	5.3.2 b.	O	O	N
XClrc	c. by systems management	5.3.2 c.	O	O	Y
XClrd	d. by provider ?	5.3.2 d.	M	M	Y
XClrer	e. by other local means?	5.3.2	O	O	N
XPD	X.25 Protocol Discrimination	5.3.3	M	M	Y
XVCC	Resolution of VC collisions	5.3.5	M	M	Y
XMCR	Multiple VCs responding	5.3.6	M	M	Y
XMCI	Multiple VCs initiating	5.3.6	O	O	N
Xpri	X.25 Priority procedure	5.3.7	O	M	N

B.2 SNDCF for use with ISO 8208 Sub-networks - X.25 Call User Data

Table B-2 provides the X.25 call user data requirements of SNDCF for use with ISO 8208 sub-network.

Table B-2: SNDCF for use with ISO 8208 Sub-networks - X.25 call user data

Item	Parameter	ISO/IEC 8473-3 Reference	Status	ATN Support	G/G Router Support
PD-s	<s> Protocol Discriminator	5.3.3	M	M	Y
PD-r	<r> Protocol Discriminator	5.3.3	M	M	Y
LI-s	<s> Length Indication	5.3.6	XMCI:M	XMCI:M	N
LI-r	<r> Length Indication	5.3.6	M	M	Y
Ver-s	<s> SNCR Version	5.3.6	XMCI:M	XMCI:M	N
Ver-r	<r> SNCR Version	5.3.6	M	M	Y
SNCR-s	<s> SNCR Value	5.3.6	XMCI:M	XMCI:M	N
SNCR-r	<r> SNCR Value	5.3.6	M	M	Y

B.3 SNDCF for use with ISO 8208 Sub-networks - ISO 8208 SNDCF Timers

Table B-3 provides the timers of SNDCF for use with ISO 8208 sub-network.

Table B-3: SNDCF for use with ISO 8208 Sub-networks - ISO 8208 SNDCF Timers

Item	Timer	ISO/IEC 8473-3 Reference	Status	Values	ATN Support	G/G Router Support
XIDL	X25 VC Idle	5.3.4	XClra:O	Any	XClra:O	Y, 0 to 72000 sec.
XNVC	additional VC	5.3.4	O	Any	M	Y, 0 to 72000 sec.

B.4 SNDCF for use with ISO 8208 Sub-networks - Multi Layer Dependencies

Table B-4 provides multi layer dependency requirements of SNDCF for use with ISO 8208 sub-network.

Table B-4: SNDCF for use with ISO 8208 Sub-networks - Multi layer dependencies

Item	Dependency	ISO/IEC 8473-3 Reference	Status	ATN Support	G/G Router Support
XSSg-r	<r> Maximum SN data unit size (Rx)	5.2	>=512	>=512	>=512
XSSg-s	<s> Maximum SN data unit size (Tx)	5.2	>=512	>=512	>=512
Xvc	X.25 Virtual call service	5.3.8	M	M	Y
Xdt	X.25 Data transfer	5.3.8	M	M	Y
Xfc	X.25 flow control procedures	5.3.8	M	M	Y
Xfrp	X.25 flow control + reset packets	5.3.8	M	M	Y
Xccp	X.25 call setup and clear packets	5.3.8	M	M	Y
Xdp	X.25 DTE and DCE data packets	5.3.8	M	M	Y
Xrs	X.25 restart procedures	5.3.8	M	M	Y
XDct	X.25 DCE timeouts	5.3.8	M	M	Y
XDtT	X.25 time limits	5.3.8	M	M	Y
Xpco	X.25 network packet coding	5.3.8	M	M	Y
Xfcn	X.25 flow control parameter negotiation	5.3.8	O	O	Y
Xtd	X.25 transit delay selection and negotiation	5.3.8	O	O	Y
Xtc	X.25 throughput class negotiation	5.3.8	O	O	Y
Xoth	Other X.25 elements	5.3.8	O	O	N

APPENDIX C- CLNP APRLS

C.0 CLNP APRLs

This appendix provides CLNP APRLs for ATN G/G router. The APRLs define the capabilities and options of the protocol that, at minimum, are required to be implemented for the ATN G/G router for ICAO Asia/Pacific regional ATN.

The APRLs in this appendix use the conventions and symbols defined in the beginning of appendix B.

C.1 Support of ATN-Specific Network Layer Features

Table C-1 provides the requirements for CLNP network layer features.

Table C-1: Support of ATN-specific network layer features

Index	Item	ATN SARPs Reference	ATN Support	G/G Router Support
ATN CLNP1	Encoding and use of the Security Parameter	5.6.2.2	M	Y
ATN CLNP2	Management of Network Priority	5.6.2.3, 5.2.8.4	M	Y
ATN CLNP4	Echo Request Function	5.6.3.3	O	Y
ATN CLNP5	Congestion Management	5.6.2.4	M	N, O
ATN CLNP6	Echo Response Function	5.6.3.4.1	M	Y
ATN CLNP7	Echo Response parameter setting	5.6.3.4.2,5.6.3.4.3 5.6.3.4.4	M	Y

C.2 Major Capabilities

Table C-2 provides the CLNP major capabilities.

Table C-2: Major Capabilities

Item	Capability	ISO/IEC 8473 Reference	Status	ATN Support	G/G Router Support
ES	End System		O.1	O.1	N
IS	Intermediate System		O.1	O.1	Y
FL-r	<r> Full protocol	8473-1: 6	M	M	Y
FL-s	<s> Full protocol	8473-1: 6	M	M	Y
NSS-r	<r> Non-segmenting subset	8473-1: 5.2	M	M	Y

Item	Capability	ISO/IEC 8473 Reference	Status	ATN Support	G/G Router Support
NSS-s	<s> Non segmenting subset	8473-1: 5.2	IS:M ^IS:O	IS:M ^IS:O	Y
IAS-r	<r> Inactive subset	8473-1: 5.2	ES:O	ES:O	N
IAS-s	<s> Inactive subset	8473-1: 5.2	IAS-r:M ^IAS-r:X	IAS-r:M ^IAS-r:X	N
S802	SNDCF for ISO 8802	8473-2: 5.4	O.2	O	Y
SCLL	SNDCF for CL Link Service	8473-4: 5.3.1	O.2	O	N
SCOL	SNDCF for CO Link Service	8473-4: 5.3.2	O.2	O	N
SX25	SNDCF for ISO 8208	8473-3: 5.4	O.2	O	Y
ATN SNDCF	SNDCF for Mobile Sub-networks	ATN SARPs Ref: Chapter 5.7	N/A	ISMOB:M ISGRD:O ^IS:O	N/A

ISMOB: If ISO/IEC 8473 is used over Mobile Sub-networks, then ISMOB is true, else ISMOB is false.

ISGRD: If ISO/IEC 8473 is used over Ground Sub-networks, then ISGRD is true, else ISGRD is false.

O.1: The supported functions, NPDUs, associated parameters and timers required for Intermediate Systems are provided in the APRLs. C.3 through C.10.

O.2: APRLs for the SNDCF for use with ISO/IEC 8208 sub-networks are provided in B.1 through B.4.

C.3 Ground-Ground Router - Supported Functions

Table C-3 specifies the ATN G/G router supported functions.

Table C-3: G/G Router - Supported Functions

Item	Function	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iPDUC	PDU Composition	6.1	M	M	Y
iPDUD	PDU Decomposition	6.2	M	M	Y

Item	Function	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iHFA	Header Format Analysis	6.3	M	M	Y
iPDUL	<s> PDU Lifetime Control	6.4	M	M	Y
iRout	Route PDU	6.5	M	M	Y
iForw	Forward PDU	6.6	M	M	Y
iSegm	Segment PDU	6.7	iDSNS:M	iDSNS:M	N
iReas	Reassemble PDU	6.8	O	O	N
iDisc	Discard PDU	6.9	M	M	Y
iErep	Error Reporting	6.10	M	M	Y
iEdec	<s> Header Error Detection	6.11	M	M	Y
iSecu	<s>Security	6.13 ATN SARPs Ref: 5.6.2.2	O	M	Y
iCRR	<s> Complete Route Recording	6.15	O	OX	N
iPRR	<s> Partial Route Recording	6.15	O	M	Y
iCSR	Complete Source Routing	6.14	O	OX	N
iPSR	Partial Source Routing	6.14	O	OX	N
iPri	<s> Priority	6.17, ATN SARPs Ref: 5.6.3.5	O	M	Y
iQOSM	<s> QOS Maintenance	6.16	O	M	Y
iCong	<s> Congestion Notification	6.18, ATN SARPs Ref: 5.6.2.4	O	M	Y
iPadd	<s> Padding	6.12	M	M	N, O
iEreq	Echo request	6.19, ATN SARPs Ref: 5.6.3.3	O	O	Y
iErsp	Echo response	6.20	O	M	Y

Item	Function	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iSegS	Create segments smaller than necessary	6.8	O	O	N
iDSNS	Simultaneous support of sub-networks with different SN-User data sizes	6.7	O	O	N

C.4 Supported Security Parameters

Table C-4 specifies the ATN G/G router supported security parameters.

Table C-4: G/G Router Supported Security Parameters

Item	Function	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iSADSSEC	Source Address Specific Security	7.5.3.1	iSecu:O.5	iSecu:O	N
iDADSSEC	Destination Address Specific Security	7.5.3.2	iSecu:O.5	iSecu:O	N
iGUNSEC	Globally Unique Security	ATN SARPs Ref. 5.6.2.2	iSecu:O.5	iSecu:M	Y

O.5: The Security parameter within a single NPDU specifies a security format code indicating Source Address Specific, Destination Address Specific or Globally Unique Security.

C.5 Quality of Service Maintenance Function

Table C-5 specifies the ATN G/G router quality of service maintenance function.

Table C-5: Quality of Service Maintenance Function

Item	Function	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
IQOSNAVAIL	If requested QOS not available, deliver at different QOS	6.16	iQOSM:M	iQOSM:M	Y
IQOSNOT	Notification of failure to meet requested QOS	6.16	iQOSM:O	iQOSM:O	N
	Which of the following formats of QOS are implemented ?				
ISADDQoS	Source Address Specific QoS	7.5.6.1	iQoSM:O.3	iQOSM:O	N
IDADDQoS	Destination Address Specific QoS	7.5.6.2	iQoSM:O.3	iQOSM:O	N
IGUNQoS	Globally Unique QoS	7.5.6.3	iQoSM:O.3	iQOSM:M	Y
iSvTD	Sequencing versus Transit Delay	7.5.6.3	iGUNQoS:O.4	iGUNQoS:O.4	N
iCongE	Congestion Experienced	7.5.6.3	iGUNQoS:O.4	iGUNQoS:M	N, O
iTDvCst	Transit Delay versus Cost	7.5.6.3	iGUNQoS:O.4	iGUNQoS:O.4	N
iREPvTD	Residual Error Probability versus Transit Delay	7.5.6.3	iGUNQoS:O.4	iGUNQoS:O.4	N

Item	Function	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iREPvCst	Residual Error Probality versus Cost	7.5.6.3	iGUNQoS:O.4	iGUNQoS:O.4	N

O.3: The Quality of Service Maintenance parameter within a single NPDU specifies a QoS format code indicating Source Address Specific, Destination Address Specific or Globally Unique QoS.

O.4: If the QoS format code indicates that the Globally Unique QoS maintenance function is employed, then each bit in the associated parameter value may be set to indicate the order of intra and inter domain routing decisions based on QoS. The parameter values which apply to inter-domain routing are provided in Table 4 of ISO/IEC 10747.

C.6 Boundary Intermediate Systems - Supported NPDUs

Table C-6 specifies the ATN G/G router supported NPDUs.

Table C-6: G/G Router - Supported NPDUs

Item	Function	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iDT-t	DT (full protocol) transmit	7.7	M	M	Y
iDT-r	DT (full protocol) receive	7.7	M	M	Y
iDTNS-t	DT (non-segment) transmit	7.7	M	M	Y
iDTNS-r	DT (non-segment) receive	7.7	M	M	Y
IER-t	ER transmit	7.9	M	M	Y
IER-r	ER receive	7.9	M	M	Y
iERQ-t	ERQ transmit	7.10	iEreq:M	iEreq:M	Y
iERQ-r	ERQ receive	7.10	M	M	Y
iERP-t	ERP transmit	7.11	iErsp:M	iErsp:M	Y
iERP-r	ERP receive	7.11	M	M	Y

C.7 Ground-Ground Router - Supported Data PDU (DT PDU) Parameters

Table C-7 describes the ATN G/G router supported DT PDU parameters.

Table C-7: G/G Router - Supported DT PDU Parameters

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
idFxPt-s	<s> Fixed Part	7.2	M	M	Y
idFxPt-r	<r> Fixed Part	7.2	M	M	Y
idAddr-s	<s> Addresses	7.3	M	M	Y
idAddr-r	<r> Addresses	7.3	M	M	Y
idSeg-s	<s> Segmentation Part	7.4	M	M	Y
idSeg-r	<r> Segmentation Part	7.4	M	M	Y
idPadd-s	<s> Padding	7.5.2	M	M	Y
idPadd-r	<r> Padding	7.5.2	M	M	Y
idSecu-s	<s> Security	7.5.3	iSecu:M	iSecu:M	Y
idSecu-r	<r> Security	7.5.3	iSecu:M	iSecu:M	Y
idCRR-s	<s> Complete Route Recording	7.5.5	iCRR:M	-	N
idCRR-r	<r> Complete Route Recording	7.5.5	iCRR:M	-	N
idPRR-s	<s> Partial Route Recording	7.5.5	M	M	Y
idPRR-r	<r> Partial Route Recording	7.5.5	iPRR:M	iPRR:M	Y
idCSR-s	<s> Complete Source Routing	7.5.4	iCSR:M	-	N
idCSR-r	<r> Complete Source Routing	7.5.4	iCSR:M	-	N
idPSR-s	<s> Partial Source Routing	7.5.4	M	M	Y
idPSR-r	<r> Partial Source Routing	7.5.4	iPSR:M	-	N
idQOSM-s	<s> QOS Maintenance	7.5.6	M	M	Y
idQOSM-r	<r> QOS Maintenance	7.5.6	iQOSM or iCong:M	iQOSM or iCong:M	Y
idPri-s	<s> Priority	7.5.7	M	M	Y
idPri-r	<r> Priority	7.5.7	iPRi:M	iPri:M	Y

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
idData-s	<s> Data	7.6	M	M	Y
idData-r	<r> Data	7.6	M	M	Y
idUnSup2	Are received PDUs containing parameters selecting unsupported type 2 functions discarded and where appropriate an Error Report PDU generated ?	6.19	M	M	Y
idUnSup3	Are parameters selecting unsupported Type 3 functions ignored ?	6.19	M	M	Y

C.8 Ground-Ground Router - Supported Error Report PDU (ER PDU) Parameters

Table C-8 specifies the ATN G/G router supported ER PDU parameters.

Table C-8: G/G Router - Supported ER PDU Parameters

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
ieFxPt-s	<s> Fixed Part	7.2	M	M	Y
ieFxPt-r	<r> Fixed Part	7.2	M	M	Y
ieAddr-s	<s> Address	7.3	M	M	Y
ieAddr-r	<r> Address	7.3	M	M	Y
iePadd-s	<s> Padding	7.5.2	M	M	Y
iePadd-r	<r> Padding	7.5.2	M	M	Y
ieSecu-s	<s> Security	7.5.3	iSecu:M	iSecu:M	Y
ieSecu-r	<r> Security	7.5.3	iSecu:M	iSecu:M	Y
ieCRR-s	<s> Complete Route Recording	7.5.5	iCRR:M	iCRR:M	N
ieCRR-r	<r> Complete Route Recording	7.5.5	iCRR:M	-	N
iePRR-s	<s> Partial Route Recording	7.5.5	M	M	Y
iePRR-r	<r> Partial Route Recording	7.5.5	iPRR:M	iPRR:M	Y
ieCSR-s	<s> Complete Source Routing	7.5.4	iCSR:M	-	N
ieCSR-r	<r> Complete Source Routing	7.5.4	iCSR:M	-	N
iePSR-s	<s> Partial Source Routing	7.5.4	M	M	Y
iePSR-r	<r> Partial Source Routing	7.5.4	iPSR:M	-	N
ieQOSM-s	<s> QOS Maintenance	7.5.6	M	M	Y
ieQOSM-r	<r> QOS Maintenance	7.5.6	iQOSM or iCong:M	iQOSM or iCong:M	Y

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iePri-s	<s> Priority	7.5.7	M	M	Y
iePri-r	<r> Priority	7.5.7	iPri:M	iPri:M	Y
ieDisc-s	<s> Reason for Discard	7.9.5	M	M	Y
ieDisc-r	<r> Reason for Discard	7.9.5	M	M	Y
ieData-s	<s> Data	7.6	M	M	Y
ieData-r	<r> Data	7.6	M	M	Y
ieUnsup2	Are received PDUs containing parameters selecting unsupported type 2 functions discarded ?	6.21	M	M	Y
ieUnsup3	Are parameters selecting unsupported Type 3 functions ignored ?	6.21	M	M	Y

C.9 Ground-Ground Router - Supported Echo Request PDU (ERQ PDU) Parameters

Table C-9 specifies the ATN G/G router supported ERQ PDU parameters.

Table C-9: G/G Router - Supported ERQ PDU Parameters

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iqFxPt-s	<s> Fixed Part	7.2	M	M	Y
iqFxPt-r	<r> Fixed Part	7.2	M	M	Y
iqAddr-s	<s> Addresses	7.3	M	M	Y
iqAddr-r	<r> Addresses	7.3	M	M	Y
iqSeg-s	<s> Segmentation Part	7.4	M	M	Y
iqSeg-r	<r> Segmentation Part	7.4	M	M	Y
iqPadd-s	<s> Padding	7.5.2	M	M	Y
iqPadd-r	<r> Padding	7.5.2	M	M	N, O
iqSecu-s	<s> Security	7.5.3	iSecu:M	iSecu:M	N, O

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iqSecu-r	<r> Security	7.5.3	iSecu:M	iSecu:M	Y
iqCRR-s	<s> Complete Route Recording	7.5.5	iCRR:M	M	N
iqCRR-r	<r> Complete Route Recording	7.5.5	iCRR:M	-	N
iqPRR-s	<s> Partial Route Recording	7.5.5	M	M	Y
iqPRR-r	<r> Partial Route Recording	7.5.5	iPRR:M	iPRR:M	Y
iqCSR-s	<s> Complete Source Routing	7.5.4	iCSR:M	-	N
iqCSR-r	<r> Complete Source Routing	7.5.4	iCSR:M	-	N
iqPSR-s	<s> Partial Source Routing	7.5.4	M	M	Y
iqPSR-r	<r> Partial Source Routing	7.5.4	iPSR:M	-	N
iqQOSM-s	<s> QOS Maintenance	7.5.6	M	M	Y
iqQOSM-r	<r> QOS Maintenance	7.5.6	iQOSM or iCong:M	iQOSM or ICong:M	Y
iqPri-s	<s> Priority	7.5.7	M	M	Y
iqPri-r	<r> Priority	7.5.7	iPRi:M	iPri:M	Y
iqData-s	<s> Data	7.6	M	M	Y
iqData-r	<r> Data	7.6	M	M	Y
iqUnSup2	Are received PDUs containing parameters selecting unsupported type 2 functions discarded and where appropriate an Error Report PDU generated ?	6.19	M	M	Y
iqUnSup3	Are parameters selecting unsupported Type 3 functions ignored ?	6.19	M	M	Y

C.10 Ground-Ground Router - Supported Echo Reply PDU (ERP PDU) Parameters

Table C-10 specifies the ATN G/G router supported ERP PDU parameters.

Table C-10: G/G Router - Supported ERP PDU Parameters

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
ipFxPt-s	<s> Fixed Part	7.2	M	M	Y
ipFxPt-r	<r> Fixed Part	7.2	M	M	Y
ipAddr-s	<s> Addresses	7.3	M	M	Y
ipAddr-r	<r> Addresses	7.3	M	M	Y
ipSeg-s	<s> Segmentation Part	7.4	M	M	Y
ipSeg-r	<r> Segmentation Part	7.4	M	M	Y
ipPadd-s	<s> Padding	7.5.2	M	M	N,O
ipPadd-r	<r> Padding	7.5.2	M	M	N,O
ipSecu-s	<s> Security	7.5.3	iSecu:M	iSecu:M	Y
ipSecu-r	<r> Security	7.5.3	iSecu:M	iSecu:M	Y
ipCRR-s	<s> Complete Route Recording	7.5.5	iCRR:M	M	N
ipCRR-r	<r> Complete Route Recording	7.5.5	iCRR:M	-	N
ipPRR-s	<s> Partial Route Recording	7.5.5	M	M	Y
ipPRR-r	<r> Partial Route Recording	7.5.5	iPRR:M	iPRR:M	Y
ipCSR-s	<s> Complete Source Routing	7.5.4	iCSR:M	-	N
ipCSR-r	<r> Complete Source Routing	7.5.4	iCSR:M	-	N
ipPSR-s	<s> Partial Source Routing	7.5.4	M	M	Y
ipPSR-r	<r> Partial Source Routing	7.5.4	iPSR:M	-	N
ipQOSM-s	<s> QOS Maintenance	7.5.6	M	M	Y
ipQOSM-r	<r> QOS Maintenance	7.5.6	iQOSM or iCong:M	iQOSM or ICong:M	Y
ipPri-s	<s> Priority	7.5.7	M	M	Y
ipPri-r	<r> Priority	7.5.7	iPRi:M	iPri:M	Y
ipData-s	<s> Data	7.6	M	M	Y
ipData-r	<r> Data	7.6	M	M	Y

Item	Parameter	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
ipUnsup2	Are received PDUs containing parameters selecting unsupported type 2 functions discarded and where appropriate an Error Report PDU generated ?	6.19	M	M	Y
ipUnsup3	Are parameters selecting unsupported Type 3 functions ignored ?	6.19	M	M	Y

C.11 Ground-Ground Router - Timer and Parameter Values

Table C-11 specifies the ATN G/G router Timer and parameter values.

Table C-11: G/G Router - Timer and Parameter Values

Item	Timer	ISO/IEC 8473-1 Reference	Status	ATN Support	G/G Router Support
iReasTim	Reassembly Timer	6.8	iReas:M	M	Y

APPENDIX D - IDRP APRLS

D.0 IDRP APRLs

This appendix provides IDRP APRLs for ATN G/G routers. The APRLs define the capabilities and options that, at a minimum, are required to be implemented for the ATN G/G router under an Asia/Pacific ATN environment.

The APRLs provided in this appendix use the conventions and symbols defined in the beginning of Appendix B.

D.1 ATN Specific Protocol Requirements

Table D-1 describes the ATN specific protocol requirements.

Table D-1: ATN specific protocol requirements

Index	Item	ATN SARPs Ref	G/G Router	G/GRouter Support
ATNIDRP1	Encoding and use of the Security Path Attribute	5.8.3.2.2, 5.8.3.2.3	M	Y
ATNIDRP2	Does this G/G ROUTER immediately re-advertise routes if the security information contained in the routes's path attribute change?	5.8.3.2.7	M	Y
ATNIDRP3	Support of 'policy based route aggregation'	5.8.3.2.6.2	O	N
ATNIDRP4	Support of 'policy based route information reduction'	5.8.3.2.6.5	O	N
ATNIDRP5	Support of aggregation of routes with identical NLRI using 'true route aggregation'	5.8.3.2.6.3	O.1	N
ATNIDRP6	Support of aggregation of routes with identical NLRI using 'route merging'	5.8.3.2.6.3	O.1	N
ATNIDRP7	Support of aggregation of security path attribute information field	5.8.3.2.6.4	M	N

D.2 IDRP General

Table D-2 describes the IDRP general requirements.

Table D-2: IDRP General Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
BASIC	Are all basic G/G ROUTER functions implemented?	12.1	M	M	Y
MGT	Is this system capable of being managed by the specified management information?	11	M	O	N
VER	Does this G/G ROUTER support Version Negotiation?	7.8	M	M	Y
RTSEP	Does this G/G ROUTER support the ROUTE_SEPARATOR attribute?	7.12.1	M	M	Y
HOPS	Does this G/G ROUTER support the RD_HOP_COUNT attribute?	7.12.13	M	M	Y
PATH	Does this G/G ROUTER support the RD_PATH attribute?	7.12.3	M	M	Y
CAPY	Does this G/G ROUTER support the Capacity Attribute?	7.12.15	M	M	Y
FSM	Does this G/G ROUTER manage ROUTER-ROUTER connections according to the G/G ROUTER FSM description?	7.6.1	M	M	Y
FCTL	Does this G/G ROUTER provide flow control?	7.7.5	M	M	Y
SEQNO	Does this G/G ROUTER provide sequence number support?	7.7.4	M	M	Y
INTG1	Does this G/G ROUTER provide Data Integrity using authentication type 1?	7.7.1	O.1	M	Y

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
INTG2	Does this G/G ROUTER provide Data Integrity using authentication type 2?	7.7.2	O.1	O	N
INTG3	Does this G/G ROUTER provide Data Integrity using authentication type 3?	7.7.3	O.1	O	N
ERROR	Does this G/G ROUTER handle error handling for IDRP?	7.20	M	M	Y
RIBCHK	Does this G/G ROUTER operate in a "fail-stop" manner with respect to corrupted routing information?	7.10.2	M	M	Y

D.3 IDRP Update Send Process

Table D-3 describes the IDRP update send process requirements.

Table D-3: IDRP Update Send Process Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G ROUTER Support
INT	Does the G/G ROUTER provide the internal update procedures?	7.17.1	M	M	Y
RTSEL	Does this G/G ROUTER support the MinRouteAdvertisementInterval Timer?	7.17.3.1	M	M	Y
RTORG	Does this G/G ROUTER support the MinRDOriginationInterval Timer?	7.17.3.2	M	M	Y
JITTER	Does this G/G ROUTER provide jitter on its timers?	7.17.3.3	M	M	Y

D.4 IDRP Update Receive Process

Table D-4 describes the IDRP update receive process requirements.

Table D-4: IDRP Update Receive Process Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
INPDU	Does the G/G ROUTER handle inbound PDUs correctly?	7.14	M	M	Y
INCONS	Does this G/G ROUTER detect inconsistent routing information?	7.15.1	M	M	Y

D.5 IDRP Decision Process

Table D-5 describes the IDRP decision process requirements.

Table D-5: IDRP Decision Process Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
TIES	Does this G/G ROUTER break ties between candidate routes correctly?	7.16.2.1	M	M	Y
RIBUPD	Does this G/G ROUTER update the Loc-RIBs correctly?	7.16.2	M	M	Y
AGGRT	Does this G/G ROUTER support route aggregations?	7.18.2.1, 7.18.2.2, 7.18.2.3	O	ATNIDRP3^ATNIDRP5: M	N
LOCK	Does this G/G ROUTER provide interlocks between its Decision Process and the updating of the information in its Adj-RIBs-In?	7.16.4	M	M	Y

D.6 IDRP Receive

Table D-6 describes the IDRP receive requirements.

Table D-6: IDRP Receive Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
RCV	Does the G/G ROUTER process incoming PDUs and respond correctly to error conditions?	7.14, 7.20	M	M	**Y**
OSIZE	Does this G/G ROUTER accept incoming OPEN PDUs whose size in octets is between MinPDULength and 3000?	6.2,7.20	M	M	**Y**
MXPDU	Does the G/G ROUTER accept incoming UPDATE, IDRP ERROR and RIB REFRESH PDUs whose size in octets is between minPDULength and maxPDULength?	6.2,7.20	M	M	**Y**

D.7 IDRP CLNS Forwarding

Table D-7 describes the IDRP connectionless network service (CLNS) forwarding requirements.

Table D-7: IDRP CLNS Forwarding

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
PSRCRT	Does the G/G ROUTER correctly handle ISO/IEC 8473 NPDUs that contain a partial source route?	8	M	O	N
DATTS	Does the G/G ROUTER correctly extract the NPDU-derived Distinguishing Attributes from an ISO/IEC 8473 NPDU?	8.2	M	M	Y
MATCH	Does the G/G ROUTER correctly match the NPDU-derived Distinguishing Attributes with the corresponding FIB-Atts?	8.3	M	M	Y

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
EXTF	Does the G/G ROUTER correctly forward NPDUs with destinations outside its own routing domain?	8.4	M	M	Y
INTF	Does the G/G ROUTER correctly forward NPDUs with destinations inside its own routing domain?	8.1	M	M	Y

D.8 IDRP Optional Transitive Attributes

Table D-8 describes the requirements for IDRP optional transitive attributes.

Table D-8: IDRP Optional Transitive Attributes Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
MEXIT	Does this G/G ROUTER support use of the MULTI-EXIT DISC attribute?	7.12.7	O	O	N, O

D.9 Generating Well-Known Discretionary Attributes

Table D-9 describes the G/G router requirements for generating well-known discretionary attributes.

Table D-9: Generating Well-Known Discretionary Attributes Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
EXTG	Does the G/G ROUTER support generation of the EXT_INFO attribute?	7.12.2	O	O	N
NHRS	Does the G/G ROUTER support generation of the NEXT_HOP attribute in support of route servers?	7.12.4	O	O	N
NHSN	Does the G/G ROUTER support generation of the NEXT_HOP attribute to advertise SNPAs?	7.12.4	O	O	N

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
DLI	Does the G/G ROUTER support generation of the DIST_LIST_INCL attribute?	7.12.5	O	O	N
DLE	Does the G/G ROUTER support generation of the DIST_LIST_EXCL attribute?	7.12.6	O	O	N
TDLY	Does the G/G ROUTER support generation of the TRANSIT DELAY attribute?	7.12.8	O	O	N
RERR	Does the G/G ROUTER support generation of the RESIDUAL ERROR attribute?	7.12.9	O	O	N
EXP	Does the G/G ROUTER support generation of the EXPENSE attribute?	7.12.10	O	O	N
LQOSG	Does the G/G ROUTER support generation of the LOCALLY DEFINED QOS attribute?	7.12.11	O	OX	N
HREC	Does the G/G ROUTER support generation of the HIERARCHICAL RECORDING attribute?	7.12.12	O	OX	N
SECG	Does the G/G ROUTER support generation of the SECURITY attribute?	7.12.14	O	M	Y
PRTY	Does the G/G ROUTER support generation of the PRIORITY attribute?	7.12.16	O	O	N

D.10 Peer Entity Authentication

Table D-10 describes peer entity authentication requirements.

Table D-10: Peer Entity Authentication Requirements

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
AUTH	Does this G/G ROUTER correctly authenticate the source of a PDU?	7.7.2	O	M	Y

Note. Only support for an Authentication Code 1 is required

D.11 Propagating Well-Known Discretionary Attributes

Table D-11 describes requirements for propagating well-known discretionary attributes.

Table D-11: Propagating Well-Known Discretionary Attributes

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
EXTGP	Does the G/G ROUTER support propagation of the EXT_INFO attribute?	7.12.2	M	M	Y
NHRSP	Does the G/G ROUTER support propagation of the NEXT_HOP attribute in support of route servers?	7.12.4	O	O	N
NHSNP	Does the G/G ROUTER support propagation of the NEXT_HOP attribute to advertise SNPAs?	7.12.4	O	O	N
DLIP	Does the G/G ROUTER support propagation of the DIST_LIST_INCL attribute?	7.12.5	O	M	Y
DLEP	Does the G/G ROUTER support propagation of the DIST_LIST_EXCL attribute?	7.12.6	O	M	Y
TDLYP	Does the G/G ROUTER support propagation of the TRANSIT DELAY attribute?	7.12.8	O	O	N

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
RERRP	Does the G/G ROUTER support propagation of the RESIDUAL ERROR attribute?	7.12.9	O	O	N
EXPP	Does the G/G ROUTER support propagation of the EXPENSE attribute?	7.12.10	O	O	N
LQOSP	Does the G/G ROUTER support propagation of the LOCALLY DEFINED QOS attribute?	7.12.11	O	OX	N
HRECP	Does the G/G ROUTER support propagation of the HIERARCHICAL RECORDING attribute?	7.12.12	O	OX	N
SECP	Does the G/G ROUTER support propagation of the SECURITY attribute?	7.12.14	O	M	Y
PRTYP	Does the G/G ROUTER support propagation of the PRIORITY attribute?	7.12.16	O	O	N

D.12 Receiving Well-Known Discretionary Attributes

Table D-12 describes the requirements for receiving well-known discretionary attributes.

Table D-12: Receiving Well-Known Discretionary Attributes

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
EXTR	Does the G/G ROUTER recognise upon receipt the EXT_INFO attribute?	7.12.2	M	M	Y
NHRSR	Does the G/G ROUTER recognise upon receipt the NEXT_HOP attribute ?	7.12.4	M	M	Y

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G Router	G/G Router Support
DLIR	Does the G/G ROUTER recognise upon receipt the DIST_LIST_INCL attribute?	7.12.5	M	M	N
DLER	Does the G/G ROUTER recognise upon receipt the DIST_LIST_EXCL attribute?	7.12.6	M	M	N
TDLYR	Does the G/G ROUTER recognise upon receipt the TRANSIT DELAY attribute?	7.12.8	M	M	Y
RERRR	Does the G/G ROUTER recognise upon receipt the RESIDUAL ERROR attribute?	7.12.9	M	M	Y
EXPR	Does the G/G ROUTER recognise upon receipt the EXPENSE attribute?	7.12.10	M	M	Y
LQOSR	Does the G/G ROUTER recognise upon receipt the LOCALLY DEFINED QOS attribute?	7.12.11	M	O	N
HRECR	Does the G/G ROUTER recognise upon receipt the HIERARCHICAL RECORDING attribute?	7.12.12	M	M	Y
SECR	Does the G/G ROUTER recognise upon receipt the SECURITY attribute?	7.12.14	M	M	Y
PRTYR	Does the G/G ROUTER recognise upon receipt the PRIORITY attribute?	7.12.16	M	M	Y

D.13 IDRP Timers

Table D-13 describes the IDRP timer requirements.

Table D-13: IDRP Timers Requirements

8/20/2003

Item	Description	ISO/IEC 10747 Ref.	ISO Status	G/G router	G/G Router Support
Ta	KeepAlive time	7.6.5	M	M	Y
Tr	Retransmission (tr) timer	7.6.5	M	M	Y
Tmr	maxRIBIntegrityCheck timer	7.10.2	M	M	Y
Tma	MinRouteAdvertisement timer	7.17.3.1	M	M	Y
Trd	MinRDOriginationInterval timer	7.17.3.2	M	M	Y
Tcw	closeWaitDelay timer	7.6.4	M	M	Y

APPENDIX E - ACRONYMS

E.0 Acronyms

This appendix defines the acronyms used in this document.

A/G	AIR-GROUND
AAC	Aeronautical Administrative Control
ABM	Asynchronous Balanced Mode
AIDC	ATS Interfacility Data Communications
AMHS	ATS Message Handling System
AOC	Aeronautical Operational Control
APC	Aeronautical Passenger Communication
APRLs	ATN Protocol Requirement Lists
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Service
ATSC	Air Traffic Service Control
CLNP	Connectionless Network Protocol
CLNS	Connection-Less Network Service
CPDLC	Controller Pilot Data Link Communications
DCE	Data Circuit-terminating Equipment
DM	Disconnected Mode
DTE	Data Terminal Equipment
E/R	Error Report
EIA	Electrical Industry Association
ERD	End Routing Domain
ES	End System
FIB	Forwarding Information Base
FSM	Finite State Machine
G-G(G/G)	Ground-Ground
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IDRP	Inter Domain Routing Protocol

IEC	International Electrotechnical Commission
ISO	International Standardization Organization
ITU	International Telecommunications Union
ITU-T	ITU Telecommunications Sector
LAPB	Link Access Procedure Balanced
NET	Network Entity Title
NPDU	Network Protocol Data Unit
NSAP	Network Service Access Point
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
PIB	Policy Information Base
PICS	Protocol Implementation Compliance Statement
PSDN	Public Switched Data Network
PSN	Packet Switched Network
PVC	Permanent Virtual Circuit
QOS	Quality of Service
RD	Routing Domain
RDC	Routing Domain Confederation
RIB	Routing Information Base
SARPs	Standards and Recommended Practices
SNDCF	Sub Network Dependent Convergence Functions
SNPA	Sub Network Point of Attachment
SVC	Switched Virtual Circuit
TBD	to be Determined
TBR	to be Reviewed

INTERNATIONAL CIVIL AVIATION ORGANISATION

ASIA PACIFIC OFFICE

ATN DOCUMENTATION TREE

March 2003

Version 2.0

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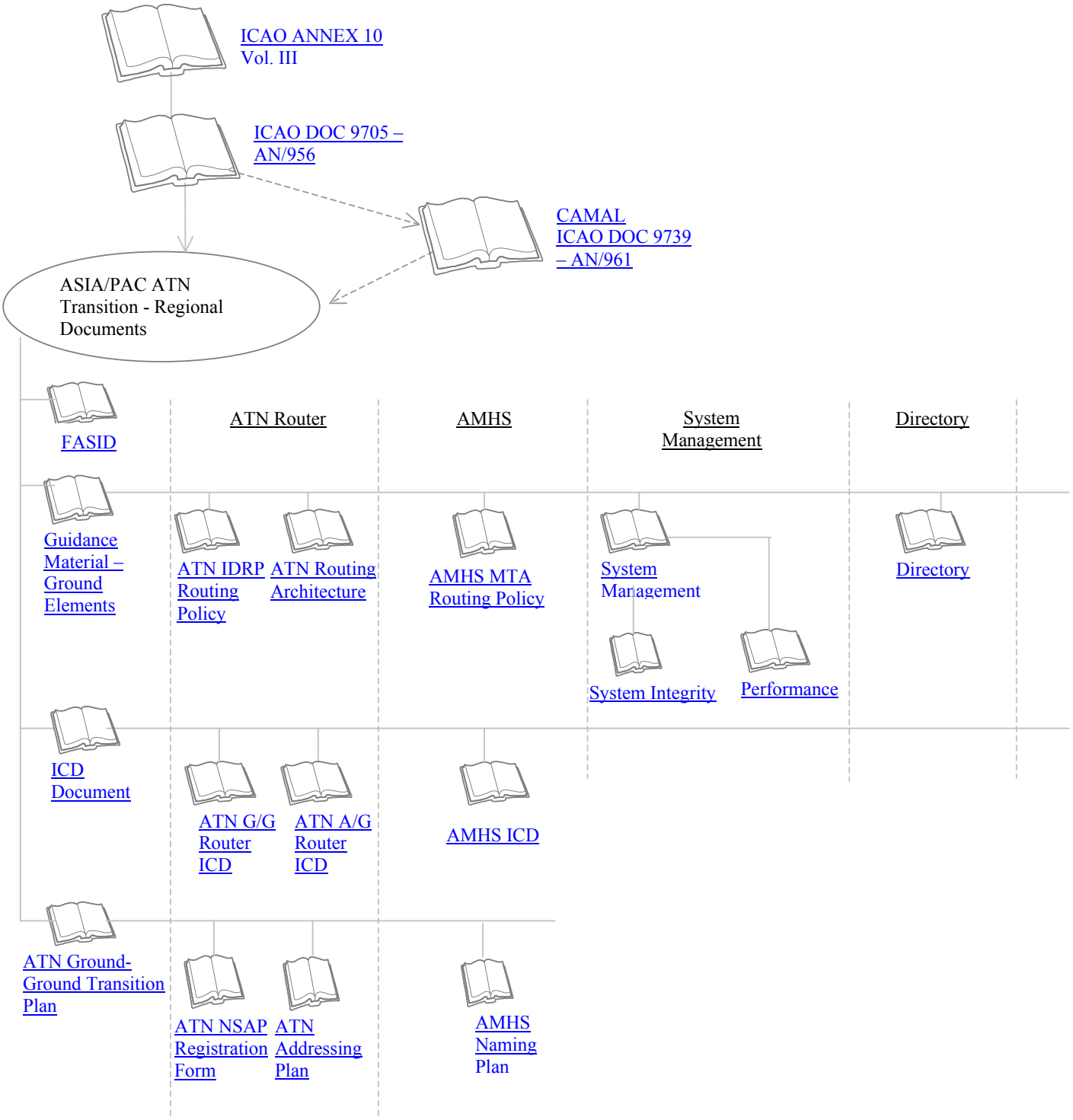
Table of Contents

1 Scope

This document has been developed to serve as a catalogue of all documentation in the Asia Pacific Region. A hierarchical representation of the relationships between the various documents is presented in section 2 “Documentation Tree”, with associated document descriptions located in section 3 “Documentation Profiles”.

2 Documentation Tree



3 Documentation Profiles

3.1 ICAO Annex10 Vol. III

Title:

International Standards and Recommended Practices, Aeronautical Telecommunications, Annex 10 Volume III.

Latest Version: March 2001

Purpose:

This ICAO document defines the Standards and Recommended Practices (SARPs) for the Aeronautical Telecommunications Network (ATN).

Contents:

Subjects covered by the document:

- Part I – Digital Data communication Systems.
  - Chapter 1 – Definitions.
  - Chapter 3 – Aeronautical Telecommunication Network.
  - Chapter 4 – Aeronautical Mobile-Satellite Service.
  - Chapter 6 – VHF Air-Ground Digital Link (VDL).
  - Chapter 8 – AFTN.
- Part II – Voice Communication Systems.
  - Chapter 2 – Aeronautical Mobile Service.
  - Chapter 4 – Aeronautical Speech Circuits.
  - Chapter 5 – Emergency Locator Transmitter (ELT) for search and rescue.

3.2 Manual of Technical Provisions for the Aeronautical Telecommunication Network - ICAO DOC 9705 – AN/956

Title:

Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN).

Latest Version: 3rd Edition

Purpose:

This ICAO manual contains detailed technical information and serves to further elaborate on the ATN standards as defined in Chapter 3 of Annex 10, Volume III, Part I.

Contents:

Subjects covered by the document:

- Sub-Volume I – Introduction and System Level Requirements.
- Sub-Volume II – Air-Ground Applications.
- Sub-Volume III – Ground-Ground Applications.
- Sub-Volume IV – Upper Layer Communications Services (ULCS).
- Sub-Volume V – Internet Communications Services (ICS).
- Sub-Volume VI – ATN Systems Management Provisions.
- Sub-Volume VII – ATN Directory Service.
- Sub-Volume VIII – ATN Security Service.
- Sub-Volume IX – ATN Identifier Registration.

3.3 Comprehensive Aeronautical Telecommunications Network Manual (CAMAL) - ICAO DOC 9739 – AN/961

Title:

Comprehensive Aeronautical Telecommunications Network (ATN) Manual.

Latest Version: 2nd Edition - 2002

Purpose:

This document provides guidance material in support of the ATN SARPS as defined in Annex 10, Vol. III and Doc. 9705.

Contents:

Subjects covered by the document:

- Components, functionality and concepts of the ATN.
- ATN Internet lower layer routing protocols.
- ATN Upper layer application protocols.
- ATN subnetworks and corresponding SNDCF's layers.
- Air-ground applications, ADS, CPDLC, CM, FIS.
- Ground-Ground applications ATSMHS, AIDC.

3.4 ATN IDRP Routing Policy

Title:

Asia/Pacific ATN IDRP Routing Policy.

Latest Version: To be developed

Purpose:

Contents:

3.5 AMHS MTA Routing Policy

Title:

Asia/Pacific AMHS MTA Routing Policy.

Latest Version: To be developed

Purpose:

Contents:

3.6 Directory

Title:

Asia/Pacific Technical Document on Use of Directory Services.

Latest Version: To be developed

Purpose:

Contents:

3.7 System Management

Title:

Asia/Pacific Regional System Management Transition Guideline Document.

Latest Version: To be developed

Purpose:

Contents:

3.8 Performance

Title:

Asia/Pacific Technical Document on ATN Performance.

Latest Version: To be developed

Purpose:

Contents:

3.9 System Integrity

Title:

Asia/Pacific Policy for ATN System Integrity.

Latest Version: To be developed

Purpose:

Contents:

3.10 ATN G/G Router ICD

Title:

Asia/Pacific Regional Interface Control Document for ATN Ground to Ground Router for ISO/IEC 8208 sub network.

Latest Version: Version 1.0

Purpose:

This document provides ICD for interconnecting ATN G/G routers between states/organizations for ISO/IEC 8208 sub network.

Contents:

Subjects covered by the document:

- ATN G/G Router Overview.
- Physical Layer.

- Data Link Layer.
- Network Layer.

3.11 ATN A/G Router ICD

Title:

Asia/Pacific Regional Router Interface Control Document for ATN Air to Ground Router.

Latest Version: To be developed

Purpose:

Contents:

3.12 ATN Ground-Ground Transition Plan

Title:

ASIA/PAC ATN Transition Plan.

Latest Version: 1.0

Purpose:

This document describes the transition activities that are to be performed by States in the region for a coordinated migration from AFTN to the new ATN environment.

Contents:

Subjects covered by the document:

- Existing ground infrastructure.
- ATN End system applications.
- ATN Traffic, both ground-ground and air-ground communication paths.
- ATN routing architecture.
- ATN backbone trunks.
- Interconnection of ATN routers.
- Transition activities.

Remarks:

Subsequent to discussions stemming from the CNS/MET SG/5 meeting much of the document's contents has been included into the CNS FASID. This document will under go no further revisions.

3.13 ATN Routing Architecture

Title:

Asia/Pacific ATN Routing Architecture.

Latest Version: 1.0

Purpose:

This document presents the routing architecture for the ground-ground infrastructure to eventually replace the existing AFTN. It is intended that this architecture will also be suitable for the accommodation of the air-ground communications traffic at some later time.

Contents:

Subjects covered by the document:

- Routing Domain Fundamentals.
- Router Fundamentals.
- Asia/Pacific regional routing architecture.
- Routing domains.
- ATN Transition.

3.14 ATN NSAP Addressing Plan

Title:

Asia/Pacific ATN Addressing Plan.

Latest Version: 1.0

Purpose:

This document presents recommendations for the assignment of ATN NSAP addresses within the region. It also defines the methods by which values are assigned to each field of the NSAP Address and specifies the assumptions upon which the addressing format has been defined.

Contents:

Subjects covered by the document:

- NSAP Address structure to be adopted by states of the Asia/Pacific Region.
- Recommendations for the values of each field of the NSAP address.
- Authority responsible for NSAP field assignments.

3.15 AMHS Naming Plan

Title:

Asia/Pacific AMHS Naming Plan.

Latest Version: 1.0

Purpose:

This document presents recommendations for the AMHS naming conventions to be adopted by AMHS users within the region.

Contents:

Subjects covered by the document:

- MF-Addressing scheme.
- XF-Addressing scheme.
- Conventions for use of MF-Addressing Format.
- Conventions for use of XF-Addressing Format.
- General use of X.400 O/R Addresses.

3.16 ATN NSAP Registration Form

Title:

Asia/Pacific ATN NSAP Registration Form.

Latest Version: 1.0

Purpose:

This document specifies the information that is required for registration of devices that are to connect to the ATN environment within the Region.

Contents:

Subjects covered by the document:

- Registration of NSAP Addresses for ATN Routers and ATN End-System.
- Registration of Communication Circuits for ATN Routers and ATN End-Systems.

3.17 Guidance Material for Ground Elements in ATN Transition

Title:

Guidance Material for Ground Elements in ATN Transition.

Latest Version: 2.0

Purpose:

This document contains guidance material for ATN transition planning within the Asia/Pacific region.

Contents:

Subjects covered by the document:

- ATN overview
  - Ground-ground service components.
  - Air-ground service components.
  - ATN security service.
  - ATN system management.
  - ATN directory.
- Planning Issues to be considered
  - ATM operational concept.
  - Transition planning.
  - Implementation planning.
  - Proposed regional planning activities for transition.
  - Proposed State planning activities for transition.
- Guidance material for ground based elements
  - Integration of new and existing infrastructure.
  - Message service definition, benefit and procedure in inter-domain operation.
  - Guidance for administrative domain definition.
  - Guidance for architectural design of ATN ground elements.
  - Connection for inter-domain operation and guidance material.
  - Identification of traffic type, quality of service with respect to inter-domain operation.
  - Performance issues of reliability, maintainability, and reliability with respect to inter-domain operation.
  - Transition paths and transitional procedure in inter-domain operation.
  - Cost analysis of ATN ground elements in transitional development for inter-domain operation.
  - ATN security solution.

3.18 AMHS ICD

Title:

ICD for ATS Message Handling System (AMHS) in Asia/Pacific Region

Latest Version: 1.0

Purpose:

This ICD has been developed in order to facilitate interoperability between States in the deployment of AMHS within the Asia/Pacific region.

Contents:

Subjects covered by the document:

- AMHS functions.
- Network configuration.
- Protocol specification overview.
- AMHS specifications.
- Upper layer specifications.
- Lower layer specifications.
- AHMS PICS.

3.19 Facilities and Services Implementation Document (FASID)

Title:

Facilities and Services Implementation Document.

Latest Version: To be advised.

Purpose:

This document contains elements of Part IV, CNS of the Asia/Pacific FASID.

Contents:

Subjects covered by the document:

- Table 1A, AFTN/Data Circuit Plan.
- Table 1B, ATN Router Plan.
- Table 1C, ATSMHS Routing Plan.
- Table 1D, AIDC Circuit Plan.

INTERNATIONAL CIVIL AVIATION ORGANISATION
ASIA PACIFIC OFFICE

Asia /Pacific
ATN IDRP Routing Policy

Table of Contents

Executive Summary

This document provides global policy for Aeronautical Telecommunication Network (ATN) routers operating in the Asia and Pacific Region in support of Air Traffic Services Message Handling Services (ATSMHS) and other ATN services.

Background

The ATN Transition Task Force (ATNTTF) has been assigned a number of tasks to prepare the region for the introduction of the ATN. At the third meeting of the ATNTTF Working Group B meeting held in Bangkok, Thailand on 27 through 30 August 2001, a specific action item was identified to develop documentation on Routing Policy. This document is in response to that action.

Overview

This document presents relevant background information on routing and provides a general discussion of policy-based routing. With this background, policy is specified for ATN routers in support of inter-regional, intra-regional and local connectivity.

1. INTRODUCTION

The Aeronautical Telecommunication Network Transition Task Force is preparing a series of documents, which will govern the introduction of the ATN into the Asia and Pacific region. This document is to be the basis of ATN routing policy for the region.

1.1 OBJECTIVES

The objective of this document is to specify global policy for Aeronautical Telecommunication Network (ATN) routers operating in the Asia and Pacific Region in support of Traffic Service Communications (ATSC) and Aeronautical Industry Service Communications (AINSC).

1.2 SCOPE

The scope of the document includes:

- An introduction to relevant routing concepts;
- An overview of the Inter-domain Routing Protocol (IDRP) and the rational for its use in the ATN
- Routing policy requirements for ATN routers in the Asia and Pacific Region.

1.3 REFERENCES

Reference 1 Manual of Technical Provisions for the ATN (Doc 9705-AN/956)

Reference 2 Asia/Pacific ATN Routing Architecture

Reference 3 ISO/IEC TR 9575, Information technology – Telecommunications and information exchange between systems – OSI Routeing Framework

Reference 4 ISO/IEC 10747, Information technology – Telecommunications and information exchange between systems – Protocol for Exchange of Inter-domain routeing Information among Intermediate Systems to Support Forwarding of ISO 8473 PDUs.

Reference 5 Asia/Pacific ATN Addressing Plan

1.4 TERMS USED

Backbone Router – A backbone router (in the Asia and Pacific region) is a Class 4 Ground/Ground ATN router which has been designated by the operating state/organization to provide an appropriate level of performance and support the routing policies for inter-regional and intra-regional connectivity, and whose operation as a

backbone router has been approved by the ICAO regional office as agreed-to by all other member states/organizations.

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) – Point within the ISO protocol architecture at which global end users may be uniquely addressed on an end-to-end basis.

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.

1.4 ROUTING CONCEPTS

In this document the primary concern is routing through the ATN at the network layer. In order to establish a common framework, certain fundamental concepts are described. See Reference 3 for more detailed information.

The routing process in any network involves a forwarding function and a route maintenance function. Forwarding refers to those actions, which result in actual relaying of network packet data units (NPDUs) through nodes in the network. From a simplified perspective, forwarding is the process of accepting an incoming NPDU, accessing the routing database to determine the next network node or locally attached system, and sending the NDPU on to that node or system. Route maintenance refers to the update of the routing database. Route maintenance may be static, in which case, it is performed through management operations in either an on-line or off-line mode, or it may be dynamic (also known as adaptive routing). Dynamic route maintenance involves the exchange of routing packet data units (RPDUs). RPDUs may be received from a single source such as a Network Control Center, in which case, routing is said to be centralized. Alternatively, RPDUs may be exchanged among the nodes in a network, in which case routing is said to be distributed. See Figure 2-1. In the ATN a distributed adaptive routing procedure is adopted.

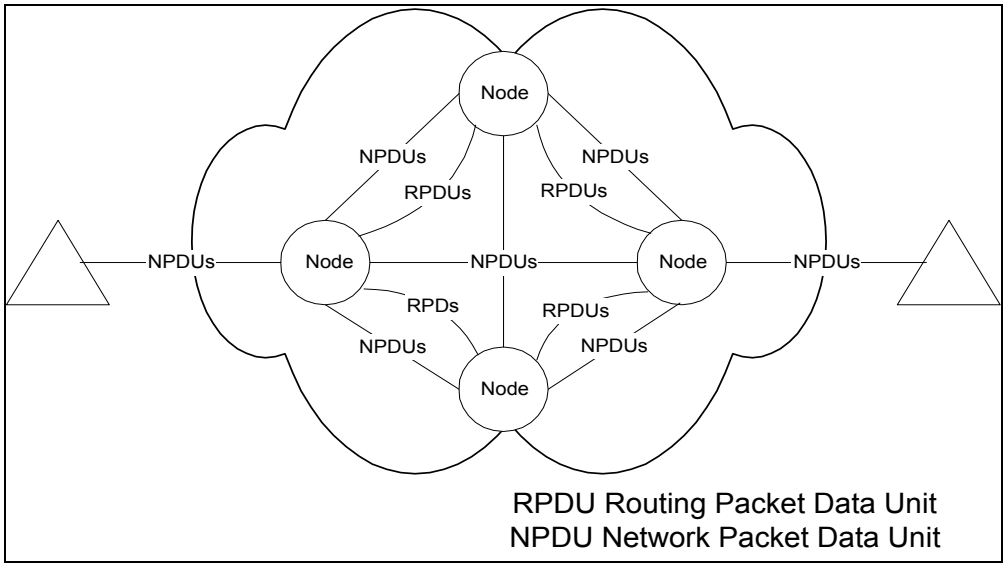


Figure 2-1. Exchange of NPDUs and RPDUs in Generic Network Environment

The route maintenance and forwarding functions under a distributed adaptive routing procedure are depicted generically in Figure 2-2. The routing database is partitioned into a Routing Information Base, which is the primary concern of the Route Maintenance Function, and a Forwarding Information Base, which is the primary concern of the Forwarding Function. The Route Maintenance and Forwarding Functions are conceptually connected through a Decision Process. The Decision Process determines:

1. Which routes are accepted into the Routing Information Base,
2. Which routes are placed into the Forwarding Information Base in support of the forwarding function, and
3. Which routes are to be advertised to other nodes in the network.

As will be described in more detail below, the decision process is affected by policy.

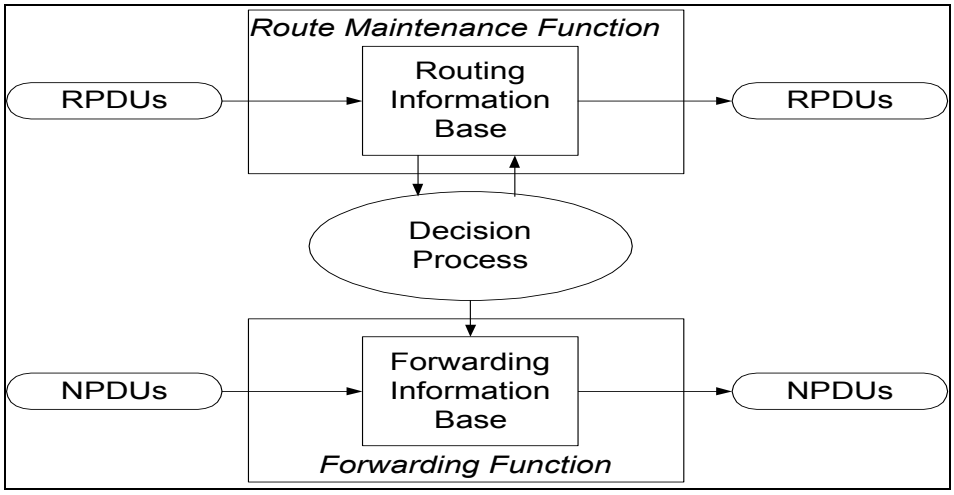


Figure 2-2 Generic Routing Functions

1.5 INTER-DOMAIN ROUTING PROTOCOL (IDRP)

In this section the rational for the use of IDRP in the ATN is summarized. The three general reasons for using IDRP are support for mobility, support for policy-based routing, and support for secure exchange of routing information.

1.5.1 SUPPORT FOR MOBILITY

A fundamental objective of the ATN is to maintain connectivity from ground-based ATSC and AINSC end systems to their airborne counterparts. This is to be accomplished over multiple subnetworks, that is, over the various VHF Digital Links, over Mode_S and over AMSS. This objective is essentially a routing problem. If we consider the general approaches to routing, it is immediately obvious that static routing would not work. This is because routes to an aircraft are inherently dynamic, that is, aircraft traverse multiple subnetworks and within each subnetwork they traverse multiple ground stations. Thus we are left with some type of adaptive routing. A centralized approach to adaptive routing has the problem that the central control center where changes would be reported becomes a bottleneck, especially in a global environment. Even if enough capacity could be provided, there are associated timing considerations, that is, a reported change in an aircraft's location must be available to communicating ground systems in real time. There are also administrative considerations with centralized adaptive routing. These considerations include determining which administration (a particular CAA, service provider, etc.) would operate the central control center and what are the liabilities associated with such an operation. Accordingly, since neither static routing nor centralized adaptive routing would be appropriate, we are led to some type of distributed adaptive routing approach as the solution to mobility.

There are two general approaches to distributed adaptive routing. The first is called *link state* routing and the second is called *distance vector* routing. Under link state routing, each change in the network topology (in connectivity to an aircraft in the context of support for mobility) is broadcast to every other node in the network. Upon receipt of each change message, each node updates its image of the network topology and calculates the complete (shortest) path to the destination in the change message. The main problem with this approach is that the number of messages required to report changes in network topology becomes quite large in a global environment. Thus we arrive at a distance vector approach to distributed adaptive routing approach in the ATN. Under distance vector routing, a change in connectivity is propagated (i.e., advertised) to affected ATN routers throughout the network. The RPDU consists of a vector containing a destination prefix and a distance metric, which is generically a measure of the cost associated with the path being advertised to a particular destination.[1] The difference

[1] In the context of the OSI Routeing Framework (Reference 3) IDRP would be classified as a distance vector routing protocol. However, in the technical literature, IDRP is often called *path vector* routing protocol. This is because IDRP can advertise multiple metrics called path attributes associated with a particular route to a destination rather than a single distance metric.

however (from link state routing) is that not all routers need be affected. In other words, not every router needs to know about every change. Particular changes need only be propagated to a point where a choice of routes is to be made. Beyond that point either an aggregate route may be advertised to other routers or these routers may be configured with a default path to that point. For example, a service provider with a ground-ground router connected to a CAA's ATN router on one side and with connections to multiple service provider air-ground routers on the other side may not need to advertise a new route each time an aircraft connects to a new air-ground router. The service provider ground-ground router may rather only advertise an aggregate route to the ATN router when the aircraft connects with the first air-ground router and withdraw the aggregate route when the aircraft is no longer connected to any air-ground router. At the same time, non-backbone routers belonging to the CAA need not receive routes to individual aircraft but rather may be configured to forward all aircraft NPDUs to the backbone router.

1.5.2 SUPPORT FOR POLICY-BASED ROUTING

1.5.2.1 IDRP Model of Operation

ATN routers execute a particular distributed adaptive routing protocol for route maintenance. The protocol is labeled IDRP, which stands for Inter-domain Routing Protocol (Reference 4). Figure 2-3 depicts a simplified model of IDRP route maintenance and CLNP forwarding.[2]

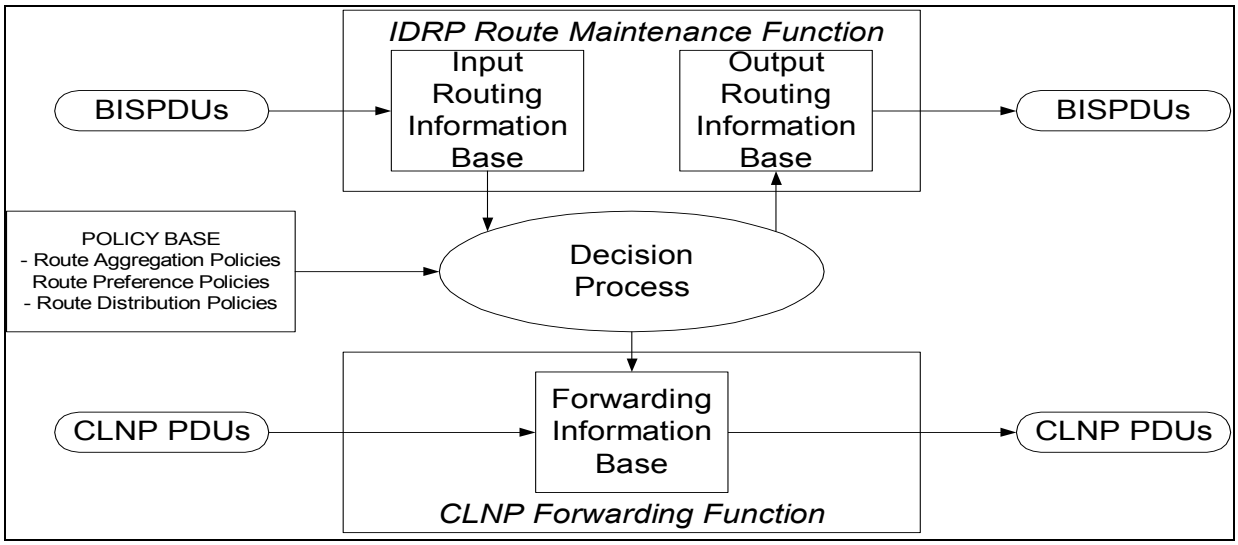


Figure 2-3. IDRP Route Maintenance and CLNP Forwarding

[2] The model of routing components in this document is a simplified form of the IDRP model. The IDRP specification (Reference 4) contains a more detailed model involving the concept of a multiple local RIBs for combinations of path attributes.

In the context of IDRP, an ATN router is a Boundary Intermediate System (BIS), and accordingly the routing PDUs exchanged are called BISPDUs. Similarly, in the context of CLNP, the forwarded NPDUs are called CLNP PDUs. As depicted in the figure and described in the following section, the IDRP decision process is conditioned by a policy base.

1.5.2.2 Types of Policy

The IDRP decision process (and thus ATN routing policy) is conditioned by three types of policy concerns.

- *Route Aggregation* policies permit ATN routers to reduce the amount of routing information propagated throughout the ATN.
- *Route Preference* policies determine which routes received in BISBPUs will be installed in the Forwarding Information Base. Route preference policies thus determine which path an ATN router will select to forward CLNP NPDUs on.
- *Route Distribution* policies determine which routes an ATN router will advertise to other ATN routers. Route distribution policies are a key aspect of a domain's transit policy in that they determine which routes will be permitted in a domain. An ATN router will not propagate a route, which it does not wish to support. By selective advertisement of routing information ATN routers control the use of their own resources since other routers cannot choose a route they do not know about.

1.5.3 SUPPORT FOR SECURE EXCHANGE OF ROUTING INFORMATION

A final general advantage of using IDRP in the ATN is that it has a mechanism for the secure exchange of routing information. The mechanism takes advantage of a transport protocol built in to IDRP operation. When an IDRP connection is established (through the exchange of OPEN BISPDUs), the type of security to be applied to subsequent BISPDUs is signaled. In Edition 3 of the SARPs, procedures for performing *Type 2* authentication are specified. With type 2 authentication each ATN router can be assured that the routing updates it receives are from a peer ATN router whose identity has been confirmed using strong (cryptographic) authentication.

2. ROUTING POLICY GOAL FOR ATN ROUTERS

The ATN infrastructure and each region of the infrastructure must support a consistent set of routing policies to provide paths to ground systems at an inter-regional, intra-regional and local level and paths to airborne systems without an inordinate number of routing protocol updates. Accordingly, the detailed policy requirements and recommendations specified in section 4 are derived from the following general routing policy goal:

a. Asia and Pacific region ATN routers will provide global shortest path connectivity with a minimal exchange of routing information.

2.1 NETWORK ORGANIZATION FOR ROUTING TO GROUND SYSTEMS

For ground ATSC and AINSC applications the ATN infrastructure may be partitioned into various levels of organization. See Figure 3-1, which depicts routing domains supporting for three states in the Asia Region. Routing domains at the highest level are associated with an ICAO region. As depicted in Figure 3-1, the NSAP address prefix for ATSC applications in this region is 4700278181. Within a particular region, routing domains are next associated with a particular state or organization. Figure 3-1 depicts three arbitrary states (s1, s2, and s3). Note that in accordance with the regional addressing plan s1, s2, and s3 would actually be a two-byte field with the two ASCII characters assigned to the state or organization. Finally, within a particular state or organization there may be multiple local routing domains. Figure 3-1 depicts one routing domain in states s1 and s2 and three routing domains in state s2. Within this framework ATN ground routers may be characterized and their policy requirements specified according to the type of connectivity they have to adjacent ATN ground routers. ATN routers connecting to adjacent routers in another region are said to have "inter-regional" connectivity. ATN routers connecting to adjacent routers in another state or organization within a particular region are said to have "intra-regional" connectivity. ATN routers connecting to adjacent routers within a particular state or organization are said to have "local" connectivity, i.e. intra-state or intra-organizational connectivity.

2.2 NETWORK ORGANIZATION FOR ROUTING TO AIRBORNE SYSTEMS

For air-ground ATSC and AINSC applications the ATN it is useful to distinguish ground state domains from ground domains operated by Service Provider organizations. See Figure 3-1. This figure depicts two distinct Air-Ground subnetwork Service Provider domains, which are connected to the regional backbone. Note that a state may operate its own Air-Ground subnetwork, in which case the concepts that apply to Service Providers apply to the state-operated subnetwork.

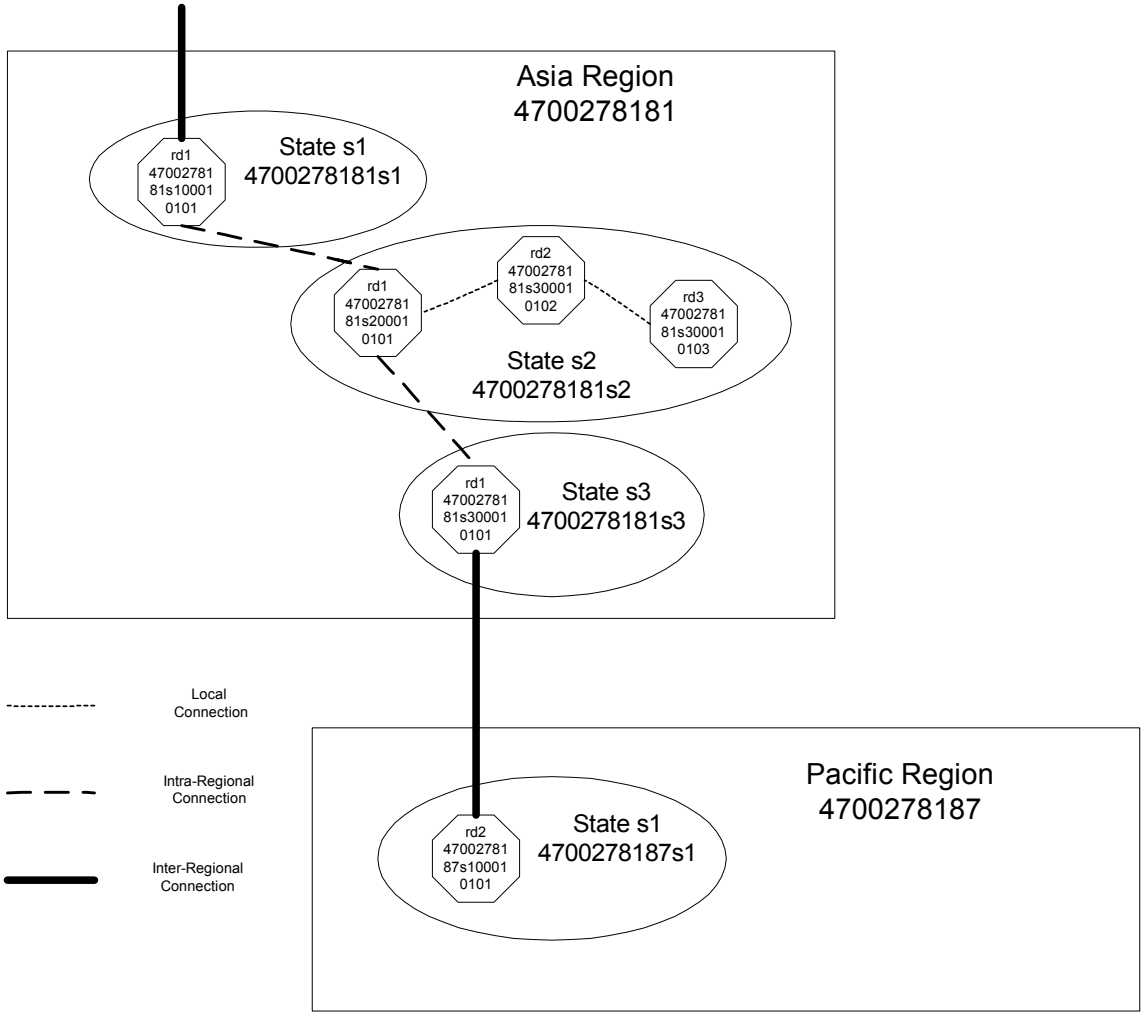


Figure 3-1. Connectivity of Ground Routing Domains

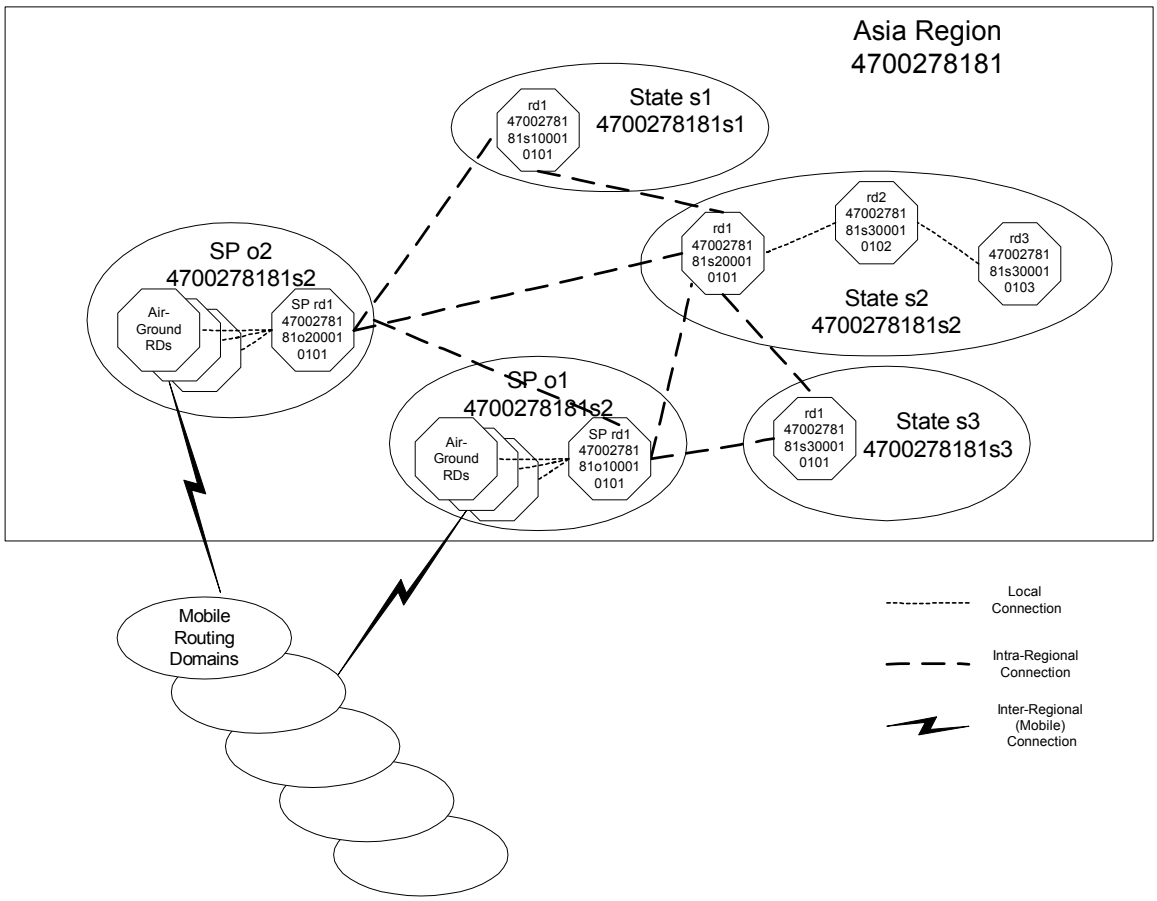


Figure 3-2. Connectivity of Air-Ground Service Providers to Regional Backbone

3. POLICY REQUIREMENTS FOR ATN ROUTERS

The policy for ATN routers in the Asia and Pacific region is specified in this section 4. The policy requirements are partitioned at a first level into policy for routes to ground (i.e., fixed) systems in section 4.1 and to policy for routes to airborne (i.e., mobile) systems in section 4.2. Within each of these first-level sections, policy requirements are next partitioned into policy for inter-regional routes, policy for intra-regional routes, and policy for local routes. Within these second-level sections policy requirements are partitioned at a third level according to the types of policy concerns identified in section 2.2, that is, policy requirements are partitioned at a third level into aggregation policies, preference policies, and distribution policies.

Note 1. – This section specifies routing policy requirements for backbone routers in the Asia/Pacific region. A backbone router is a Class 4 Ground/Ground ATN router which has been designated by the operating state/organization to provide an appropriate level of performance and support the routing policies for inter-regional and intra-regional connectivity, and whose operation as a backbone router has been approved by the ICAO regional office as agreed-to by all other member states/organizations. This section also contains a number of recommended policies non-backbone routers.

Note 2. – This document and companion documents specify requirements for ATN routers in the "Asia/Pacific region"; however, from the perspective of the ATN NSAP Addressing Planthere is not a single "Asia/Pacific region" but rather there is a distinct Asia region and a distinct Pacific region each with a unique region identifier.

3.1 POLICY FOR ROUTES TO GROUND SYSTEMS

3.1.1 GENERAL POLICY

a) If a backbone router receives multiple routes to an aggregate or specific destination, the route with the shortest path (i.e., lowest value of RD Hop Count) shall be selected.

b) All ATN routers in the Asia and Pacific shall authenticate the identity of peer ATN routers.

Note. – Authentication may be accomplished via IDRP Type 2 Authentication as specified in Edition 3 of ICAO Doc 9705 or via local means via Bilateral Agreement between the responsible organizations.

3.1.2 POLICY FOR INTER-REGIONAL AGGREGATE ROUTES TO GROUND SYSTEMS

Inter-regional route aggregation permits advertisement of a single aggregate route, which identifies all systems in an ICAO region. Aggregation at an inter-regional level refers to aggregating NLRI fields to an NSAP prefix up through the first octet of the ADM field. (Reference 5)

3.1.2.1 Route Aggregation Policies for Inter-Regional Routes

a) Backbone routers with inter-regional connectivity shall be configured with aggregate routes to ground systems for ATSC and AINSC applications at an inter-regional level.

3.1.2.2 Route Preference Policies for Inter-Regional Aggregate Routes

a) Backbone routers with inter-regional connectivity shall accept inter-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

b) **Recommendation. -** Backbone routers with inter-regional connectivity should only accept inter-regional aggregate routes on these connections.

Note 1. - A simple method is to not accept routes with an NSAP prefix longer than the first octet of the ADM field. An alternative is to only accept inter-regional aggregate routes, which have been pre-configured (using a so-called access control list).

Note 2. – This policy statement is a recommendation since in the future other routes such as routes to an airline's "home" routing domain may need to be supported.

c) Backbone routers with intra-regional connectivity shall accept inter-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

d) Backbone routers with local connectivity (i.e., intra-state or intra-organization) shall accept inter-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

3.1.2.3 Route Distribution Policies for Inter-Regional Aggregate Routes

a) Backbone routers with inter-regional connectivity shall distribute inter-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

b) Backbone routers with intra-regional connectivity shall distribute inter-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

c) Backbone routers with local connectivity shall distribute inter-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

3.1.3 POLICY FOR INTRA-REGIONAL AGGREGATE ROUTES TO GROUND SYSTEMS

Intra-regional route aggregation permits advertisement of a single aggregate route, which identifies all systems in a particular state or organization of an ICAO region. Aggregation at an intra-regional level refers to aggregating NLRI fields to an NSAP prefix up through the complete ADM field. (Reference 5)

3.1.3.1 Intra-Regional Route Aggregation Policies

a) Backbone routers with intra-regional connectivity shall be configured with aggregate routes to ground systems for ATSC and AINSC applications at an intra-regional level.

3.1.3.2 Intra-Regional Route Preference Policies

a) Backbone routers with intra-regional connectivity shall accept intra-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

b) **Recommendation.** Backbone routers with intra-regional connectivity should only accept inter-regional or intra-regional aggregate routes on these connections.

c) Backbone routers with local connectivity shall accept intra-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

d) **Recommendation.** Non-Backbone routers with local connectivity accept intra-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

3.1.3.3 Intra-Regional Route Distribution Policies

a) Backbone routers with intra-regional connectivity shall distribute intra-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

b) Backbone routers with local connectivity shall distribute intra-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

c) **Recommendation.** Non-Backbone routers with local connectivity should distribute intra-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

3.1.4 POLICY FOR AGGREGATE ROUTES TO GROUND SYSTEMS FOR DISTINCT ROUTING DOMAINS WITHIN A STATE/ ORGANIZATION

Distinct Routing Domain-level aggregation permits advertisement of a single aggregate route, which identifies all systems in a specific routing domain of a particular state or organization of an ICAO region. Aggregation at this level refers to aggregating NLRI fields to an NSAP prefix up through the complete ARS field. (Reference 5) ATN routers connecting to adjacent routers within a particular state or organization, i.e., with intra-state or intra-organizational connectivity, are said to have “local” connectivity.

3.1.4.1 Distinct Routing Domain Route Aggregation Policies

a) **Recommendation.** ATN routers serving individual routing domains should be configured with aggregate routes to all ground systems for ATSC and AINSC applications.

3.1.4.2 Distinct Routing Domain Route Preference Policies

a) **Recommendation.** ATN routers with local connectivity should accept state/organizational-level aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers within the same state or organization.

3.1.4.3 Distinct Routing Domain Route Distribution Policies

a) **Recommendation.** ATN routers with local connectivity should distribute state/organizational-level aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers within the same state or organization.

3.2 POLICY FOR ROUTES TO AIRBORNE SYSTEMS

3.2.1 POLICY FOR AGGREGATE ROUTES TO AIRBORNE SYSTEMS

Aggregation of routes to airborne (i.e. mobile) systems permits advertisement of a single aggregate route to airborne systems rather than advertisement of individual routes to each airborne system. Aggregation of routes to mobile systems may occur at a coarse level to "all mobile" or may occur at a "home domain" level of all aircraft belonging to an airline or the General Aviation aircraft of a given country of registration.

3.2.1.1 Route Aggregation Policies for Routes to Airborne Systems

a) **Recommendation. -** ATN routers in an Air-Ground subnetwork with intra-regional connectivity (to the regional backbone routers) should be configured with aggregate routes to airborne systems for ATSC and AINSC applications at a "home domain" level.

Note –The basic assumption of this recommendation is there are multiple service providers operating in a region and that an airline will contract with one service provider as the primary provider of air-ground service and optionally contract with a second service provider for back-up service. It is also assumed that the state is not operating its own air-ground subnetwork in which case it may be preferred to receive routing updates for individual aircraft.

b) **Recommendation. -** ATN routers in the regional backbone with local connectivity should be configured with aggregate routes to airborne systems for ATSC and AINSC applications at an "all mobile" level.

3.2.1.2 Route Preference Policies for Routes to Airborne Systems

a) **Recommendation. -** ATN ground routers in the regional backbone with intra-regional connectivity to ATN routers in an Air-Ground subnetwork should accept aggregate routes to airborne systems for ATSC and AINSC applications from adjacent ATN routers at a "home domain" level.

b) **Recommendation. -** ATN ground routers with local connectivity to ATN routers should accept aggregate routes to airborne end systems for ATSC and AINSC applications from adjacent ATN routers at an "all mobile" level.

3.2.1.3 Route Distribution Policies for Routes to Airborne Systems

a) **Recommendation. -** ATN ground routers with intra-regional connectivity to ATN routers should distribute aggregate routes to airborne systems for ATSC and AINSC applications at a "home domain" level to adjacent ATN ground routers.

b) **Recommendation.** ATN ground routers with local connectivity to ATN routers should distribute aggregate routes to airborne systems for ATSC and AINSC applications at an "all mobile" level to adjacent ATN ground routers.

3.3 LOCAL STATE/ORGANIZATIONAL ROUING POLICYS

Individual states/organizations may have additional routing policies consistent with the above general policies for routes to ground systems and airborne systems. Such policies may include various local preferences or Quality of Service based routing, for example, routing based on line error rates, expense, delay, capacity, and priority.

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

DRAFT

ASIA/PACIFIC REGIONAL GUIDANCE MATERIAL FOR THE USE OF THE PUBLIC INTERNET FOR THE AFTN

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JUNE 2003

CONTENTS

EXECUTIVE SUMMARY

This document presents the various issues that need to be addressed before implementing a system that uses the Public Internet to support low speed AFTN. These areas include conducting a safety case analysis that identifies risks and mitigation plans, ensuring that security measures are implemented in order to protect the integrity of the AFTN from external unauthorized sources. The use of appropriate logging and audit reporting required ensuring conformity and integrity of the service.

The document also covers the need for appropriate contract agreements to be put in place with end users to ensure that they do not abuse or allow the system to be misused.

Examples of a safety case and a contract agreement documents are also included in appendices to the document to illustrate the sort of subject matter that should be considered.

1 Introduction

The purpose of this document is to provide guidance for the use of the public Internet technology to support low speed AFTN, where required.

2 Purpose

There are a number of States where dedicated low speed AFTN facilities are either not available or unaffordable. Such stations have been receiving and sending AFTN by fax or phone.

The costs associated with using the above method are high because the connection calls are charged at ISD rates. The process also is labor intensive and may result in a higher than necessary workload for staff. Such stations are ideally suited for which this Internet type of service delivery is more convenient and economical until the operational requirement dictates a need for a dedicated AFTN/ATN links.

3 Assessment Process

There are several assessments that should be followed to ensure that the system is implemented in a safe and secure manner. These are outlined in the following sections.

3.1 Risk Assessment

Before considering the development and implementation of a system that utilizes the internet for delivery of AFTN, a * Safety Hazard Analysis must be conducted. The Safety Hazard Analysis should identify hazards and the risks associated with the hazards. Once the risks are identified they must be mitigated against. The following table illustrates the minimum hazards that will need addressing. Additional hazards may be realized depending on the situation.

Safety Requirement	Hazards	Safety Requirement Explanation	Met/Yet to be met
1. Customer contract specifications	1. Risk of Customer of failure to receive data. 2. Risk to Customer due to corrupted or missing data. 3. Risk to Customer due to bogus data. 4. Risk to Customer due to delayed data 5. Risk to Customer due to flooding of data. 6. Risk to Customer due to messages sent to incorrect address 7. Risk to Customer due to Virus in system (internal or external generated). 9 Inbound messages. System failure or degraded operations from the Provider	Customers will be made aware, through the contract, of the limitations of this service due to outside ISP issues. This will include user contingency arrangements during outages or if corrupted data is received on a regular basis.	Met
2. Anti-hacking strategy	8. INBOUND- Hacking into System.	1.URL for send screen - limited distribution- as per contract restrictions. 2. Must have registered user name & password. 3. A user name and password can not have duplicate sessions running at a time. 4. Access is through main	Met

Safety Requirement	Hazards	Safety Requirement Explanation	Met/Yet to be met
		web server with an ASP page front end. Prevents direct TCP-IP connection from end-user to server. 5. AFTN Protocol (async) between switch and Server. 6. All IP addresses are logged.	
3. Server parameters to limit number of incoming messages per minute	8. Inbound Hacking into System	The AFTN/Internet Server parameter will limit the number of incoming messages from the customer to the server to a factor of 'X' messages at time. This factor will be checked over a period of mili- seconds to ensure the X factor is not reached	Met
4. Encryption of data from customer	8. Inbound Hacking into System	The system uses SSL (Secure Socket Layer) to encrypt any data sent from the user to the server. This ensures that the data sent from the user cannot be read. SSL is used by the banking industry to secure transactions	Met
5. HTML page	10. Inbound - Incorrect users data received by The Provider	HTML pages are designed to ensure correct AFTN format for messages. Use of preformatted templates eliminates errors in the AFTN message format.	met
6. Users AFTN training	10. Inbound - Incorrect users data received by system	All contracted users of the gateway will have been trained in AFTN message handling procedures or will be provided with appropriate training prior to using the system. A user Operating procedures manual will also be provided for quick reference of the user.	Met

* See Appendix A for an outline of a Hazard Analysis.

3.2 Security

To maintain the integrity of the AFTN the following security measures must be employed as a minimum to protect against abuse of the system by unauthorized user.

- The system server must maintain a database of authorized web users.
- Usernames and passwords must consist of no less than six alphanumeric characters and no greater than eight alphanumeric characters.
- Usernames and passwords must be treated confidentially in the same way as pin numbers are for bank cards. The security codes shall not be disclosed to any unauthorized user.
- There shall be only one user session allowed at one time for individual user accounts. Any attempt to logon to the system by more than one session for a user will result in that attempt being disallowed by the web server.
- The URL for the website must be hidden from public view. It is not to be published and no hyperlinks from home pages or other web sites are to be used allowed.
- The site must use a secure connection (Secure Sockets Layer or SSL protocol 128 bit encryption) utilising an SSL server.
- The user must type in the URL starting with 'https' otherwise the user will receive a message warning that 'https' must be used.
- Session authentication must be implemented on either the client (using cookies etc) or client and web server (session tracking).
- The web server must provide a 'lockout' facility that locks a web user out from the system when excessive amounts of AFTN messages have been received by a web user. This protects against flooding of the system by a potential hacker.
- The web server should be protected from direct exposure from the internet. The main ATC web server should direct any AFTN web requests to a middle proxy server which then on forwards requests to the AFTN web server. This protects the AFTN web server from direct TCP-IP connections from the Internet.
- Internet firewall protection shall be utilised.
- All transactions must be logged. IP addresses, user names and transaction information are to be logged for each transaction and time stamped by the web server.

3.3 Logging and Auditing

A system that supports AFTN over the internet must maintain a log of all the different types of transactions that occur between the server system and web user, mail server and AFTN switch. The following points indicate the various areas that system logging should cover.

- The system shall maintain an AFTN message transaction log file.
- The system must archive all received and transmitted AFTN messages for 30 days.
- The AFTN message transaction log file must contain the original message information that is received or transmitted by the system.
- Each transaction stored in the database must be time stamped with the server time.
- Each Web transaction stored must be stamped with the identification of the user (obtained from their original logon) and user IP address.
- Additional a system log shall be kept to store system related messages.

3.4 Formulation of Contract Agreements

Because there are security issues involved with setting up an internet based system that connects to the AFTN, *contractual agreements need to be formally established between the party supplying the AFTN Internet Gateway access and any external party's utilising the facility. These contract agreements are to be put in place with end users to ensure that they do not abuse or allow the system to be misused. When formulating a contract agreement besides the normal contractual information the contract must address the

following areas that are specific to setting up a system that allows access to AFTN via the internet.
The customer must:

- ensure that the services are only accessed from the designated sites;
- ensure that the procedures for AFTN circuit that conform to the requirements specified in International Standards and Recommended Practices, Annex 10 to the Convention on International Civil Aviation, are used at all times;
- not cause or authorize any Internet site to be linked with the AFTN Internet Gateway Internet sites without prior consent of the AFTN Internet Gateway provider;
- treat all Security Information as confidential and should not, without prior written consent of the provider, disclose the Security Information to any person (including persons within Its own organisation) or not use the security information for any purpose other than the purpose for which it is provided by the provide;
- ensure that only users at a Designated Site have access to, and knowledge of, the Security Information specific to that Site;

- lodge, through the Help Desk, a request for a new Security Information when the membership of a user group changes in any way;

* See Appendix B for an example of a Contract agreement.

4 System Recommendations

4.1 Acronyms

AFTN	Aeronautical Fixed Telecommunications Network
AFTN Gateway	The gateway sever that provides the Internet email/web conversion between the AFTN switching device and the internet/intranet
ASP	Active Server Pages
ATS	Air Traffic Services
COOKIE	A small text file kept on the client computer that is used to track user's activity
CGI	Common Gateway Interface
CSN	Channel Sequence Number (AFTN Message CSN)
DTG	Date Time Group
GUI	Graphical User Interface
HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
ISP	Public Internet Service Provider
ISD	International Subscriber Dialing
PC	Personal Computer
PERL	Program Language
SSL	Secure Sockets Layer protocol
TCP-IP	Transmission Control Protocol-Internet Protocol

4.2 System software

The system should consist of the following software components:

- Operating system
- Web server
- Web server program to handle and process web form submissions (Eg: CGI, ASP, PERL etc)
- Program/s to handle AFTN switch to Email conversion and web form to AFTN format conversion including message error handling and logging.

4.3 Equipment Hardware Specifications

4.3.1 Hardware

The AFTN Gateway system hardware for the Operational System shall be Commercial off the Shelf (COTS).

The hardware should be proven hardware, which is demonstrably suitable for use in a critical system with the reliability requirements of the AFTN Gateway system.

It shall consist of at least the following minimum components:

(a) Pentiumn III CPU

(b) 264 Mb of RAM

(c) LAN Card.

(d) Two standard Serial Ports

(e) CD Drive.

(f) 20 G Hard Drive

The system shall consist of two servers, an on-line server and an off-line server.

The on-line server keeps an up to-date message database and is connected to both the AFTN and intranet/internet.

The off-line server is not connected to the AFTN or intranet/internet. It contains the same configuration information as the on-line server but the message database will not be current or may be empty.

Upon complete failure of the on-line server the AFTN and network connection may then be transferred to the backup server which will become on-line.

4.3.2 System Interfaces

- AFTN interface
- Optional station clock (UTC time reference)
- Network connection (TCP/IP) Internet/Intranet connectivity.

AFTN Interface

(a) interfaces to the AFTN through an asynchronous connection (RS232 port)

(b) ensures the availability of the connection both to and from the AFTN host;

(c) controls the flow of data to and from the AFTN host;

(d) receive messages from, and transmit messages to, the AFTN host;

(e) checks received AFTN message Channel Sequence Numbers (CSNs) for consistency;

(f) utilises SVC QTA MIS for missed messages;

(g) has the abilty to retrive transmitted missed message/s from the message database;

(h) provides transmission of CH messages every 20 minutes;

(i) should be able receive and process CH and test messages from the AFTN host;

Optional Station Clock Interface

(a) time synchronisation, be connected to the UTC time reference, interface to the Station Clock.

(b) In the absence of a station clock, the system clock shall have an accuracy of 10 seconds for a period of 1 week.

(c) The clock will be within 1 second of the station clock when the station clock is available.

Network Interface

(a) Controls the conection to the mailserver/internet

4.4 Reception of AFTN Web messages

The Web User interface consists of a series of web pages.

(a) A Web page for username and password verification and login.

(b) The AFTNGateway web site must have a number of web forms that allow the input of various types of standard ICAO AFTN messages FreeText ,FPL, ARR, CHG, DEP, CNL, DLA,EST, Notam, etc.

(c) The web site may also support AFTN message templates that can be saved and recalled at a later time.

(d) The origin address must be automatically generated based on user login.

(e) Upon reception of an AFTN web message the AFTNGateway server will insert the date time group (DTG) into the AFTN message.

(f) Form field validation must be supported on both the client side and server side.

(g) An AFTN Web form submission confirmation page, verifying receipt of web message at the web server.

(h) A number of Web pages the warn the user of logon errors, database errors etc.

(i) The AFTNGateway web server will generate a four (4) digit web sequence number that is associated with the AFTN message submitted that can be used to identify and track the message submited by individual AFTNGateway web users.

(j) The AFTNGateway web server will automatically generate a email as receipt message for the web user submission which will be sent to the web user as a record for the transaction.

(k) The web server must support Internet Explorer and Netscape browsers.

4.5 Transmission of AFTN Email messages

(a) The AFTNGateway server must provide a database with a table of AFTN to Email address translations.

(b) Email messages generated from AFTN messages will be allocated an individual Email Sequence Number for each user consisting of four (4) digits.

(c) There must be a provision for e-mail 'CH' messages to be sent to the user every 20 minutes.

(d) A change of day message must be sent at 0000 to all e-mail users notifying users of change of day and reset of e-mail sequence number back to one (0001).

(e) An AFTN SVC message shall be sent to the AFTN COM centre/station in the event that the AFTNGateway server cannot connect to the mail server.

(f) An AFTN SVC message shall be sent to the AFTN COM centre/station in the event that the AFTNGateway server cannot find an e-mail address for the AFTN address.

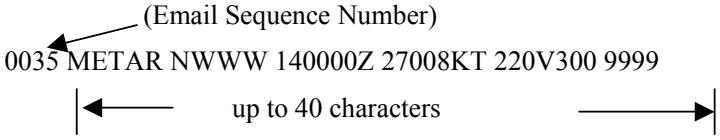
(g) The e-mail sequence number shall be reset at start of day.

(h) The e-mail sequence number shall be reset when the server is re-started.

(i) The sender field of the generated AFTN e-mail message shall be the e-mail address of the AFTN COM centre/station.

(j) The subject field of the generated AFTN e-mail message shall consist firstly of the four digit e-mail sequence number followed by up to forty character of the first line of text of the AFTN message.

Example:



(k) It is the responibility of the end user to check the email account for missed messages.

4.6 Security

(a) The AFTNGateway server must maintain a database of authorised web users.

(b) Usernames and passwords must consist of no less than six alphanumeric characters and no greater than eight alphanumeric characters.

(c) Usernames and passwords must be treated confidentially in the same way as pin numbers are for bank cards. The security codes shall not be disclosed to any unathorised user.

(d) There shall be only one user session allowed at one time for individual user accounts. Any attempt to logon to the system by more than one session for a user will result in that attempt being disallowed by the web server.

(e) The URL must be hidden for the AFTNGateway website. It is not to be published and no hyperlinks from home pages or other web sites are to be used allowed.

(f) The site must use a secure connection (Secure Sockets Layer or SSL protocol 128 bit encryption) utilising an SSL server.

(g) The user must type in the URL starting with 'https' otherwise the user will receive a message warning that 'https' must be used.

(h) Session authentication must be implemented on either the client (using cookies etc) or client and web server (session tracking).

(i) The AFTNGateway web server must provide a 'lockout' facility that locks a web user out from the system when excessive amounts of aftn messages have been received by a web user. This protects against flooding of the system by a potential hacker.

(j) The AFTNGateway web server should be protected from direct exposure from the internet. The main ATC web server should direct any AFTN web requests to a middle proxy server which then on forwards requests to the AFTNGateway web server. This protects the AFTNGateway web server from direct TCP-IP connections from the Internet.

(k) Internet firewall protection shall be utilised.

(l) All transactions must be logged. IP addresses, user names and transaction information are to be logged for each transaction and time stamped by the web server.

4.7 Archiving and Reviewing Data

(a) The AFTNGateway system shall maintain an AFTN message transaction log file.

(b) The AFTNGateway system must archive all received and transmitted AFTN messages for 30 days.

(c) The AFTN message transaction log file must contain the original message information that is received or transmitted by the AFTN Gateway system.

(d) Each transaction stored in the database must be time stamped with the AFTNGateway server time.

(e) Each Web transaction stored must be stamped with the identification of the user (obtained from their original logon) and user IP address.

An example of the format of the AFTN message transaction log file is shown here:

14/11/2001 00:10:19
---INCOMING---
THE FOLLOWING AFTN MESSAGE WAS RECEIVED:
TEE0002 140010
GG ABCDYSYX
140010 NWBBYMYX
SANC20 NWBB 140000
METAR NWWW 140000Z 27008KT 220V300 9999 SCT023 BKN056 30/21
Q1015
NOSIG=

14/11/2001 00:10:20
---OUTGOING---
EMAIL FOR Pacific FIS(Pacific@yahoo.com.au)
WITH SEQ NO OF 0002 SUCCESSFULLY SENT FOR FOLLOWING
AFTN MESSAGE:
TEE0002 140010
GG ABCDYSYX
140010 NWBBYMYX
SANC20 NWBB 140000
METAR NWWW 140000Z 27008KT 220V300 9999 SCT023 BKN056 30/21
Q1015 NOSIG=

The system must log user login and system information.

Examples of the format of these types of messages that may appear in the transaction log file are shown here:

8/11/2001 00:35:35
EMAIL Connect Failed
--- Welcome to a new day ---
Your last Email Sequence Number was 0023.
This message has reset your sequence number to 0001.

8/11/2001 00:37:45
AFTN PROCESS TERMINATED

8/11/2001 00:37:45
EMAIL PROCESS TERMINATED

8/11/2001 00:37:45
LOGGER PROCESS TERMINATED

8/11/2001 00:59:30
AFTN SVC Message - EMAIL NOW SENT AFTER PROBLEMS
SVC Message from AFTNGATEWAY.
Email with sequence number: 0023
was Successfully sent.

4.8 System Start up and Recovery

At system start up the AFTNGateway system shall automatically notify all users via e-mail that the system has been restarted and all user e-mail sequence number shall be reset to one (0001).

The following illustrates the contents of a typical e-mail restart message.

The system has RESTARTED.
Your last e-mail Sequence Number was 0356.
This message has reset your sequence number to 0001.

4.9 End User Equipment and software

- Standard PC
- Any email program or web based mail
- Internet Explorer or Netscape browser
- Email account dedicated to reception of AFTN messages

APPENDIX A - USE OF AFTN OVER THE PUBLIC INTERNET HAZARD ANALYSIS

The following sections should be considered and included in the Hazard Analysis.

INTRODUCTION
EXECUTIVE SUMMARY
SCOPE
CONFIGURATION DESCRIPTION
- Provide a full description on how the system is to be configured.

SYSTEM OPERATION
- Provide details on how the system operation will work.

ASSUMPTIONS
- List all assumptions associated with how the system will be implemented.

SAFETY REQUIREMENTS DERIVATION
- State how the safety requirements were derived.

SAFETY REQUIREMENTS
- Outline the safety requirements identified for this system.

DESIGN PROCESS
- Outline the design process that will be applied to develop the system.
- This should include System Test Plans, Engineering Readiness Checklist, Operational Readiness checklist, Commissioning process and Service Agreements.

DESIGN AUTHORITY
- Identify who is the design authority for the system.

STATUTARY AND REGULATORY REQUIREMENTS
- Identify the regulations that will apply to various parts of the system.

DEPENDENCIES, LIMITATIONS AND SHORTCOMINGS
- List all dependencies, limitations and shortcomings that are known about the system.

INSTALLATION, INTEGRATION COMMISSIONING AND TRANSITION INTO SERVICE PROCESS
- Detail the process that will be followed for the installation, integration commissioning and transition into service criteria.

OPERATION, MAINTENANCE AND PERFORMANCE MONITORING
- Identify who will be carrying out the operation, maintenance and performance monitoring of the system.

OPERATIONAL PROCEDURES
- List the operational procedures documents that will be used to operate the system.

ENGINEERING PROCEDURES
- List the engineering procedures documents that will be used to maintain and manage the system.

CHANGE CONTROL
- Identify the change control process that will be used to manage the configuration and engineering changes to the system.

SUPPORT
- Identify the support arrangements that will be put in place to manage and maintain the support of the system.

STAFF
- Identify the staff responsible for supporting the system and their level of technical certification for the system.

CONCLUSION
- List the conclusions about whether or not the system is low risk to the safety of the National Airways System and that all risks identified have been mitigated to a reasonable level that is practical.

REVIEW

- Identify if a review of the hazard analysis will be ongoing and if so the period in which a review must take place.

APPENDIX A - Hazard Report

- Contains the detail report on the hazards that have been identified and the plan on how they will be mitigated, the safety requirements and the effect on customers and operations.
- The report may be in the form of a table as shown below.

Project *The Project Name*

Status: Active

Description	Hazard Initiation	Mitigation Plans	Effect	Safety Requirement	Comments

APPENDIX B - Safety Management and Methodology

- Contains the methodology in how the safety management process works in your organisation.

APPENDIX B – EXAMPLE OF A CONTRACT AGREEMENT

THE PROVIDER'S NAME

THE USER'S NAME

[Product Name] AGREEMENT

AGREEMENT made **BETWEEN**

The Provider

AND:

The User ('You')

1. **INTRODUCTION**
2. **DEFINITIONS**
3. **TERM OF CONTRACT**
4. **PROVISION OF THE SERVICES**
5. **RESPONSIBILITIES OF THE CUSTOMER**
6. **FEE**
7. **TAXES**
8. **INTELLECTUAL PROPERTY**
9. **LIABILITY**
10. **LIMITATION OF LIABILITY**
11. **SECURITY INFORMATION**
12. **IMMEDIATE TERMINATION**
13. **TERMINATION FOR CONVENIENCE**
14. **FORCE MAJEURE (such as** The Provider will not be liable for any loss, damage, expense or charge of any kind for failure to perform the Services due to any event beyond its reasonable control, such events to include, but not be limited to, unsuitable weather conditions; fire; storm, flood, earthquake or any other Act of God; labour dispute or transportation embargo; act or omission of a government or other competent authority; viruses, catastrophic hardware failures, usage spikes, attacks on The Provider servers, an inability to transit or receive information over the Internet, and changes to any laws or regulations or the making of any legally enforceable orders frustrating the effectual performance of this Contract**)**
15. **PRESERVATION OF RIGHTS**
16. **ASSIGNMENT AND NOVATION**
17. **ENTIRE CONTRACT AND VARIATION**
18. **SEVERABILITY**
19. **WAIVER**
20. **GOVERNING LAW**

SIGNED AS AN AGREEMENT

EXECUTED by **THE PROVIDER**)
by its authorized officer)
)

Signature of witness	Signature of authorized officer
Name of witness	Name of authorized officer

EXECUTED by **The User** by its Authorized officer)
)
)

Signature of witness	Signature of authorized officer
Name of witness	Name of authorized officer

SCHEDULE

CONTRACT DETAILS

Clause No.	Issue	Information
1	**Commencement Date**	
1	**Services**	
1	**Message**	
1, 6	**Fee**	
1, 5.1	**Customer's Information**	***The User's Address***
11	**Designated Sites**	**The Designated Sites are:** ***The User's site address***
20	**Notices**	**The Provider**

TITLE AND TERMS OF REFERENCE

TITLE: ATN Transition Task Force

TERMS OF REFERENCE:

Plan for implementation of the Aeronautical Telecommunication Network (ATN) in the ASIA/PAC region to meet performance and capacity requirements of CNS/ATM Systems. The planning also addresses the ongoing development of the AFS including digital speech communication.

Subject/Tasks List of the ATN Transition Task Force

No.	Ref.	Task	Priority	Action Proposed/In Progress	Target
1	RAN/3 C 10/12 C 10/11d	Subject: ATN Transition Guidance Material. Task: Develop Regional ATN Transition Guidance Material.		1) Development of detailed guidance material.	Completed
2	RAN/3 C 10/11d	Subject: ATN Transition Plan Task: Develop an ATN Transition Plan to provide seamless transition to ATN.		1) Develop Ground Transition Plan taking into account Air-to-Ground aspects. 2) Develop a set of planning documents covering: i) ATN Regional Routing Architecture ii) ATN Naming and Addressing Conventions, and iii) Documentation of the Assigned ATN Names and Addresses.	Completed
3		Subject: ATN major elements. Task: Provide performance and functional requirements of ATN.	A	1) Develop ATN Technical Documents. - Security - Performance - System Management	~~2003~~ 2004 ~~2003~~ 2004 ~~2003~~ 2004
4	RAN/3 C 10/11b	Subject: AFTN related issues Task: Review operation of AFTN.	B	1) Evaluate and review the effect of increases or decreases in capacity and network changes, on circuit loading. 2) Plan network changes for support of OPMET and AIS databases, automated VOLMET broadcast.	On-going ~~2003~~ completed
5		Subject: Planning and implementation information in ANP. Task: Develop G/G part of the CNS FASID.	A	Development of detail description for the existing tables and Charts for the G/G part of the CNS FASID. 1) Table CNS 1B – ATN Router Plan 2) Table CNS 1C – ATS MHS 3) Table CNS 1D – AIDC Routing Plan	 Completed ~~2003~~ 2004 ~~2003~~ 2005

No.	Ref.	Task	Priority	Action Proposed/In Progress	Target
6		Subject: ATN Documentation Task: Development of ATN Routing Documentations and ICDs.	A	Development of ATN Documents: 1) A Router ICD 2) A Routing policy for IDRP 3) A Routing policy for MTA 4) Directory of Service 5) An AMHS ICD 6) An AIDC ICD	~~2003~~ completed completed ~~2003~~ 2004 2004 completed 2004
7		Subject: Use of the public Internet Task: Develop guidance material for the use of the public internet technology to support AFTN, where required.	A	Study the possibility of using the public Internet and develop guidance material for its use to support low speed AFTN stations, as an interim measure, with particular emphasis on security and reliability.	~~2003~~ completed
8		Subject: Use of IP Task: Develop guidance material for the use of IP as a Sub-Network for ATN	B	In accordance with the work being performed by ATNP, develop guidance material for the support of IP as a Sub-Network of the ATN, with particular emphasis on system compatibility between adjacent centers and security.	(2005) (Monitor development in ACP)
9		Subject: AMHS Naming Registration Task: Develop registration forms for assigning AMHS address for the region	A	To develop an AMHS Naming Registration Planning Document for registering the AMHS naming conventions and assignments to be used within the region.	2004
10		Subject: AFTN/AMHS Operational Procedures Tasks: Revise and develop operational procedures applicable to the use of the AMHS.	A	To review existing AFTN proceduress and adopt or develop new procedures applicable to the operation and use of the AMHS.	2004

UPDATED STRATEGY FOR THE PROVISION OF PRECISION APPROACH AND LANDING GUIDANCE SYSTEMS

Considering:

a) ~~that,~~ in the ASIA/PAC Region, ILS is capable of meeting the majority of requirements for precision approach and landing;

b) ~~that,~~ requirements for provision of terrestrial-based navigation facilities, non-precision and precision approach and landing have been implemented in most cases;

c) the availability of ICAO ~~GNSS~~ SARPs and guidance material ***for GNSS with augmentation to support Cat I precision approach;***

d) the knowledge that GNSS without augmentation can support non-precision approaches and that augmented GNSS- based systems ***is expected to*** ~~will~~ be available to support Category I operations ***by year 2006*** ~~from end of year 2004~~;

e) ~~feasibility of GBAS systems~~ ***GNSS with augmentation*** to support category II and III operations ***is expected to be available in 2010 – 2015 time frame*** ~~in 2006~~;

f) ~~the availability of a proven and standardized MLS to meet all weather operations requirements;~~ ***MLS Cat I is operational and ground and airborne Cat III B certification is in progress;***

g) ~~the development and deployment of multimode receivers;~~ ***a multi-modal airborne approach and landing capability is necessary and expected to be available;***

h) the definition of Required Navigation Performance for approach, landing and departure operations;

i) the need to maintain aircraft interoperability both within the region and between the ASIA/PAC region and other ICAO regions and to provide flexibility for future aircraft equipage.

The strategy for ASIA/PAC Region in the provision of precision approach and landing guidance is:

a) ***Retain*** ILS ~~be retained~~ as an ICAO standard system for as long as it is operationally acceptable and economically beneficial;

b) Implement GNSS with ***augmentation*** ~~GBAS~~ to support Category I operations where ***operationally required and economically beneficial*** ~~appropriate~~;

c) Conduct studies for the implementation of GNSS ground- based augmentation systems and GNSS avionics equipment for Category II and III operations;

d) Introduce applicable Required Navigation Performance (RNP) for approach, landing and departure operations in accordance with ICAO provisions.

e) Conduct necessary on-going GNSS and RNP education and training for operational personnel to ensure safe operations.

f) Implement MLS where operational requirements cannot be satisfied by implementation of ILS or GNSS.

g) Protect radio frequency spectrum of ILS, MLS and GNSS since the transition from ILS to GNSS and /or MLS will be evolutionary and will take some time.

UPDATED STRATEGY FOR THE IMPLEMENTATION OF GNSS NAVIGATION CAPABILITY IN THE ASIA/PACIFIC REGION

Considering that:

1) Safety is the highest priority;

2) Elements of Global Air Navigation Plan for CNS/ATM system on GNSS and requirements for the GNSS implementation have been incorporated into the CNS part of FASID;

3) GNSS SARPs, PANS and guidance material for GNSS implementation are available;

4) The availability of avionics including limitations of some receiver designs; the ability of aircraft to achieve RNP requirements and the level of user equipage;

5) Development of GNSS systems including satellite constellations and improvement in system performance;

6) Airworthiness and operational approvals allowing the current GNSS to be used for en-route and non precision approach phases of flight without the need for augmentation services external to the aircraft;

7) Development status of aircraft-based augmentation systems;

8) Regional augmentation systems include both satellite-based (SBAS) and ground-based systems (GBAS);

9) Human, environmental and economic factors will affect the implementation of GNSS.

~~**The general strategy for the implementation of GNSS in the Asia/Pacific Region is detailed below**~~. This strategy ~~**is based on the**~~

10) The regional navigation requirements are~~of~~:

(a) RNP10***/RNP4*** for en-route~~ in remote/oceanic areas~~;
(b) RNP4 for ~~en-route and~~ ***transition to*** terminal phase of flight;
(c) *RNP1 for terminal phase of flight*;
(~~e~~d) NPA/APV for approaches and departures; and
~~(d)~~(e) Precision approaches at selected airports.

The general strategy for the implementation of GNSS in the Asia/Pacific Region is detailed below:

1) There should be an examination of the extent to which the GNSS system accessible in the Region can meet the navigational requirements of ATM service providers and aircraft operators in the Region;

2) Evolutionary introduction of GNSS Navigation Capability should be consistent with the Global Air Navigation Plan for CNS/ATM Systems;

3) During transition to GNSS, sufficient ground infrastructure for current navigation systems must remain available. Before existing ground infrastructure is considered for removal, users should be given reasonable transition time to allow them to equip with GNSS to attain equivalent navigation service;

~~3)~~4) Implementation shall be in full compliance with ICAO SARPs and PANS;

~~4) Introduce the use of GNSS as primary means of navigation in remote/oceanic areas;~~

~~5) Introduce the use of GNSS as a supplementary means of en-route navigation and non-precision approach~~;

5) Introduce the use of GNSS for en-route, terminal and approach navigation;

6) States are encouraged to implement future GNSS approvals based on TSO C145/146 receiver standards or equivalents;

7) To the extent possible, States should work co-operatively on a multinational basis to implement GNSS augmentation systems in order to facilitate seamless and inter-operable systems;

8) States consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance ~~with the exception of State aircraft~~ ***, taking due consideration of the need of State aircraft.***

9) States undertake a co-coordinated R & D programme on GNSS implementation and operation;

10) ICAO and States should undertake education and training to provide necessary knowledge in GNSS theory and operational application, including RNP, and

11) States establish multidisciplinary GNSS implementation teams, using section 6.10.2 of ICAO Circular 267, Guidelines for the Introduction and Operational Approval of the GNSS , as a guide.

Note1: Identified SBAS systems are EGNOS, MSAS and WAAS. The MSAS is expected to be available for providing augmentation for the Asia/Pacific region.

Proposed revision to

TOR of ADS-B STUDY AND IMPLEMENTATION TASK FORCE

Terms of Reference

Complete an industry wide ADS-B cost/benefit study for the near term use of ADS-B throughout the Asia/Pacific Region.

Develop an implementation plan for near term ADS-B applications in Asia Pacific including target dates taking into account available equipment standards and readiness of airspace users and ATS providers.

Note:

1. The Task Force, while undertaking the task, should take into account of the work being undertaken by OPLINK, SAS, SCRS and AMC Panels with a view to avoid any duplication.

2. The Task Force should report to the APANPIRG meeting to be held in 2004 and subsequent meetings.

ASIA/PAC FASID **6-7-1**

FASID TABLE MET 7 — ~~IMPLEMENTATION~~ AUTHORIZED USERS OF THE SADIS AND ISCS2 SATELLITE BROADCAST in ASIA/PAC Region

EXPLANATION OF THE TABLE

Column

1. Name of the State or Territory.

2. User of the satellite broadcast. Abbreviations used:

CAA — civil aviation authority
NMS — national meteorological service
O — other than the civil aviation authority or the national meteorological service.

3. Location of VSAT : town and, where applicable, aerodrome to be indicated.

~~4. Indication whether the access to the satellite broadcast has been approved:~~

~~X — yes~~
~~[blank] — no~~

~~5~~4. Indication whether the equipment is operational:

2w — two-way VSAT operational
1w — one-way VSAT operational
[blank] — no

Editorial Note. —	Column 4 considered redundant and proposed therefore for deletion.

International Satellite Communication System (ISCS/2) provided by the United States					
State/Territory	**WAFS User**	**Location of VSAT**	**~~Access Approved~~**	**~~Equipment Installed~~**	**Equipment Operational**
1	2	3			4
American Samoa (United States)		Information received from the US NWS, Honolulu via a dedicated circuit			
Australia	Bureau of Meteorology	Melbourne	~~X~~	~~X~~	~~X~~1w
China Civil Aviation Administration Civil Aviation Administration Hong Kong Observatory Chinese Aeronautical Meteorology Association	China Meteorological Administration (CMA)	National MET Centre, Beijing Beijing Intl. Airport Shanghai Intl. Airport Hong Kong Intl. Airport Taibei	~~X~~ ~~X~~ ~~X~~ ~~X~~ ~~X~~	 ~~X~~ ~~X~~ ~~X~~	 ~~X~~1w ~~X~~1w ~~X~~1w
Cook I.	Meteorological Service				
Fiji	Meteorological Service	Nadi Intl. Airport	~~X~~	~~X~~	~~X~~1w
French Polynesia (France)	Meteo France	Information received from France via satellite	~~X~~		
Indonesia	Meteorological and Geophysical Agency	Soekarno – Hatta International Airport	~~X~~	~~X~~	~~X~~1w
Japan	Japan Meteorological Agency	~~Kokusai Denshin Denwa Co.~~ KODI Co.	~~X~~	~~X~~	~~X~~1w
Kiribati					
Malaysia	Department of Meteorology	Kuala Lumpur International Airport	~~X~~		1w
Mongolia	Civil Aviation Authority	Ulaanbaatar	~~X~~		
Nauru					
New Caledonia (France)	Meteo France		~~X~~	~~X~~	~~X~~1w
New Zealand	MET Service of New Zealand, Ltd.	Auckland Wellington	~~X~~ ~~X~~	~~Backup only~~ ~~X~~	 ~~X~~1w
Niue					
Papua New Guinea	Meteorological Department	Port Moresby Intl. Airport	~~X~~	~~X~~	~~X~~1w[1]
Philippines	Department of Meteorology	Manila	~~X~~	~~X~~	~~X~~1w[1]
Republic of Korea	Korea Meteorological Administration	Incheon Intl. Airport	~~X~~	~~X~~	~~X~~1w
Samoa					
Singapore	Singapore MET Service	Singapore/Changi Intl. Airport	~~X~~	~~X~~	~~X~~1w
Thailand	Meteorological Department	Bangkok Intl. Airport	~~X~~		
Tonga					
Tuvalu					
Vanuatu	Meteorological Service	Port Vila	~~X~~		
Viet Nam	Meteorological Service	Hanoi City	~~X~~	~~X~~	~~X~~1w
United States	National Weather Service	Guam Hawaii	~~X~~ ~~X~~	 ~~X~~	 ~~X~~1w

[1] Information received from the State that equipment is not operational.

International Satellite Communication System (ISCS/2) provided by the United States					
State/Territory	**WAFS User**	**Location of VSAT**	**~~Access Approved~~**	**~~Equipment Installed~~**	**Equipment Operational**
1	2	3			4
Wallis I. (France)	Meteo France	Wallis	~~X~~	~~X~~	~~X~~1w

Satellite Distribution System (SADIS) provided by the United States					
State/Territory	**WAFS User**	**Location of VSAT**	**~~Access Approved~~**	**~~Equipment Installed~~**	**Equipment Operational**
1	2	3			4
Bangladesh	Department of Meteorology	Dhaka			~~X~~1w
~~Brunei~~	~~Department of Civil Aviation~~	~~Brunei Intl. Airport~~	~~X~~	~~X~~	~~X~~
China	China Meteorological Administration (CMA)	National MET Centre, Beijing	~~X~~	~~X~~	
	Civil Aviation Administration	Beijing Intl. Airport	~~X~~	~~X~~	~~X~~1w
	Civil Aviation Administration	Shanghai Intl. Airport	~~X~~	~~X~~	~~X~~1w
	Hong Kong Observatory	Hong Kong Intl. Airport	~~X~~	~~X~~	~~X~~1w
	Chinese Aeronautical Meteorology Association	Taibei	~~X~~	~~X~~	
	Civil Aviation Administration	Macau Intl. Airport	~~X~~	~~X~~	~~X~~1w
DPR of Korea	General Administration of Civil Aviation	Pyongyang Intl. Airport	~~X~~	~~X~~	~~X~~1w
India	Meteorological Department	New Delhi	~~X~~	~~X~~	~~X~~1w
Indonesia	Meteorological and Geophysical Agency	Headquarters	~~X~~	~~X~~	
Lao PDR	Department of Meteorology	Vientiane, Watty	~~X~~	~~X~~	~~X~~1w
Malaysia	Department of Meteorology	Kuala Lumpur Intl. Airport	~~X~~	~~X~~	~~X~~1w
Maldives	Department of Meteorology	Male Intl. Airport	~~X~~	~~X~~	~~X~~1w
Mongolia	Civil Aviation Authority	Ulaanbaatar Intl. Airport	~~X~~	~~X~~	~~X~~1w
Nepal	Department of Meteorology	Kathmandu Intl. Airport	~~X~~	~~X~~	~~X~~1w
Pakistan	Meteorological Department	Karachi Intl Airport	~~X~~	~~X~~	~~X~~1w
Republic of Korea	Korea Meteorological Administration	Incheon Intl. Airport	~~X~~	~~X~~	~~X~~1w
Sri Lanka	Department of Meteorology	Colombo	~~X~~	~~X~~	~~X~~1w
Thailand	Thai Meteorological Department	Bangkok Intl. Airport	~~X~~	~~X~~	~~X~~1w
Vietnam	~~Civil Aviation Administration~~	~~Gialam Airport, Hanoi~~	~~X~~	~~X~~	~~X~~1w
	Civil Aviation Administration	Tan-Son-Nhat Intl. Airport, Ho Chi Minh	~~X~~	~~X~~	

SADIS STRATEGIC ASSESSMENT TABLES
CURRENT AND PROJECTED DATA VOLUMES 2003-2007

Note 1:1 octet = 1 byte = 1 character;

Note 2: low level (SWL) <FL 100; medium level (SWM): FL100 – FL 250; high level (SWH): >FL250.

Table 1. ASIA— OPMET data volumes

Main routing(s): AFTN, ~~Two-way,~~ direct line (GTS)

OPMET data	*Current 2003*	*Projected 2004*	*Projected 2005*	*Projected 2006*	*Projected 2007*
ALPHANUMERIC DATA					
Number of FC bulletins issued per day	106	110	120	130	140
Average number of stations per FC bulletin	6	6	6	6	6
Number of **FT bulletins** issued per day	211	220	230	240	250
Average number of stations per FT bulletin	6	6	6	6	6
Number of **SA bulletins** issued per day	1448	1500	1550	1600	1650
Average number of stations per SA bulletin	6	6	6	6	6
Number of **SP bulletins** issued per day	0	20	30	40	50
Number of **SIGMET** bulletins issued per day	25	25	25	25	25
Number of **FK/FV** bulletins issued per day?	**4**	**5**	**5**	**5**	**5**
~~(WS<WV and WC) for relevant FIRS~~					
~~**OTHER OPMET**~~ **BINARY DATA** Number of other bulletins issued per day	**0**	**0**	**0**	**0**	**0**
(please specify header(s))					
Average number of stations per bulletin	**0**	**0**	**0**	**0**	**0**
TOTALS					
Total number of OPMET bulletins per day	1794	1880	1960	2040	2120
Average size of OPMET bulletin (bytes)	350	350	350	350	350
Total estimated OPMET data volume per day (bytes)	628K	658K	686K	714K	742K

Table 2. ASIA — T4 Facsimile chart volumes

Editorial Note.— *Proposed for deletion*; no requirement.

Table 3. ASIA — BUFR data volumes

Main routing(s): ~~Two-way SADIS/~~GTS

BUFR SIGWX messages	*Current 2003*	*Projected 2004*	*Projected 2005*	*Projected 2006*	*Projected 2007*
(a) WMO Header			~~**One two-way site**~~	~~**One two-way site**~~	~~**One two-way site**~~
Time(s) of issue of data (UTC)	No requirement	No requirement	0700, 1300, 1900, 0100	0700, 1300, 1900, 0100	0700, 1300, 1900, 0100
Average size of message (bytes)			15K	15K	15K
Data level (e.g. FL range or low (SWL)/medium (SWM) level)			SWL/SWM	SWL/SWM	SWL/SWM
Validity time(s) of data VT (UTC)			1200, 1800, 0000, 0600	1200, 1800, 0000, 0600	1200, 1800, 0000, 0600
TOTALS					
Total number of BUFR messages per day			12	12	12
Average size of messages (bytes)			15K	15K	15K
Total estimated volume of BUFR messages per day (bytes)			180K	180K	180K

Note: It is assumed that only one site will have the capacity to send BUFR information to WAFC London.

Table 4. ASIA — AIS data volumes

Main routing(s): AFTN, ~~Two-Way SADIS~~

AIS (Subject to statement of an operational requirement)	*Current 2003*	*Projected 2004*	*Projected 2005*	*Projected 2006*	*Projected 2007*
ALPHANUMERIC AIS DATA (e.g. NOTAMs, ASHTAMs)	~~From the two-way site~~				
Bulletin type	No requirement	No requirement	No requirement	No requirement	No requirement
Number of bulletins issued per day					
Average size of each bulletin (bytes)					
Bulletin type					
Number of bulletins issued per day					
Average size of each bulletin (bytes)					
CHART AIS DATA (e.g. AIP CHARTS)					
Header number/Chart type (e.g. AIP)					
Time(S) of issue of chart (UTC)					
Average size of chart (bytes)					
Validity time of chart VT(UTC)					
Header number/Chart type (e.g. AIP)					
Time(S) of issue of chart (UTC)					
Average size of chart (bytes)					
Validity time of chart VT(UTC)					
TOTALS					
Total number of AIS bulletins per day					
Average size of AIS bulletin (byte)					
Total number of AIS charts issued per day					
Average size of AIS chart (byte)					
Total estimated volume of AIS data per day (bytes)					

Results of the Survey on States' Plans for Transition to GRIB/BUFR WAFS Products (WAFS/T TF)

Table 1. Survey Results on States' Current Setup

	Workstations		Software		Software GRIB & BUFR Capability	Communication	SADIS FTP
State/Territory	**SADIS**	**ISCS**	**SADIS**	**ISCS**			
Australia	-	Use existing gear	-	Use existing software	Yes (GRIB) No (BUFR)	Satellite	No
Bangladesh	Note – a SADIS user.						
Bhutan	Note – not yet a WAFS user.						
Brunei Darussalam	UKW technik	-	WEDIS from Sofreavia/ UKW technik	-	Yes (GRIB) No (BUFR)	Internet (Note)	No
	Note – We used to receive the SADIS products from the SADIS direct broadcast but this practice has been abandoned since the SADIS operator started the cost recovery process some time ago. We now receive the ISCS products on a regular basis for part of our aviation needs via the Internet.						
Cambodia	Note – not yet a WAFS user. May purchase a SADIS system according to latest information from ICAO.						
China	Both SADIS and ISCS workstations are used currently		WSI	Alden	Yes	Satellite	No
Hong Kong, China	IES ULTIMA	Aviation Weather Workstation	IES ULTIMA	Aviation Weather Workstation	SADIS: Yes ISCS: Yes (GRIB); No (BUFR)	Satellite	Yes
Macao, China	One workstation	-	NETSYS VHAN 5.0	-	No	Satellite	No
Cook Islands	Note – not yet a WAFS user.						
D.P.R. of Korea	SADIS VSAT	-	VISIONMAN JR	-	No	Satellite	No

Fiji	-	Alden STAR4	-	X-Weather, AWGS, XAn STAR4	No (not all)	Satellite	No
France (French Polynesia, New Caledonia and Wallis Islands)	-	COROBOR MESSIR	-	COROBOR MESSIR	Yes (GRIB) No (BUFR)	Satellite	No
India	Pentium II workstation	-	PC METIS	-	Yes	Satellite	No
Indonesia	✓	✓	ALMOS	STAR4	No	Satellite	No
Japan	-	Use existing system	-	Use existing system	No	Satellite	No
Kiribati	Note – not yet a WAFS user.						
Lao P.D.R.	Compaq DESKPRO & HP Netserver E800 for alternative	-	COROBOR MESSIR & WEDIS	-	Yes	Satellite	No
Malaysia	HP 9000 K210 servers & HP C110 workstations	Workstation being acquired	Sonalysts wXstation software	MESSIR-AERO being acquired	Yes (GRIB) No (BUFR)	Satellite	No
Maldives	One workstation	-	Aviation Weather Workstation	-	No	Satellite & Internet	No
Marshall Islands	Note – not yet a WAFS user.						
Micronesia, Federated States of	Note – not yet a WAFS user.						
Mongolia	✓	-	FLIGHT MAN LITE	-	Yes	Satellite	No
Myanmar	Note – not yet a WAFS user.						

Nauru	Note – not yet a WAFS user.						
Nepal	✓	-	MESSIR	-	Yes (only GRIB)	Satellite	No
New Zealand	-	Metservice Forecaster Workstations	-	Metservice developed In-house	Yes	Satellite, GTS & Internet	Yes
Niue	Note – not yet a WAFS user.						
Pakistan	SADIS workstation is in use	-	WEDIS	-	No (BUFR)	SADIS workstation installed (Satellite)	No
Palau	Note – not yet a WAFS user.						
Papua New Guinea	Note – an ISCS user.						
Philippines	-	STAR 4	-	STAR 4	Never been operational	-	-
Republic of Korea	Compaq PC workstations		PC METIS		Yes	Satellite	No
Samoa	-	Nil	-	Nil	No	No	No
Singapore	-	✓	-	COROBOR MESSIR – AERO & VISION	Yes	Satellite & SADIS FTP Backup	Yes
Solomon Islands	Note – not yet a WAFS user.						
Sri Lanka	One workstation	-	Sofreavia software	-	Yes (only GRIB)	Satellite	No
Thailand	Windows/2000 Server		COROBOR software		Yes	Satellite	Yes
Tonga	Note – not yet a WAFS user.						
Tuvalu	Note – not yet a WAFS user.						
United States	Note – ISCS Provider State.						
Vanuatu	-	-	-	-	-	Non reception of WAFS products	-
Viet Nam	STAR 4	-	ALDEN	-	No	Satellite	No

Table 2. Survey Results on States' Plan

	Operational Capability		Training Needs			BUFR Visualization Software	ISCS STAR4 Workstation	
State/Territory	**GRIB**	**BUFR**	**GRIB**	**BUFR Decoding**	**BUFR Visualization**	**Plan to Purchase**	**Operate**	**Plan to Upgrade (Date)**
Australia	Yes	7/2005 (Note 1)	No	No	No	No (Note 2)	No	-
	Note 1 – Decoder can be built once BUFR specifications have been supplied. Note 2 – We do not want to use standalone systems if avoidable. Comment – The earlier BUFR standards and specifications can be supplied, the better. This will help us in establishing the appropriate capabilities into our integrated communications systems.							
Bangladesh	Note – a SADIS user.							
Bhutan	Note – not yet a WAFS user.							
Brunei Darussalam	Yes	mid-2004	Yes	Yes	Yes	Yes	-	-
Cambodia	Note – not yet a WAFS user. May purchase a SADIS system according to latest information from ICAO.							
China	Yes	Yes (5/2004)	No	Yes	Yes	Yes	Yes	Yes
	Comment – Training forecaster for application of WAFS products and training computer technician for BUFR decoding.							
Hong Kong, China	Yes	Yes (Notes 1 and 2)	No	No	No	Yes	No	-
	Note 1 – On the assumption that SADIS and ISCS are the same in respect of BUFR operation. Note 2 – Under interactive mode only. New software is being sourced to provide automatic conversion operations. There is at present no software which could convert WAFS BUFR data into SIGWX chart for user selected area under automatic mode.							
Macao, China	6/2004	6/2004	Yes	Yes	Yes	Yes	No	-
Cook Islands	Note – not yet a WAFS user.							
D.P.R. of Korea	12/2003	12/2003	Yes	Yes	Yes	Yes	-	-

Fiji	12/2003	12/2003	Yes	Yes	Yes	Yes	Yes	Yes (12/2003)
	Comment – Fiji Meteorological Service (FMS) has only recently been formally informed of the deadline for change to new ISCS system. FMS will require external financial support to upgrade its system within so short time frame. Otherwise more time will be needed to determine exact nature of upgrade to existing system, obtain costs, secure financial aid and implement the change. It is hoped that the overlap period can be extended to mid-2004.							
France (French Polynesia, New Caledonia and Wallis Islands)	3/2004	3/2004	No	No	No	Yes	No	-
	Comment – We operate 2 ISCS receiving sites: in Tontouta (New Caledonia) and Wallis. For the first one, reception is handled by a message switching system (TRANSMET) and visualization with COROBOR MESSIR. For Wallis reception and visualization with MESSIR.							
India	Yes	Yes	No	No	No	No	-	-
Indonesia	2005	2005	Yes	Yes	Yes	Yes (Note)	Yes	Yes (2005)
	Note – We intend to replace the old systems with the new in 2005. Comments – (i) Please take a note that SADIS has been switched off by UK, caused by our shortage to pay its cost share, no SADIS services since 31 July 2002. (ii) Alden has no longer support their STAR4 software. (iii) We have no ability to access WAFS product, yet.							
Japan	3/2005	3/2005	No	No	No	No	No	-
Kiribati	Note – not yet a WAFS user.							
Lao P.D.R.	No (Note)	No (Note)	Yes	Yes	Yes	Yes	-	-
	Note – while the response was indicated as 'Yes', the current status appears to be 'No' considering the comment below. Comment – Department of Meteorology and Hydrology (DMH) Lao P.D.R. has encountered problems in both communication means to receive SADIS products and lack of capability/staff to decode and visualize GRIB and BUFR data.							
Malaysia	Yes	12/2003	No	No	No	Yes	No	No
	Comment – We are in the process of acquiring an ISCS Receiving System with MESSIR-AERO software. The ISCS Receiving System is expected to be operational by the end of 2003. The MESSIR-AERO has the capability to convert BUFR data into SIGWX charts.							
Maldives	2/2004	2/2004	Yes	Yes	Yes	Yes	-	-
	Comment – Time must be permitted till all the user states are ready and capable.							

Marshall Islands	Note – not yet a WAFS user.							
Micronesia, Federated States of	Note – not yet a WAFS user.							
Mongolia	5/2003	5/2003	Yes	Yes	Yes	Yes	-	-
Myanmar	Note – not yet a WAFS user.							
Nauru	Note – not yet a WAFS user.							
Nepal	Yes	No (Note)	-	-	-	No (Note)	-	-
	Note – Yet to be planned. Comment – The anticipated date to convert BUFR data into SIGWX may not be quite practical for all the States. It might take longer time than anticipated.							
New Zealand	Yes	Yes	No	No	No	No	No	-
Niue	Note – not yet a WAFS user.							
Pakistan	Yes	1/2004 (tentative)	No	Yes	Yes	Yes	-	-
Palau	Note – not yet a WAFS user.							
Papua New Guinea	Note – an ISCS user.							
Philippines	12/2003 (Notes)	12/2003 (Notes)	-	-	-	-	Yes (Notes)	12/2003 (Notes)
	Notes – (i) The Philippine WAFS Products Receiving System was a grant from NOAA, NSA under the VCP Program, making the Philippines an ISCS user. (ii) The Workstation used is STAR4. (iii) The Workstation is to be replaced with one capable of communicating the IP protocol by December 15, 2003. (iv) The Philippines through the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), will send to WMO within March application for assistance through VCP for the acquisition of the replacement workstation. (v) The National Weather Service of NOAA, USA through the Permanent Representative of the USA with WMO is coordinating for the replacement of workstation by ISCS users.							
Republic of Korea	Yes	Yes	No	No	No	No	No	-
	Comment – We would like to know ftp-address for the SADIS products.							

Samoa	No (Note 1)	No (Note 1)	No	No	No	No (Note 2)	No	-
	Note 1 – New Zealand weather office is responsible for the airspace over us. Note 2 – at the airport we have no plans of purchasing BUFR (software).							
Singapore	Yes	Yes	Yes	Yes	No	No (Note)	No	-
	Note – Already has a system. Comment – While we have the capability to convert BUFR/GRIB to SIGWX & WIND/TEMP charts, we would like our staff to be trained to operate WAFS BUFR/GRIB decoding software.							
Solomon Islands	Note – not yet a WAFS user.							
Sri Lanka	1/2004	1/2004	Yes	Yes	Yes	Yes	-	-
	Comment – Training component is essential in Sri Lanka scenario where we have a limited number of personnel. Also appreciate software at a concessionary rate. These are important, as no charge is levied on aviation products issued by the Met Dept.							
Thailand	Yes	Yes	Yes	Yes	Yes	No (Note)	No	-
	Note – Currently capable.							
Tonga	Note – not yet a WAFS user.							
Tuvalu	Note – not yet a WAFS user.							
United States	Note – ISCS Provider State.							
Vanuatu	No	No	-	-	-	-	-	-
	Comment – I regret to inform you that the implementation of WAFS system under the Vanuatu National Meteorological Services is not completed, hence no reception and non availability of WAFS products and information. Equipment unsatisfactorily installed, inadequate equipment, hardware, software, documentation, consumables, insufficient training, lack of spare parts etc. The station has been installed but not operating due to reasons not made known to Vanuatu. We have voiced our concern to WMO to look into the matter and if possible to assist and to determine the requirements of equipment and training in order to complete the implementation of the project.							
Viet Nam	Yes	7/2004	No	Yes	Yes	Yes	-	-

Table 3. Summary

	No. of responses	Percentage
Expected Responses	**42**	
Received Responses	**26**	**62**
Capabilities		
State/Territory currently capable or plans to have the capability to operationally convert GRIB and BUFR into Wind/Temp and SIGWX charts	22	52
State/Territory currently capable to operationally convert GRIB into Wind/Temp charts	13	31
State/Territory currently capable to operationally convert BUFR into SIGWX charts	7	17
Training Needs		
State/Territory requires training in GRIB and/or BUFR	14	33
State/Territory requires training to operate GRIB software	11	26
State/Territory requires training to operate BUFR decoding software	14	33
State/Territory requires training to operate BUFR visualization software	13	31
Procurement/Upgrade Plans		
State/Territory has plan to purchase BUFR visualization software	15	36
State/Territory has plan to upgrade ISCS STAR 4 workstation	4	10
State/Territory operates ISCS STAR 4 workstation	4	10
SADIS FTP Backup Service		
State/Territory utilizes the SADIS FTP backup service	4	10

ASIA/PAC WAFS IMPLEMENTATION TASK FORCE

1. Terms of Reference

Expedite the implementation of the World Area Forecast System (WAFS) in the Asia and Pacific Regions.

2. Work Programme

The work to be addressed by the ASIA/PAC WAFS Implementation Task Force (WAFS/I TF) includes:

(a) Coordinating the replacement of Wind/Temp charts in T4 facsimile format by GRIB encoded products.

(b) Coordinating the replacement of SIGWX charts in T4 facsimile format by BUFR encoded products.

(c) Coordinating the provision of assistance to States to ensure that WAFS can be effectively implemented in the Asia and Pacific Regions.

(d) Providing inputs (via the CNS/MET SG) to APANPIRG on the regional planning and development of WAFS for coordination with the WAFSOPSG.

(e) Keeping the Asia/Pacific WAFS Implementation Plan and Procedures up to date.

The work is expected to be carried out primarily by correspondence.

3. Composition

(a) The Task Force is composed by experts from:

Australia; Hong Kong, China (Chairman); India; Japan; New Zealand; United Kingdom and United States.

(b) IATA is invited to participate in the work of the Task Force.

ASIA/PAC WAFS Implementation Plan and Procedures

6th Edition - July 2003

ASIA/PAC WAFS Implementation Plan and Procedures

6th Edition - July 2003

Introduction

1. The Asia/Pacific WAFS Implementation Plan and Procedures has been revised to take account of progress already made and in recognition of the impact of the migration to GRIB and BUFR.

The Implementation of WAFS

2. This plan is based on the understanding that the implementation of WAFS in the Asia/Pacific Regions involves:

a. Production and dissemination by the WAFCs of global forecast winds, temperatures, tropopause height, tropopause temperature and humidity in GRIB format.

b. The transfer of responsibility for the production for SWH from RAFCs to the two WAFCs, and hence the closing down of the RAFCs.

c. The implementation of a communication system/s for the distribution of WAFS products in the Asia/Pacific Regions, to all the States that require the products in support of international air navigation. This will be achieved via satellite broadcast (SADIS and ISCS/2). States may need to use an alternative distribution system.

d. The production and distribution (via satellite broadcast) by the WAFCs, of Global, quality controlled SWH (FL 250 - 630) in BUFR format.

e. The production and distribution (via satellite broadcast) by the WAFCs of quality controlled SWM (FL 100 - 250) in BUFR format over limited geographical areas where required by PIRGs.

f. The capability of States to convert BUFR and GRIB messages to graphical products on an operational basis.

SIGWX Charts

3. The table below shows the status of the SIGWX charts and responsible WAFCs.

Chart area & responsible WAFC
G London (SWH)
K London (SWH)
D London (SWH)
J Washington (SWH)

E	London (SWH)
F	Washington (SWH)
I	Washington (SWH)
M	Washington (SWH)

4. There will be an ongoing requirement for NMSs to monitor the quality of WAFC products.

5. 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 radio active material and SIGMETs are made available to the WAFCs in a timely manner.

6. The SIGWX charts produced by WAFC Washington are also available on the US NWS Aviation Weather Center Internet site at: http://www.nws.noaa.gov/iscs. All WAFC London products are available on a password controlled internet-based FTP site, together with appropriate GRIB and BUFR decoding facilities.

7. States are encouraged to send comments to the WAFCs about the quality and accuracy of SIGWX on a frequent and regular basis. Contact details for comments are:

WAFC Washington

i. NWS/Aviation Weather Center
Attention: Mr Mike Campbell
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371
ii. E-mail addressed to: mike.campbell@noaa.gov
iii. Fax number: 1 816 880 0650

WAFC London

i. The Met. Office
Attention: Mr. Nigel Gait
Civil Aviation Branch
Sutton House
London Road, Bracknell
Berkshire RG12 2SY, United Kingdom
ii. E-mail addressed to: nigel.gait@metoffice.com
iii. Fax number: +44 (1344) 854 156

Distribution of WAFS Products

8. Most States in the Asia/Pacific Regions are receiving wind, temperature and humidity forecasts in GRIB, and SIGWX in T4 facsimile format from the two WAFCs by VSAT, either SADIS or ISCS/2. A range of WAFS products are available via the Internet and through bilateral arrangements with neighbouring national meteorological services.

9. The two WAFCs will distribute by satellite broadcast Global, quality controlled SWH and quality controlled SWM for limited geographical areas (Note: WAFC London started the operational distribution of Global, quality controlled SWH by satellite broadcast in June 2003) . Once suitable

decoding and visualization software has been acquired by States in the Asia/Pacific Regions, to provide them with the ability to operationally construct graphical SIGWX from the BUFR messages, and graphical products from the GRIB messages, the T4 facsimile format charts will be eliminated from the satellite broadcasts.

Indicative Timetable for Achieving the Final Phase of WAFS

10. The table given in Attachment 1 provides an indicative timetable for the implementation of WAFS within the Asia/Pacific Regions.

Volcanic Ash Advisory Centres (VAACs)

11. The VAACs will have an ongoing role of monitoring WAFS SIGWX charts that cover their areas of responsibility, and advising the appropriate WAFC to ensure the accurate inclusion of the volcanic ash symbol.

Tropical Cyclone Advisory Centres (TCAC)

12. The TCACs will have an ongoing role of monitoring WAFS SIGWX charts that cover their areas of responsibility, and advising the appropriate WAFC to ensure the accurate inclusion of the tropical cyclone symbol.

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	late 2002 (SADIS) late 2004 / early 2005 (ISCS)
4	All states that receive GRIB products capable of converting GRIB forecasts to Wind / Temp charts	early 2005
5	Removal of T4 Facsimile Wind / Temp charts from the satellite broadcast	1 July 2005
6	Training in the operational conversion of BUFR to SIGWX charts	late 2002 (SADIS) late 2004 / early 2005 (ISCS)
7	States having the ability to operate the decoding software to convert BUFR SIGWX messages into graphical format	early 2005
8	The satellite distribution by the two WAFCs of global SWH and of SWM for limited geographical areas in BUFR format	June 2003 (SADIS) September 2003 (ISCS)
9	Removal of T4 Facsimile SIGWX products from the satellite broadcast	1 July 2005

AMENDMENT PROPOSAL TO ASIA/PAC BASIC ANP AND FASID (DOC 9673)

ASIA/PAC BASIC ANP) MET **6-0-1**

PART VI

METEOROLOGY (MET)

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8. World area forecast system (WAFS)
(FASID Tables MET 5, MET 6 and MET 7)

8.1 FASID Table MET 5 sets out the ASIA/PAC Regions requirements for WAFS ~~products: upper wind and temperature and significant weather (SIGWX) charts, and the gridded binary (GRIB) data, and abbreviated plain language SIGWX,~~ forecasts to be provided by WAFCs London and Washington.
[APANPIRG/10 Concl. 10/18]

~~8.2 All the WAFS products should be prepared by WAFCs London and Washington for fixed valid times of 00, 06, 12 and 18 UTC.~~
~~[APANPIRG/10 Concl. 10/18]~~

Editorial Note.) Paragraph is redundant as it repeats Annex 3, 3.2.3.

8.~~3~~2 The levels for which forecasts of upper-air wind and temperature and SIGWX forecasts in charts ~~form~~ are to be provided by the WAFCs London and Washington and the areas to be covered by these charts ~~and the GRIB data~~ are indicated in FASID Table MET 5.
[APANPIRG/10 Concl. 10/18]

Note.) WAFCs will continue to issue forecasts of upper-air wind and temperature and of SIGWX in chart form until 1 July 2005.

8.~~4~~3 FASID Table MET 6 sets out the ~~WAFCs~~ responsibilities ~~for~~ of WACs London and Washington for the production of ~~SIGWX~~ WAFS forecasts ~~and upper wind and temperature charts for the areas of coverage indicated, and GRIB data. Each WAFC is responsible for the routine production, and dissemination by satellite broadcast, of charts for the areas of coverage listed.~~ For back-up purposes, each WAFC should have the capability to produce ~~SIGWX~~ WAFS forecasts for all the required areas of coverage.
[APANPIRG/10 Concl. 10/18]

8.~~5~~4 The projection of the WAFS forecasts in charts ~~from~~ and their areas of coverage should be as indicated in FASID Charts MET 4, MET 5 and MET 6 associated with FASID Table MET 6; their scale should be 1:20 X 10^6, true at 22.5^0 in the case of charts in the Mercator projection, and true at 60^0 latitude in the case of charts in the polar stereographic projection.
[APANPIRG/10 Concl. 10/18]
[ASIA/PAC/3 Rec. 8/21]
[APANPIRG/12 Concl. 12]

Note.) WAFCs will continue to issue forecasts of upper-air wind and temperature and of SIGWX in chart form until 1 July 2005.

8.~~6~~5 WAFS products should be disseminated by WAFC London using the satellite distribution system for information relating to air navigation (SADIS) and by WAFC Washington using the international satellite communications system (ISCS2) covering the reception area shown in FASID Chart CNS 7. To fulfil the requirements of long distance flights, transmission of WAFS products should be completed not later than 11 hours before validity time.
[APANPIRG/10 Concl. 10/18]

8.~~7~~6 The amendment service to the ~~WAFS products~~ SIGWX forecasts issued by WAFCs London and Washington should be by means of ~~abbreviated plain language messages~~ amended BUFR files disseminated through SADIS and ISCS2.
[APANPIRG/10 Concl. 10/18]

8.8 Each State should make the necessary arrangements to receive and make full operational use of WAFS products ~~issued~~ disseminated by WAFCs London and Washington. FASID Table MET 7 provides ~~the status of~~ lists the authorized ~~access by~~ users of the SADIS and ISCS2 ~~users to the~~ satellite broadcasts in the ASIA/PAC Regions and location of the operational VSATs.
[APANPIRG/10 Conc. 10/18]

PART VI

METEOROLOGY (MET)

. . . .

6. WORLD AREA FORECAST SYSTEM (WAFS)

(FASID Tables MET 5, MET 6 and MET 7
FASID Charts MET 4, MET 5, MET 6, and MET 7)

6.1 FASID Table MET 5 sets out the ASIA/PAC Regions requirements for WAFS ~~products: upper wind and temperature and significant weather (SIGWX) charts, and the gridded binary (GRIB) data, and abbreviated plain language SIGWX~~ forecasts, to be provided by WAFCs London and Washington.

6.2 FASID Table MET 6 sets out the ~~WAFCs~~ responsibilities ~~for the production of SIGWX forecasts and upper wind and temperature charts for the areas of coverage indicated, and the GRIB data~~ of WAFCs London and Washington for the production of WAFS forecasts. ~~WAFS~~ The maximum areas of coverage of WAFS forecasts in chart form are shown on FASID Charts MET 4, MET 5, MET 6, and MET 7).

Note.) WAFCs will continue to issue forecasts of upper-air wind and temperature and of SIGWX in chart form until 1 July 2005.

6.3 FASID Table MET 7 ~~provides the status of~~ lists the authorized ~~access by~~ users of SADIS and ISCS2 ~~users to the~~ satellite broadcasts in ASIA/PAC Regions and location of the operational VSATs. The table is included in the FASID for information purposes and kept up-to-date by the Regional Offices concerned.

FASID TABLE MET 5 – REQUIREMENTS FOR WAFS PRODUCTS

EXPLANATION OF THE TABLE

~~*PRODUCT REQUIRED*~~

~~W/T Chart = Wind and temperature chart~~
~~SWM = Medium level significant weather chart (FL 100 - 240)~~
~~SWH = High level significant weather chart (FL 250 - 630)~~

Column

1. WAFS products required by the ASIA/PAC States, to be provided by WAFC London and Washington.

2. Area of coverage required for the WAFS forecasts, to be provided by WAFC London and Washington.

CHART COVERAGE REQUIRED

D, E, F, G, H, I, J, K, M = Maximum area of coverage required (see Charts MET 4, 5, 6 and 7 attached to Table MET 6)

FASID TABLE MET 5 - REQUIREMENTS FOR WAFS PRODUCTS

~~PRODUCT~~ FORECAST REQUIRED		AREAS REQUIRED
1		2
W/T CHART >	FL 390	D, E, F, G, I, J
" " " "	FL 390	D, E, F, G, I, J
" " " "	FL 340	D, E, F, G, I, J
" " " "	FL 300	D, E, F, G, I, J
" " " "	FL 240	D, E, F, G, I, J
" " " "	FL 180	D, E, F, G, I, J
" " " "	FL 100	D, E, F, G, I, J
" " " "	FL 50	D, E, F, G, I, J
SWM (FL 100 - 450)		D
SWH CHART (FL 250 - 630)		D, E, F, G, I, J, K, M
~~GRIB data~~ SIGWX forecasts in the BUFR code form		GLOBAL
~~Amendment to SIGWX forecasts in abbreviated plain language~~ Upper-air wind and temperature forecasts in the GRIB code form		~~D, E, F, G, I, J, K~~ GLOBAL

Note 1.— SWM charts are provided for limited geographical areas as determined by regional air navigation agreement.

Note 2.— WAFCs will continue to issue forecasts of upper-air wind and temperature and of SIGWX in chart form until 1 July 2005.

FASID TABLE MET 6 – RESPONSIBILITIES OF THE WORLD AREA FORECAST CENTRES

EXPLANATION OF THE TABLE

Column

1 Name of the world area forecast centre (WAFC).

2 Area of ~~responsibility for the preparation~~ coverage of the significant weather (SIGWX) forecasts by the WAFC in Column 1.

3 Area of coverage of the SIGWX charts prepared or relayed by the WAFC in Column 1.

4 Area of coverage of the upper-air wind and temperature ~~charts prepared~~ forecasts in the GRIB code form issued by the WAFC in Column 1.

5 Area of coverage of the upper-air wind and temperature forecasts in chart form ~~GRIB data~~ prepared by the WAFC in Column 1.

FASID TABLE MET 6 – RESPONSIBILITIES OF THE WORLD AREA FORECAST CENTRES

WAFC	Areas of coverage of			
	SIGWX forecasts		Upper-air wind and temperature forecasts	
	~~Area of responsibility~~ In the BUFR code form	~~Areas of coverage of SIGWX~~ In chart form[~~2~~1]	~~Areas of charts coverage~~ In the GRIB code form	~~GRIB data~~In charts form[~~2~~1]
1	2	3	4	5
London	Global[±]	D, E, G, K~~,~~ ~~ASIA SOUTH MEDIUM~~D (FL100-450)	~~D, E, G~~ ~~g~~Global[±]	~~Global~~ D, E, G
Washington	~~global[±]~~Global	F, I, J, M	~~F, I~~ ~~g~~Global[±]	~~Global~~ F, I, J, M

~~*Note : All SIGWX charts are for FL250 – 630, except for ASIA SOUTH*~~ *Notes corresponding to superscripts in FASID Table MET 6 above*

~~1) For back-up purposes~~

~~2~~1) ~~Special medium level chart (FL100-450)~~ WAFCs continue to issue forecasts of upper-air wind and temperature and of SIGWX in chart form until 1 July 2005.

NEW ROBEX TABLES

Table 1. ROBEX Collection and Dissemination of METAR Bulletins - APAC Region

Explanation of Table

Col. 1: Name and ICAO location indicator of the MCC.

Col. 2: Description of the METAR Bulletin.

Col. 3: Regional OPMET Data Bank (RODB) responsible for collection and disssemination of the bulletin.

Col. 4: Official time of the bulletin. Aerodromes indicated with an asterisk (*) make half-hourly reports with official bulletin time in brackets.

Col. 5: Addresses to be used by the RODB in Col. 3 for the distribution in bulletin.

Table 1. ROBEX Collection and Dissemination of METAR Bulletins - APAC Region

1		2			3	4	5	
MCC		METAR Bulletin			RODB	Bul. Time	DISSEMINATION TO	
Name	CCCC	BUL No.	CCCC	Aerodrome			MCC Name	AFTN Address
Bangkok	VTBD	SAAS31	VTBD	BANGKOK/Bangkok Intl	BANGKOK	HH +30	Brisbane	YBZZSPTX
			VTCC	CHIANG MAI/Chiang Mai Intl		(HH +00)	Calcutta	VECCYPYX
			VTBU	RAYONG/U-Tapao Intl			Colombo	VCCCYPYX
			VTSS	SONGKHLA/Hat Yai Intl			Delhi	VIDPYPYX
			VTSP	PHUKET/Phuket Intl			Hong Kong	VHZZYPYX
			VLVT	VIENTIANE/Wattay			Jakarta	WIZZMCMC
			VYYY	YANGON/ Yangon Intl			Kuala Lumpur	WMZZYPYR
			VVTS	HO-CHI-MINH/Tan-Son Nhat			Mumbai	VABBYPYX
			VVNB	HANOI/Noibai			Incheon	RKSIYPYX
			VVDN	DANANG/Danang			Singapore	WSZZYPYM
			VDPP	PHNOM PENH/Pochentong			Wellington	NZZZYPYX
Beijing	ZBBB	SACI31	ZBAA	BEIJING/Capital	TOKYO	HH + 00	Bangkok	VTBBYPYX
			ZBTJ	TIANJING/Binhai		(HH + 30)	Brisbane	YBZZSQJX
			ZBYN	TAIYUAN/Wusu			Hong Kong	VHZZYPYX
			ZGGG	GUANGZHOU/Baiyun			Jakarta	WIZZMZBB
			ZSHC	HANGZHOU/Xiaoshan			Karachi	OPZZYPYX
			ZSPD	SHANGHAI/Pudong			Mumbai	VABBYPYX
			ZSSS	SHANGHAI/Hongqiao			Incheon	RKSIYPYX
			ZWWW	URUMQI/Diwopu			Singapore	WSZZYPYM
			ZYTL	DALIAN/Zhoushuzi			Tokyo	RJAAYPYX
			ZYTX	SHENYANG/Taoxian			Ulan Bator	ZMUBYMYX
							Wellington	NZZZYPYX
		SACI32	ZGKL	GUILIN/Liangjang	TOKYO	HH + 00	Bangkok	VTBBYPYX
			ZGNN	NANNING/Wuxu			Brisbane	YBZZSQSX
			ZGOW	SHANTOU/Shantou			Hong Kong	VHZZYPYX
			ZGSZ	SHENZHEN/Baoan			Jakarta	WIZZMZBB
			ZLXY	XIAN/Xianyang			Kuala Lumpur	WMZZYPYX
			ZMUB	ULAANBAATOR/Bryant-Ukhaa			Incheon	RKSIYPYX
			ZPPP	KUNMING/Wujiaba			Singapore	WSZZYPYM
			ZSAM	XIAMEN/Gaoqi			Tokyo	RJAAYPYX
			ZSQD	QINGDAO/Liuting			Wellington	NZZZYPYX
			ZUUU	CHENGDU/Shuangliu				
		SACI41	ZBHH	HOHHOT/Baita	TOKYO	HH + 00	Bangkok	VTBBYPYX
			ZGHA	CHANGSHA/Huanghua			Brisbane	YBZZSQJX
			ZHHH	WUHAN/Tianhe			Hong Kong	VHZZYPYX
			ZJHK	HAIKOU/Meilan			Jakarta	WIZZMZBB

1		2			3	4	5	
MCC		METAR Bulletin			RODB	Bul. Time	DISSEMINATION TO	
Name	CCCC	BUL No.	CCCC	Aerodrome			MCC Name	AFTN Address
			ZJSY	SANYA/Fenghuang			Karachi	OPZZYPYX
			ZLLL	LANZHOU/Zhongchuan			Mumbai	VABBYPYX
			ZSNJ	NANJING/Lukou			Incheon	RKSIYPYX
			ZSOF	HEFEI/Luogang			Singapore	WSZZYPYM
			ZUCK	CHONGQING/Jiangbei			Tokyo	RJAAYPYX
			ZWSH	KASHI			Ulan Bator	ZMUBYMYX
			ZYCC	CHANGCHUN/Dafangshen			Wellington	NZZZYPYX
			ZYHB	HARBIN/Yanjiangang				
Brisbane	YBBN	SAAU31	YSSY	SYDNEY/Kingsford Smith Intl	BRISBANE	HH + 00	Jakarta	WIZZMIMI
			YMML	MELBOURNE/Melbourne Intl		(HH + 30)	Nadi	NFFNYPYX
			YBBN	BRISBANE/Brisbane			Port Moresby	AYPYYMYX
			YPAD	ADELAIDE/Adelaide			Incheon	RKSIYPYX
			YPDN	DARWIN/Darwin			Wellington	NZZZYPYX
			YPPH	PERTH/Perth int			Hong Kong	VHZZYPYX
			YBCS	CAIRNS/Cairns				
			YBAS	ALICE SPRINGS/Alice Springs				
			YPLM	LEARMONTH/Learmonth				
			YBTL	TOWNSVILLE/Townsville				
			YPCC	COCOS ISL/Cocos Isl				
			YPXM	CHRISTMAS ISL/Christmas Isl				
			YPTN	TINDAL /Tindal RAAF				
		SAAU32	YSCB	CANBERRA/Canberra*	BRISBANE	HH + 00	Jakarta	WIZZMIMI
			YBCG	COOLANGATTA/Coolangatta*		(HH + 30)	Nadi	NFFNYPYX
			YMAV	AVALON/Avalon*			Port Moresby	AYPYYMYX
			YBRK	ROCKHAMPTON/Rockhampton*			Seoul	RKSSYPYX
			YPKG	KLAGOORLIE/Kalgoorlie*			Wellington	NZZZYPYX
			YPPD	PORT HEDLAND/Port Hedland*				
			YBRM	BROOME/Broome*				
			YSNF	NORFOLK ILS/Norfolk Isl*				
			YSDU	DUBBO/Dubbo				
			YSRI	RICHMOND/Richmond *				
			YWLM	WILLIAMTOWN/Williamtown *				
			YMLT	LAUNCESTON/Launceston*				
			YMHB	HOBART/Hobart*				
			YPEA	PEARCE/Pearce				

1		2			3	4	5	
MCC		METAR Bulletin			RODB	Bul. Time	DISSEMINATION TO	
Name	CCCC	BUL No.	CCCC	Aerodrome			MCC Name	AFTN Address
Colombo	VCCC	SASB31	VCBI	COLOMBO/Katunayake	BANGKOK	HH +50	Bangkok	VTBBYPYX
			VRMM	MALE/Male Intl		(HH + 20)	Kuala Lumpur	WMZZYPYR
							Mumbai	VABBYPYX
							Singapore	WSZZYPYM
							Tokyo	RJAAYPYX
							Hong Kong	VHZZYPYX
Delhi	VIDP	SAIN32	VIDP	DELHI/Indira Gandhi Intl	BANGKOK	HH + 30	Bangkok	VTBBYPYX
			VILK	LUCKNOW		(HH + 00)	Brisbane	YBZZSPXX
			VIBN	VARANASI/Varanasi			Calcutta	VECCYPYX
			VIAR	AMRITSAR/Amritsar			Karachi	OPZZYPYX
							Mumbai	VABBYPYX
							Tokyo	RJAAYPYX
							Hong Kong	VHZZYPYX
Hong Kong	VHHH	SAHK31	VHHH	HONG KONG/Hong Kong Intl	TOKYO	HH + 00	Bangkok	VTBBYPYX
			RCTP	TAIBEI/Taibei Intl		(HH + 30)	Beijing	ZBBBYPYX
			RCKH	GAOXIONG/Gaoxiong			Brisbane	YBZZSPHX
			RCSS	TABEI/Sungshan			Guangshou	ZGGGYPYX
			VMMC	MACAU/Macau Intl			Kuala Lumpur	WMZZYPYR
			RPLL	MANILA/Ninoy Aquino Intl*			Incheon	RKSIYPYX
			RPVM	LAPU LAPU/Mactan Cebu Intl*			Singapore	WSZZYPYM
			RPMD	DAVAO/Francisco Bangoy Intl			Tokyo	RJAAYPYX
			RPLB	SUBIC BAY/Subic Bay Intl			Wellington	NZZZYPYX
Jakarta	WIII	SAID31	WIIH	JAKARTA/Halim	SINGAPORE	HH + 00	Bangkok	VTBBYPYX
			WIII	JAKARTA/Soekarno-Hatta		(HH + 30)	Brisbane	YBZZSSHX
			WIMM	MEDAN/Polonia			Kuala Lumpur	WMZZYPYR
			WRSJ	SURABAYA/Juanda			Singapore	WSZZYPYM
			WRRR	DENPASAR*			Wellington	NZZZYPYX
			WAAA	UJUNG PANDANG/Hasanuddin			Hong Kong	VHZZYPYX
			WABB	BIAK/Frans Kaisieppo				
Calcutta	VECC	SAAE31	VECC	CALCUTTA/Netaji Subhash Chandra Bose Intl	BANGKOK	HH + 50	Bangkok	VTBBYPYX
			VEPT	PATNA/Patna			Brisbane	YBZZSPWX
			VGZR	DHAKA/Zia Intl			Colombo	VCCCYPYX
			VGEG	CHITTAGONG/M. A. Hannan Intl			Delhi	VIDPYPYX
			VNKT	KATHMANDU/Tribhuvan Intl*			Karachi	OPZZYPYX
							Mumbai	VABBYPYX
							Tokyo	RJAAYPYX
							Hong Kong	VHZZYPYX

1		2			3	4	5	
MCC		METAR Bulletin			RODB	Bul. Time	DISSEMINATION TO	
Name	CCCC	BUL No.	CCCC	Aerodrome			MCC Name	AFTN Address
Karachi	OPKC	SAPK31	OPKC	KARACHI/Quaid-E-Azam Intl	BANGKOK	HH +50	Abu Dhabi	OMZZYPYX
			OPRN	ISLAMABAD/Chaklala		(HH +20)	Bahrain	OBZZYPYX
			OPLA	LAHORE/Lahore			Beijing	ZBBBYPYX
			OPNH	NAWABSHAH			Calcutta	VECCYPYX
			OPGD	GAWADAR			Delhi	VIDDYPYX
			OPPS	PESHAVAR			Mumbai	VABBYPYX
							Tehran	OIZZYPYX
							Hong Kong	VHZZYPYX
Kuala Lumpur	WMKK	SAMS31	WMKK	KUALA LUMPUR/Kuala Lumpur Intl	SINGAPORE	HH + 30	Bangkok	VTBBYPYX
			WSSS	SINGAPORE/Changi		(HH + 10)	Colombo	VCCCYPYX
			~~WSAP~~	~~SINGAPORE/Paya Lebar~~			Hong Kong	VHZZYPYX
			WMKP	PENANG/Bayan Lepas			Jakarta	WIZZMBMB
			WBKK	KOTA KINABALU/Kota Kinabalu Intl			Manila	RPLLYPYX
			WBGG	KUCHING/Kuching			Mumbai	VABBYPYX
			WBSB	BANDAR SERI BEGAWAN /Brunei Intl			Incheon	RKSIYPYX
							Wellington	NZZZYPYX
Mumbai	VABB	SAIN31	VABB	MUMBA/Jawaharial Nehru IntlI	BANGKOK	HH + 40	Abu Dhabi	OMZZYPYX
			VOMM	CHENNAI/Chennai		(HH + 10)	Bahrain	OBZZYPYX
			VOTR	TIRUCHCHIRAPPALLI			Bangkok	VTBBYPYX
			VOTV	TRIVANDRUM/Trivandrum Intl			Brisbane	YBZZSPVX
			VAAH	AHMADABAD/Ahmadabad			Calcutta	VECCYPYX
			VOHY	HYDERABAD			Colombo	VCCCYPYX
			VANP	NAGPUR			Delhi	VIDPYPYX
							Karachi	OPZZYPYX
							Singapore	WSZZYPYM
							Tehran	OIZZYPYX
							Tokyo	RJAAYPYX
							Hong Kong	VHZZYPYX
Port Moresby	AYPY	SAPW31	AYPY	PORT MORESBY/Jacksons	BRISBANE	HH + 00	Bangkok	VTBBYPYX
			AYMD	MADANG		(HH + 30)	Beijing	ZBBBYPYX
			AYWK	WEWAK			Brisbane	YBZZSPSX
							Hong Kong	WSZZYPYM
							Wellington	NZZZYPYX

1		2			3	4	5	
MCC		METAR Bulletin			RODB	Bul. Time	DISSEMINATION TO	
Name	CCCC	BUL No.	CCCC	Aerodrome			MCC Name	AFTN Address
Incheon	RKSI	SAKO31	RKSI	SEOUL/Incheon Intl	TOKYO	HH + 00	Bangkok	VTBBYPYX
			RKSS	SEOUL/Gimpo Intl		(HH + 30)	Beijing	ZBBBYPYX
			RKPC	JEJU/Jeju Intl			Brisbane	YBZZSPSX
			RKPK	BUSAN/Gimhae Intl			Hong Kong	WSZZYPYM
			RKTU	CHEONGJU/Cheongju Intl			Singapore	WSZZYPYM
			RKNY	YANGYANG/Yangyang Intl			Tokyo	RJAAYPYX
			RKTN	DAEGU/Daegu Intl			Wellington	NZZZYPYX
							Mumbai	VABBYPYX
Tokyo	RJTD	~~SAJP31~~	RJAA	TOKYO/New Tokyo Intl	TOKYO	HH + 00	Beijing	ZBBBYPYX
		SAFE31	RJTT	TOKYO/Tokyo Intl		(HH + 30)	Brisbane	YBZZSPAX
			ROAH	NAHA/Naha			Hong Kong	VHZZYPYX
			RJOO	OSAKA/Osaka Intl			Incheon	RKSIYPYX
			RJBB	OSAKA/Kansai Intl			Singapore	WSSSYMYX
			RJNN	NAGOYA/Nagoya			Wellington	NZZZYPYX
							Bangkok	VTBBYPYX
							Guam	PGUMCOAX
							Nadi	NFZZRCXX
		~~SAJP32~~	RJCC	SAPPORO/New Chitose	TOKYO	HH + 00	Beijing	ZBBBYPYX
		SAFE32	RJFF	FUKUOKA/Fukuoka		(HH + 30)	Brisbane	YBZZSPAX
			RJFK	KAGOSHIMA/Kagoshima			Hong Kong	VHZZYPYX
			RJCH	HAKODATE/Hakodate			Incheon	RKSIYPYX
			RJFU	NAGASAKI/Nagasaki			Singapore	WSSSYMYX
							Bangkok	VTBBYPYX
							Guam	PGUMCOAX
							Nadi	NFZZRCXX
							London	EGZZMASI
							Wellington	NZZZYPYX
Wellington	NZKL	SANZ31	NZWN	WELLINGTON/Wellington Intl	BRISBANE	HH + 00	Bangkok	VTBBYPYX
			NZAA	AUCKLAND/Auckland Intl			Beijing	ZBBBYPYX
			NZCH	CHRISTCHURCH/Christchurch Intl			Brisbane	YBZZSPNX
							Jakarta	WIZZYPYX
							Hong Kong	VHZZYPYX
							Nadi	NFFNYPYX
							Port Moresby	AYPYYMYX
							Incheon	RKSIYPYX
							Singapore	WSZZYPYM
							Tokyo	RJAAYPYX

Table 2. ROBEX Collection and Dissemination of TAF (FT) Bulletins - APAC Region

Explanation of the Table

Col. 1: Name of the TCC.

Col. 2: Location indicator of TCC

Col. 3: Bulletin id

Col. 4: Location indicators of the aerodromes in the bulletin

Col. 5: Name of the aerodrome

Col. 6: Filing time of the bulletin

Col. 7: Start of validity time for the TAFs in the bulletin

Col. 8: Regional OPMET data bank responsible for the bulletin

Col. 9: Name of the aerodromes/OPMET centres to which the bulletin shall be disseminated

Col 10: AFTN address of the aerodrome/OPMET centre

Table 2. ROBEX Collection and Dissemination of TAF (FT) Bulletins - APAC Region

TCC		TAF Bulletin					Dissemination		
Name	CCCC	Bul No.	CCCC	Aerodrome	Filing time	Start of v.	RODB	Aerodrome	AFTN
1	2	3	4	5	6	7	8	9	10
Bangkok	VTBD	FTAS31	VTBD	BANGKOK/Bangkok Intl	0400	0600	BANGKOK	Abu Dhabi	OMZZYPYX
			VYYY	YANGON/ Yangon Intl	1000	1200		Bahrain	OBZZYPYX
			VGZR	DHAKA/Zia Intl	1600	1800		Beijing	ZBBBYPYX
			VLVT	VIENTIANE/Wattay	2200	0000		Beirut	OLLLYPYX
			VVTS	HO-CHI-MINH/Tan-Son Nhat				Brisbane	YBZZSQEX
			VDPP	PHNOM PENH/Pochentong				Hong Kong	VHZZYPYX
								Jeddah	OEJDYPYX
								Karachi	OPZZYPYX
								Kuala Lumpur	WMZZYPYR
								Mumbai	VABBYPYX
								Incheon	RKSIYPYX
								Singapore	WSZZYPYX
								Tehran	OIIIYPYX
								Tokyo	RJAAYPYX
								Wellington	NZZZYPYA
		FTAS32	VTBU	RAYONG/U-Tapao Intl	0400	0600	BANGKOK	Abu Dhabi	OMZZYPYX
			VTCC	CHIANG MAI/Chiang Mai Intl	1000	1200		Bahrain	OBZZYPYX
			VTSS	SONGKHLA/Hat Yai Intl	1600	1800		Beijing	ZBBBYPYX
			VTSP	PHUKET/Phuket Intl	2200	0000		Beirut	OLLLYPYX
			VVNB	HANOI/Noibai				Brisbane	YBZZSQEX
			VVDN	DANANG/Danang				Hong Kong	VHZZYPYX
								Jeddah	OEJDYPYX
								Karachi	OPZZYPYX
								Kuala Lumpur	WMZZYPYR
								Mumbai	VABBYPYX
								Incheon	RKSIYPYX
								Singapore	WSZZYPYX
								Tehran	OIIIYPYX
								Tokyo	RJAAYPYX
								Wellington	NZZZYPYA
Beijing	ZBBB	FTCI31	ZBAA	BEIJING/Capital	0500	0600	TOKYO	Bangkok	VTBBYPYX
			ZBTJ	TIANJING/Binhai	1100	1200		Brisbane	YBZZSQJT
			ZBYN	TAIYUAN/Wusu	1700	1800		Hong Kong	VHZZYPYX
			ZGGG	GUANGZHOU/Baiyun	2300	0000		Karachi	OPZZYPYX
			ZSSS	SHANGHAI/Hongqiao				Mumbai	VABBYPYX
			ZSHC	HANGZHOU/Xiaoshan				Incheon	RKSIYPYX
			ZYTX	SHENYANG/Taoxian				Singapore	WSZZYPYX

TCC		TAF Bulletin					Dissemination		
Name	CCCC	Bul No.	CCCC	Aerodrome	Filing time	Start of v.	RODB	Aerodrome	AFTN
1	2	3	4	5	6	7	8	9	10
			ZYTL	DALIAN/Zhoushuzi				Tokyo	RJAAYPYX
			ZWWW	URUMQI/Diwopu				Ulan Bator	XMUBYMYX
			ZSPD	SHANGHAI/Pudong				Wellington	NZZZYPYA
		FTCI32	ZPPP	KUNMING/Wujiaba	0500	0600	TOKYO	Bangkok	VTBBYPYX
			ZGNN	NANNING/Wuxu	1100	1200		Brisbane	YBZZSQJT
			ZGOW	SHANTOU/Shantou	1700	1800		Hong Kong	VHZZYPYX
			ZGSZ	SHENZHEN/Baoan	2300	0000		Jakarta	WIZZYPYX
			ZSAM	XIAMEN/Gaoqi				Karachi	OPZZYPYX
			ZSQD	QINGDAO/Liuting				Kuala Lumpur	WMZZYPYR
			ZUUU	CHENGDU/Shuangliu				Mumbai	VABBYPYX
			ZLXY	XIAN/Xianyang				Singapore	WSZZYPYX
			ZMUB	ULAANBAATOR/Bryant-Ukhaa				Tokyo	RJAAYPYX
			ZGKL	GUILIN/Liangjang				Wellington	NZZZYPYA
		FTCI41	ZBHH	HOHHOT/Baita	0500	0600	TOKYO	Bangkok	VTBBYPYX
			ZGHA	CHANGSHA/Huanghua	1100	1200		Brisbane	YBZZSQJX
			ZJHK	HAIKOU/Meilan	1700	1800		Hong Kong	VHZZYPYX
			ZHHH	WUHAN/Tianhe	2300	0000		Jakarta	WIZZYPYX
			ZSOF	HEFEI/Luogang				Karachi	OPZZYPYX
			ZSNJ	NANJING/Lukou				Mumbai	VABBYPYX
			ZUCK	CHONGQING/Jiangbei				Incheon	RKSIYPYX
			ZLLL	LANZHOU/Zhongchuan				Singapore	WSZZYPYX
			ZYHB	HARBIN/Yanjiangang				Tokyo	RJAAYPYX
			ZYCC	CHANGCHUN/Dafangshen				Ulan Bator	ZMUBYMYX
			ZWSH	KASHI				Wellington	NZZZYPYX
Brisbane	YBBN	FTAU31	YSSY	SYDNEY/Kingsford Smith Intl	0500	0600	BRISBANE	Bangkok	VTBBYPYX
			YPAD	ADELAIDE/Adelaide	1100	1200		Beijing	ZBBBYPYX
			YBBN	BRISBANE/Brisbane	1700	1800		Hong Kong	VHZZYPYX
			YMML	MELBOURNE/Melbourne Intl	2300	0000		Jakarta	WIZZYPYX
			YBCS	CAIRNS/Cairns				Manila	RPLLYPYX
			YPPH	PERTH/Perth				Mumbai	VABBYPYX
			YPDN	DARWIN/Darwin				Nadi	NFZZRFXX
			YBAS	ALICE SPRINGS/Alice Springs				Port Moresby	AYPYYMYX
			YPTN	TINDAL/Tindal				Singapore	WSZZYPYX
			YPXM	CHRISTMAS ISLAND/Christmas Island				Tokyo	RJAAYPYX
								Wellington	NZZZYPYX

TCC		TAF Bulletin					Dissemination		
Name	CCCC	Bul No.	CCCC	Aerodrome	Filing time	Start of v.	RODB	Aerodrome	AFTN
1	2	3	4	5	6	7	8	9	10
		FTAU32	YSCB	CANBERRA/Canberra	0500	0600	BRISBANE	Bangkok	VTBBYPYX
			YBCG	COOLANGATTA/Coolangatta	1100	1200		Hong Kong	VHZZYPYX
			YMAV	AVALON/Avalon	1700	1800		Jakarta	WIZZYPYX
			YBTL	TOWNSVILLE/Townsville	2300	0000		Manila	RPLLYPYX
			YBRK	ROCKHAMPTON/Rockhampton				Mumbai	VABBYPYX
			YPLM	LEARMOUNTH/Learmounth				Nadi	NFZZRFXX
			YPKG	KALGOORLIE/Kalgoorlie				Singapore	WSZZYPYQ
			YPPD	PORT HEDLAND/Port Hedland				Tokyo	RJAAYPYX
			YPEA	PEARCE/Perace RAAF				Wellington	NZZZYPYX
			YPCC	COCOS ISLAND/Cocos Island					
		FTAU33	YBRM	BROOME/Broome	0100	0200	BRISBANE	Bangkok	VTBBYPYX
			YSNF	NORFOLK ISLAND/Norfolk Island	0700	0800		Hong Kong	VHZZYPYX
			YSDU	DUBBO/Dubbo	1300	1400		Jakarta	WIZZYPYX
			YSRI	RICHMOND/Richmond RAAF	1900	2000		Manila	RPLLYPYX
			YWLM	WILLIAMTOWN/Williamtown RAAF				Mumbai	VABBYPYX
			YMLT	LAUNCESTON/Launceston				Nadi	NFZZRFXX
			YMHB	HOBART/Hobart				Singapore	WSZZYPYQ
								Tokyo	RJAAYPYX
								Wellington	NZZZYPYX
Hong Kong	VHHH	FTHK31	VHHH	HONG KONG/Hong Kong Intl	0400	0600	TOKYO	Abu Dhabi	OMZZYPYX
			RCTP	TAIBEI/Taibei Intl	1000	1200		Bahrain	OBZZYPYX
			RCKH	GAOXIONG/Gaoxiong	1600	1800		Bangkok	VTBBYPYX
			RCSS	TABEI/Sungshan	2200	0000		Beijing	ZBBYPYX
			VMMC	MACAU/Macau Intl				Beirut	OLLLYPYX
			RPLL	MANILA/Ninoy Aquino Intl				Brisbane	YBZZSQKX
			RPVM	LAPU LAPU/Mactan Cebu Intl				Karachi	OPZZYPYX
			RPMD	DAVAO/Francisco Bangoy Intl				Mumbai	VABBYPYX
			RPLB	SUBIC BAY/Subic Bay Intl				Incheon	RKSIYPYX
			RPMZ	ZAMBOANGA/Zamboanga Intl				Singapore	WSZZYPYQ
			RPLI	LAOAG/Laoag Intl				Tehran	OIIIYPYX
								Tokyo	RJAAYPYX
								Wellington	NZZZYPYA
Karachi	OPKC	FTPK31	OPKC	KARACHI/Quaid-E-Azam Intl	0400	0600	BANGKOK	Abu Dhabi	OMZZYPYX
			OPRN	ISLAMABAD/Chaklala	1000	1200		Bahrain	OBZZYPYX
			OPLA	LAHORE/Lahore	1600	1800		Bangkok	VTBBYPYX
			OPNH	NAWABSHAH/Nawabshah	2200	0000		Beijing	ZBBYPYX
			OPPS	PESHAVAR				Beirut	OLLLYPYX
			~~OAKB~~	~~KABUL/Kabul~~				Brisbane	YBZZSQKX
			~~OAKN~~	~~KANDAHAR/Kandahar~~				Hong Kong	VHZZYPYX

TCC		TAF Bulletin					Dissemination		
Name	CCCC	Bul No.	CCCC	Aerodrome	Filing time	Start of v.	RODB	Aerodrome	AFTN
1	2	3	4	5	6	7	8	9	10
			OPGD	GAWADAR				Jeddah	OEJDYPYX
								Karachi	OPZZYPYX
								Singapore	WSZZYPYQ
								Tehran	OIIIYPYX
								Tokyo	RJAAYPYX
Mumbai	VABB	FTIN31	VABB	MUMBAI/Jawaharlal Nehru Intl	0400	0600		Abu Dhabi	OMZZYPYX
			VAAH	AHMADABAD/Ahmadabad	1000	1200		Bahrain	OBZZYPYX
			VECC	CALCUTTA/Calcutta	1600	1800		Bangkok	VTBBYPYX
			VCBI	COLOMBO/Katunayake	2200	0000		Beijing	ZBBYPYX
			VIDP	DELHI/Indira Gandhi Intl				Beirut	OLLLYPYX
			VILK	LUCKNOW*				Brisbane	YBZZSQKX
			VOMM	CHENNAI/Chennai				Hong Kong	VHZZYPYX
			VOTV	TRIVANDRUM/Trivandrum				Jeddah	OEJDYPYX
			VANP	NAGPUR/Nagpur				Karachi	OPZZYPYX
			VNKT	KATHMANDU/Tribhuvan Intl				Singapore	WSZZYPYQ
								Tehran	OIIIYPYX
								Tokyo	RJAAYPYX
Nadi	NFFN	FTPS31	NFFN	NADI/Intl	0400	0600	NADI	Brisbane	YBZZSUGX
			NWWW	NOUMEA/La Tontouta	1000	1200		Hong Kong	VHZZYPYX
			NSTU	PAGO PAGO/Intl, Tutuila I.	1600	1800		Singapore	WSZZYPYX
					2200	0000		Wellington	NZZZYPYA
Incheon	RKSI	FTKO31	RKSI	SEOUL/Incheon Intl	0500	0600	TOKYO	Bangkok	VTBBYPYX
			RKSS	SEOUL/Gimpo Intl	1100	1200		Hong Kong	VHZZYPYX
			RKPC	JEJU/Jeju Intl	1700	1800		Karachi	OPZZYPYX
			RKPK	BUSAN/Gimhae Intl	2300	0000		Singapore	WSZZYPYQ
			RKTU	CHEONGJU/Cheongju Intl				Tokyo	RJAAYPYX
			RKNY	YANGYANG/Yangyang Intl				Wellington	NZZZYPYX
			RKTN	DAEGU/Daegu Intl					
Singapore	WSSS	FTSR31	WSSS	SINGAPORE/Changi	0430	0600	SINGAPORE	Abu Dhabi	OMZZYPYX
			WSAP	SINGAPORE/Paya Lebar	1030	1200		Bahrain	OBZZYPYX
			WMKK	KUALA LUMPUR/Kuala Lumpur Intl	1630	1800		Bangkok	VTBBYPYX
			WRRR	DENPASAR/Ngurah Rai (Bali Intl)	2230	0000		Beijing	ZBBBYPYX
			WMKJ	JOHOR BAHRU/Sultan Ismail				Beirut	OLLLYPYX
			WMKP	PENANG/Bayan Lepas				Brisbane	YBZZSVLX
			WRSJ	SURABAYA/Juanda				Colombo	VCCCYPYX
			WIIH	JAKARTA/Halim				Hong Kong	VHZZYPYX

TCC		TAF Bulletin					Dissemination		
Name	CCCC	Bul No.	CCCC	Aerodrome	Filing time	Start of v.	RODB	Aerodrome	AFTN
1	2	3	4	5	6	7	8	9	10
			WIII	JAKARTA/Soekarno-Hatta				Karachi	OPZZYPYX
			WMSA	SUBANG/Sultan Abdul Aziz Shah				Manila	RPLLYPYX
								Mumbai	VABBYPYX
								Nadi	NFZZRFXX
								Incheon	RKSIYPYX
								Tehran	OIIIYPYX
								Tokyo	RJAAYPYX
								Wellington	NZZZYPYA
		FTSR32	WBSB	BANDAR SERI BEGAWAN /Brunei Intl	0430	0600	SINGAPORE	Bangkok	VTBBYPYX
			WBKK	KOTA KINABALU/Kota Kinabalu Intl	1030	1200		Beirut	OLLLYPYX
			WBGG	KUCHING/Kuching	1630	1800		Brisbane	YBZZSVMX
			WIMM	MEDAN/Polonia	2230	0000		Hong Kong	VHZZYPYX
								Manila*	RPLLYMYX
								Mumbai	VABBYPYX
								Wellington	NZZZYPYX
Tokyo	RJTD	FTJP31	RJAA	TOKYO/New Tokyo Intl	0300	1200	TOKYO	Bangkok	VTBBYPYX
			RJTT	TOKYO/Tokyo Intl	0900	1800		Beijing	ZBBBYPYX
			ROAH	NAHA/Naha	1500	0000		Beirut	OLLLYPYX
			RJOO	OSAKA/Osaka Intl	2100	0600		Brisbane	YBZZSWRX
			RJCH	HAKODATE/Hakodate				Hong Kong	VHZZYPXX
			RJBB	OSAKA/Kansai Intl				Mumbai	VABBYPYX
			RJSS	SENDAI/Sendai				~~Nadi~~	~~NFFNYPYX~~
								Seoul	~~RKSSYPYX~~
									RKSIYPYX
								Singapore	WSZZYPYX
								Wellington	~~NZZZYPYX~~
									NZZZYPYA
								Colombo	VCBIYMYX
								Roma	LIIBYMYX
								London	EGZZFRXX
								Singapore	WSSSYMYX
								Nadi	NFZZRAXX
								Washington	KWBCYMYX
								Saipan	PGSNYMYX
								Guam	PGUMCOAX
								Brasilia	SBBRYZYX

TCC		TAF Bulletin					Dissemination		
Name	CCCC	Bul No.	CCCC	Aerodrome	Filing time	Start of v.	RODB	Aerodrome	AFTN
1	2	3	4	5	6	7	8	9	10
		FTJP32	RJFF	FUKUOKA/Fukuoka	0300	1200	TOKYO	Bangkok	VTBBYPYX
			RJNN	NAGOYA/Nagoya	0900	1800		Beijing	ZBBBYPYX
			RJCC	SAPPORO/New Chitose	1500	0000		Beirut	OLLLYPYX
			RJFK	KAGOSHIMA/Kagoshima	2100	0600		Brisbane	YBZZSWRX
			RJSN	NIIGATA/Niigata				Hong Kong	VHZZYPXX
			RJFU	NAGASAKI/Nagasaki				Mumbai	VABBYPYX
			RJFT	KUMAMOTO/Kumamoto				~~Nadi~~	~~NFFNYPYX~~
			RJOA					Seoul	~~RKSSYPYX~~
				HIROSHIMA/Hiroshima					RKSIYPYX
			RJOB	OKAYAMA/Okayama				Singapore	WSZZYPYX
									~~NZZZYPYX~~
			RJOT	TAKAMATSU/Takamatsu				Wellington	NZZZYPYA
			RJFO	OITA/Oita				Colombo	VCBIYMYX
			RJNT	TOYAMA/Toyama				London	EGZZFRXX
			RJNK	KANAZAWA/Komatsu				Nadi	NFZZRAXX
								Washington	KWBCYMYX
								Saipan	PGSNYMYX
								Guam	PGUMCOAX
								Brasilia	SBBRYZYX
Wellington	NZKL	FTNZ31	NZWN	WELLINGTON/Wellington Intl		1200	BRISBANE	Bangkok	VTBBYPYX
			NZAA	AUCKLAND/Auckland Intl		1800		Beijing	ZBBBYPYX
			NZCH	CHRISTCHURCH/Christchurch Intl		0000		Brisbane	YBZZSQCX
						0600		Nadi	NFZZRFYX
								Port Moresby	AYPPYMYX
								Singapore	WSZZYPYQ
								Tokyo	RJAAYPYX
								Hong Kong	VHZZYPYX
		~~FTNZ32~~	~~NCRG~~	~~AVARUA/Rarotonga Intl~~			~~BRISBANE~~	~~Brisbane~~	~~YBZSQCX~~
			~~NTAA~~	~~TAHITI/Faaa~~				~~Nadi~~	~~NFZZRFYX~~
			~~NTTO~~	~~HAO/Hao~~					

* - not in the FASID MET 1A Table

Table 3. ROBEX Exchange of METAR and TAF compared with ASIA/PAC ANP Table AOP1 (FASID Table MET 1A)

Name of the aerodrome	Use	ICAO loc.ind.	ROBEX SA bulletin	ROBEX FT bulletin	RODB
1	2	3	4	5	6
AMERICAN SAMOA(United States)					
PAGO PAGO/Pago Pago Intl	RS	NSTU		FTPS31 NFFN	Nadi
AUSTRALIA					
ADELAIDE/Adelaide	RS	YPAD	SAAU31 YBBN	FTAU31 YBBN	Brisbane
ALICE SPRINGS/Alice Springs	AS	YBAS	SAAU31 YBBN	FTAU31 YBBN	
BRISBANE/Brisbane	RS	YBBN	SAAU31 YBBN	FTAU31 YBBN	
BROOME/Broome	AS	YBRM	SAAU32 YBBN	FTAU33 YBBN	
CAIRNS/Cairns	RS	YBCS	SAAU31 YBBN	FTAU31 YBBN	
CHRISTMAS I./Christmas I.	RS	YPXM	SAAU31 YBBN	FTAU31 YBBN	
COCOS I./Cocos I.	RS	YPCC	SAAU32 YBBN	FTAU32 YBBN	
DARWIN/Darwin	RS	YPDN	SAAU31 YBBN	FTAU32 YBBN	
DUBBO/Dubbo	AS	YSDU	SAAU32 YBBN	FTAU33 YBBN	
HOBART/Hobart	RS	YMHB	SAAU32 YBBN	FTAU33 YBBN	
LEARMONTH/Learmonth	AS	YPLM	SAAU31 YBBN	FTAU32 YBBN	
MELBOURNE/Melbourne Intl	RS	YMML	SAAU31 YBBN	FTAU31 YBBN	
NORFOLK I./Norfolk I.	RS	YSNF	SAAU32 YBBN	FTAU33 YBBN	
PERTH/Perth Intl	RS	YPPH	SAAU31 YBBN	FTAU32 YBBN	
PORT HEDLAND/Port Hedland	RS	YPPD	SAAU32 YBBN	FTAU32 YBBN	
ROCKHAMPTON/Rockhampton	AS	YBRK	SAAU32 YBBN	FTAU32 YBBN	
SYDNEY/Kingsford Smith Intl	RS	YSSY	SAAU31 YBBN	FTAU31 YBBN	
TINDAL/Tindal	AS	YPTN	SAAU31 YBBN	FTAU32 YBBN	
TOWNSVILLE/Townsville	RS	YBTL	SAAU31 YBBN	FTAU32 YBBN	
CANBERRA*		YSCB	SAAU32 YBBN	FTAU32 YBBN	
COOLANGATA*		YBCG	SAAU32 YBBN	FTAU32 YBBN	
AVALON*		YMAV	SAAU32 YBBN	FTAU32 YBBN	
KLAGOORLIE*		YPKG	SAAU32 YBBN	FTAU32 YBBN	
RICHMOND*		YSRI	SAAU32 YBBN	FTAU33 YBBN	
WILLIAMTOWN*		YWLM	SAAU32 YBBN	FTAU33 YBBN	
LAUNCESTON*		YMLT	SAAU32 YBBN	FTAU33 YBBN	
PEARCE*		YPEA	SAAU32 YBBN	FTAU32 YBBN	
BANGLADESH					
CHITTAGONG/Chittagong	RS	VGEG	SAAE31 VECC		Bangkok
DHAKA/Zia Intl	RS	VGZR	SAAE31 VECC	FTAS31 VTBB	
BHUTAN					
PARO/Paro	RS	VQPR			
BRUNEI DARUSSALAM					
BANDAR SERI BEGAWAN/ Brunei Intl	RS	WBSB	SAMS31 WMKK	FTSR32 WSSS	Singapore
CAMBODIA					
PHNOM-PENH/Pochentong	RS	VDPP	SAAS31 VTBD	FTAS31 VTBB	Bangkok
SIEM-REAP/Angkor	AS	VDSR			

Name of the aerodrome	Use	ICAO loc.ind.	ROBEX SA bulletin	ROBEX FT bulletin	RODB
1	2	3	4	5	6
CANADA					Tokyo
ABBOTSFORD/Abbotsford	AS	CYXX			
CALGARY/Calgary Intl	RS	CYYC			
COMOX/Comox	AS	CYQQ			
EDMONTON/Edmonton Intl	RS	CYEG	**Not required for regular ROBEX exchange, but to be available on request through Tokyo RODB**		
VANCOUVER/Vancouver Intl	RS	CYVR			
VICTORIA/Victoria Intl	RNS	CYYJ			
CHILE					
ISLA DE PASCUA/Mataveri	RS	SCIP			
CHINA					
BEIJING/Capital	RS	ZBAA	SACI31 ZBBB	FTCI31 ZBBB	Tokyo
CHANGSHA/Huanghua	RS	ZGHA	SACI41 ZBBB	FTCI41 ZBBB	
CHENGDU/Shuangliu	RS	ZUUU	SACI32 ZBBB	FTCI32 ZBBB	
CHONGQING/Jiangbei	RS	ZUCK	SACI41 ZBBB	FTCI41 ZBBB	
DALIAN/Zhoushuizi	RS	ZYTL	SACI31 ZBBB	FTCI31 ZBBB	
FUZHOU/Changle	RS	ZSFZ			
GAOXIONG/Gaoxiong	RS	RCKH	SAHK31 VHHH	FTHK31 VHHH	
GUANGZHOU/Baiyun	RS	ZGGG	SACI31 ZBBB	FTCI31 ZBBB	
HAIKOU*/Meilan		ZJHK	SACI41 ZBBB	FTCI41 ZBBB	
GUILIN/Liangjiang	RS	ZGKL	SACI32 ZBBB	FTCI32 ZBBB	
HANGZHOU/Jianqiao	RS	ZSHC	SACI31 ZBBB	FTCI31 ZBBB	
HARBIN/Yanjiagang	RS	ZYHB	SACI41 ZBBB	FTCI41 ZBBB	
HEFEI/Luogang	AS	ZSOF	SACI41 ZBBB	FTCI41 ZBBB	
HOHHOT/Baita	RS	ZBHH	SACI41 ZBBB	FTCI41 ZBBB	
JINAN/Yaoqiang	RS	ZSJN			
KASHI/Kashi	AS	ZWSH	SACI41 ZBBB	FTCI41 ZBBB	
KUNMING/Wujiaba	RS	ZPPP	SACI32 ZBBB	FTCI32 ZBBB	
LANZHOU/Zhongchuan	AS	ZLLL	SACI41 ZBBB	FTCI41 ZBBB	
NANJING/Lukou	RS	ZSNJ	SACI41 ZBBB	FTCI41 ZBBB	
NANNING/Wuxu	AS	ZGNN	SACI32 ZBBB	FTCI32 ZBBB	
QINGDAO/Liuting	RS	ZSQD	SACI32 ZBBB	FTCI32 ZBBB	
SANYA/Fenghuang	RS	ZJSY	SACI41 ZBBB		
SHANGHAI/Hongqiao	RS	ZSSS	SACI31 ZBBB	FTCI31 ZBBB	
SHANGHAI/Pudong	RS	ZSPD	SACI31 ZBBB	FTCI31 ZBBB	
SHANTOU*		ZGOW	SACI32 ZBBB	FTCI32 ZBBB	
SHENYANG/Taoxian	RS	ZYTX	SACI31 ZBBB	FTCI31 ZBBB	
SHENZHEN/Huangtian	RS	ZGSZ	SACI32 ZBBB	FTCI32 ZBBB	
TAIBEI/Sungshan	AS	RCSS	SAHK31 VHHH	FTHK31 VHHH	
TAIBEI/Taibei Intl	RS	RCTP	SAHK31 VHHH	FTHK31 VHHH	
TAIYUAN/Wusu	AS	ZBYN	SACI31 ZBBB	FTCI31 ZBBB	
TIANJIN/Binhai	RS	ZBTJ	SACI31 ZBBB	FTCI31 ZBBB	
URUMQI/Diwopu	RS	ZWWW	SACI31 ZBBB	FTCI31 ZBBB	
WUHAN/Tianhe	RS	ZHHH	SACI41 ZBBB	FTCI41 ZBBB	
XIAMEN/Gaoqi	RS	ZSAM	SACI32 ZBBB	FTCI32 ZBBB	
XI'AN/Xianyang	RS	ZLXY	SACI32 ZBBB	FTCI32 ZBBB	
XICHANG/Qingshan	RNS	ZUXC			
Hong Kong, CHINA					
HONG KONG/Hong Kong Intl	RS	VHHH	SAHK31 VHHH	FTHK31 VHHH	Tokyo
Macau, CHINA					
MACAU/Macau Intl	RS	VMMC	SAHK31 VHHH	FTHK31 VHHH	Tokyo

Name of the aerodrome	Use	ICAO loc.ind.	ROBEX SA bulletin	ROBEX FT bulletin	RODB
1	2	3	4	5	6
COOK ISLANDS					
AVARUA/Rarotonga Intl	RS	NCRG			Brisbane
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA					
PYONGYANG/Sunan	RS	ZKPY			
FIJI					
NADI/Nadi Intl	RS	NFFN		FTPS31 NFFN	Nadi
SUVA/Nausori	RS	NFSU			
FRENCH POLYNESIA					
RANGIROA/Rangiroa	AS	NTTG			
TAHITI/Faaa	RS	NTAA			Brisbane
GUAM(United States)					
GUAM I./Agana NAS	RS	PGUM			
GUAM I./Anderson AFB	AS	PGUA			
INDIA					
AHMADABAD/Ahmadabad	AS	VAAH	SAIN31 VABB	FTIN31 VABB	Bangkok
AMRITSAR/Amritsar	RS	VIAR	SAIN32 VIDP		
CALCUTTA/Calcutta	RS	VECC	SAAE31 VECC	FTIN31 VABB	
CALICUT/Calicut	RS	VOCL		(FTIN31 VABB)	
CHENNAI/Chennai	RS	VOMM	SAIN31 VABB	FTIN31 VABB	
DELHI/Indira Gandhi Intl	RS	VIDP	SAIN32 VIDP	FTIN31 VABB	
HYDERABAD*		VOHY	SAIN31 VABB	(FTIN31 VABB)	
LUCKNOW*		VILK		FTIN31 VABB	
MUMBAI/Jawaharlal Nehru Intl	RS	VABB	SAIN31 VABB	FTIN31 VABB	
NAGPUR/Nagpur	AS	VANP	SAIN31 VABB	FTIN31 VABB	
PATNA/Patna	RS	VEPT	SAIN31 VABB		
TIRUCHCHIRAPPALLI/Tiruchchirappalli	RS	VOTR	SAIN31 VABB		
TRIVANDRUM/Trivandrum	RS	VOTV	SAIN31 VABB	FTIN31 VABB	
VARANASI/Varanasi	RS	VIBN	SAIN32 VIDP		
INDONESIA					
AMBON/Pattimura	RNS	WAPP			Singapore
BALIKPAPAN/Sepinggan	RS	WRLL			
BANJARMASIN/Syamsuddin Noor	AS	WRBB			
BATAM/Hang Nadim	AS	WIKB			
BIAK/Frans Kaisieppo	RS	WABB	SAID31 WIII		
DENPASAR/Ngurah Rai (Bali Intl)	RS	WRRR	SAID31 WIII	FTSR31 WSSS	
JAKARTA/Halim Perdanakusuma	RS	WIIH	SAID31 WIII	FTSR31 WSSS	
JAKARTA/Soekarno Hatta Intl	RS	WIII	SAID31 WIII	FTSR31 WSSS	
JAYAPURA/Sentani	RS	WAJJ			
KUPANG/Eltari	RS	WRKK			
MANADO/Sam Ratulangi	RS	WAMM			
MEDAN/Polonia	RS	WIMM	SAID31 WIII	FTSR32 WSSS	
MERAUKE/Mopah	RNS	WAKK			
PADANG/Tabing	RS	WIMG			
PALEMBANG/Sultan Mahmud Badaruddin II	RNS	WIPP			
PEKANBARU/Simpang Tiga	RS	WIBB			
PONTIANAK/Supadio	RS	WIOO			
SURABAYA/Juanda	RS	WRSJ	SAID31 WIII	FTSR31 WSSS	
TANJUNG PINANG/Kijang	RS	WIKN			
TARAKAN/Tarakan	RS	WRLR			
TIMIKA/Tembagapura	RNS	WABP			
UJUNG PANDANG/Hasanuddin	RNS	WAAA	SAID31 WIII		

Name of the aerodrome	Use	ICAO loc.ind.	ROBEX SA bulletin	ROBEX FT bulletin	RODB
1	2	3	4	5	6
JAPAN					
FUKUOKA/Fukuoka	RS	RJFF	SAFE32 RJTD	FTJP32 RJTD	Tokyo
HAKODATE/Hakodate	AS	RJCH	SAFE32 RJTD	FTJP31 RJTD	
HIROSHIMA/Hiroshima	RS	RJOA		FTJP32 RJTD	
KAGOSHIMA/Kagoshima	RS	RJFK	SAFE32 RJTD	FTJP32 RJTD	
KANAZAWA/Komatsu*		RJNK		FTJP32 RJTD	
KUMAMOTO/Kumamoto	RS	RJFT		FTJP32 RJTD	
NAGASAKI/Nagasaki	RS	RJFU	SAFE32 RJTD	FTJP32 RJTD	
NAGOYA/Nagoya	RS	RJNN	SAFE31 RJTD	FTJP32 RJTD	
NAHA/Naha	RS	ROAH	SAFE31 RJTD	FTJP31 RJTD	
NIIGATA/Niigata	RS	RJSN		FTJP32 RJTD	
OITA/Oita	RS	RJFO		FTJP32 RJTD	
OKAYAMA/Okayama	RS	RJOB		FTJP32 RJTD	
OSAKA/Kansai Intl	RS	RJBB	SAFE31 RJTD	FTJP31 RJTD	
OSAKA/Osaka Intl	RS	RJOO	SAFE31 RJTD	FTJP31 RJTD	
SAPPORO/New Chitose	RS	RJCC	SAFE32 RJTD	FTJP32 RJTD	
SENDAI/Sendai	RNS	RJSS		FTJP31 RJTD	
TAKAMATSU/Takamatsu	RS	RJOT		FTJP32 RJTD	
TOKYO/New Tokyo Intl	RS	RJAA	SAFE31 RJTD	FTJP31 RJTD	
TOKYO/Tokyo Intl	AS	RJTT	SAFE31 RJTD	FTJP31 RJTD	
TOYAMA/Toyama*		RJNT		FTJP32 RJTD	
JOHNSTON I.(United States)					
JOHNSTON I./Johnston Atoll	RS	PJON			
KIRIBATI					
KIRITIMATI/Christmas I.	RS	PLCH			
TARAWA/Bonriki Intl	RS	NGTA			
LAO PEOPLE'S DEMOCRATIC REPUBLIC					
VIENTIANE/Wattay	RS	VLVT	SAAS31 VTBD	FTAS31 VTBB	Bangkok
MALAYSIA					
JOHOR BAHRU/Sultan Ismail	RS	WMKJ		FTSR31 WSSS	Singapore
KOTA KINABALU/Kota Kinabalu Intl	RS	WBKK	SAMS31 WMKK	FTSR32 WSSS	
KUALA LUMPUR/Kuala Lumpur Intl	RS	WMKK	SAMS31 WMKK	FTSR31 WSSS	
KUANTAN/Kuantan	RS	WMKD			
KUCHING/Kuching	RS	WBGG	SAMS31 WMKK	FTSR32 WSSS	
MALACCA/Malacca	RS	WMKM			
PENANG/Bayan Lepas	RS	WMKP	SAMS31 WMKK	FTSR31 WSSS	
PULAU LANGKAWI/Pulau Langkawi	RS	WMKL			
TAWAU/Tawau	RS	WBKW			
MALDIVES					
GAN/Gan	AS	VRMG			Bangkok
MALE/Hulule	RS	VRMM	SASB31 VCCC		
MARSHALL ISLANDS					
MAJURO ATOLL/Marshall I. Intl	RS	PKMJ			
MICRONESIA, FEDERATED STATES OF					
MOEN/Truk Intl	RS	PTKK			
PONAPE I./Ponape	RS	PTPN			
YAP I./Yap Intl	RS	PTYA			
MONGOLIA					
ULAN BATOR/Ulan Bator	RS	ZMUB	SACI41 ZBBB	FTCI32 ZBBB	Tokyo

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1	2	3	4	5	6
MYANMAR					
YANGON/Yangon Intl	RS	VYYY	SAAS31 VTBD	FTAS31 VTBB	Bangkok
NAURU					
NAURU I./Nauru	RS	ANAU			
NEPAL					
KATHMANDU/Tribhuvan Intl	RS	VNKT	SAAE32 VECC	FTIN31 VABB	Bangkok
NEW CALEDONIA (France)					
NOUMEA/La Tontouta	RS	NWWW	SANC01 NWWW	FTPS31 NFFN	Nadi
NEW ZEALAND					
AUCKLAND/Auckland Intl	RS	NZAA	SANZ31 NZWN	FTNZ31 NZKL	Brisbane
CHRISTCHURCH/Christchurch Intl	RS	NZCH	SANZ31 NZWN	FTNZ31 NZKL	
WELLINGTON/Wellington Intl	RS	NZWN	SANZ31 NZWN	FTNZ31 NZKL	
NIUE(New Zealand)					
ALOFI/Niue Intl	RS	NIUE			
NORTHERN MARIANA ISLANDS (United States)					
ROTA/Rota Intl	RS	PGRO			
SAIPAN I. (OBYAN)/Saipan I. (Obyan) Intl	RS	PGSN			
PAKISTAN					
GWADAR/Gwadar	RS	OPGD			Bangkok
ISLAMABAD/Chaklala	RS	OPRN	SAPK31 OPKC	FTPK31 OPKC	
KARACHI/Quaid-E-Azam Intl	RS	OPKC	SAPK31 OPKC	FTPK31 OPKC	
LAHORE/Lahore	RS	OPLA	SAPK31 OPKC	FTPK31 OPKC	
NAWABSHAH/Nawabshah	AS	OPNH	SAPK31 OPKC	FTPK31 OPKC	
PESHAWAR/Peshawar	RS	OPPS		FTPK31 OPKC	
PALAU					
KOROR/Koror	RS	PTRO			
PAPUA NEW GUINEA					
~~KIETA/Kieta~~	~~RS~~	~~AYKT~~			Brisbane
PORT MORESBY/Jacksons	RS	AYPY	SAPW31 AYPY	FTAU32 YBBN	
VANIMO/Vanimo	RS	AYVN	SAPW31 AYPY		
PHILIPPINES					
DAVAO/Francisco Bangoy Intl	RNS	RPMD	SAHK31 VHHH	FTHK31 VHHH	Tokyo
LAOAG/Laoag Intl	AS	RPLI		FTHK31 VHHH	
LAPU-LAPU/Mactan Intl	RS	RPVM	SAHK31 VHHH	FTHK31 VHHH	
MANILA/Nimoy Aquino Intl	RS	RPLL	SAHK31 VHHH	FTHK31 VHHH	
OLONGAPO/Cubi Intl	RNS	RPMB			
SUBIC BAY*		RPLB	SAHK31 VHHH	FTHK31 VHHH	
ZAMBOANGA/Zamboanga Intl	AS	RPMZ		FTHK31 VHHH	
REPUBLIC OF KOREA					
BUSAN/Gimhae Intl	RS	RKPK	SAKO31 RKSI	FTKO31 RKSI	Tokyo
CHEONGJU/Cheongju Intl	RS	RKTU	SAKO31 RKSI	FTKO31 RKSI	
DAEGU/Daegu Intl	RS	RKTN	SAKO31 RKSI	FTKO31 RKSI	
SEOUL/Incheon Intl	RS	RKSI	SAKO31 RKSI	FTKO31 RKSI	
JEJU/Jeju Intl	RS	RKPC	SAKO31 RKSI	FTKO31 RKSI	
SEOUL/Gimpo Intl	AS	RKSS	SAKO31 RKSI	FTKO31 RKSI	
YANGYANG/Yangyang Intl	RS	RKNY	SAKO31 RKSI	FTKO31 RKSI	

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1	2	3	4	5	6
SAMOA					
APIA/Faleolo Intl	RS	NSAP			
SINGAPORE					
SINGAPORE/Changi	AS	WSSS	SAMS31 WMKK	FTSR31 WSSS	Singapore
SINGAPORE/Paya Lebar	AS	WSAP		FTSR31 WSSS	
SINGAPORE/Seletar	RS	WSSL			
SOLOMON ISLANDS					
HONIARA/Henderson	RS	AGGH			
SRI LANKA					
COLOMBO/Katunayake	RS	VCBI	SASB31	FTIN31 VABB	Bangkok
MINNERIYA/Hingurakgoda (1997)	AS	VCCH			
THAILAND					
BANGKOK/Bangkok Intl	RS	VTBD	SAAS31 VTBB	FTAS31 VTBB	Bangkok
CHIANG MAI/Chiang Mai Intl	RS	VTCC	SAAS31 VTBB	FTAS32 VTBB	
CHIANG RAI/Chiang Rai Intl	RS	VTCR			
KHON KAEN/Khon Kaen		VTUK			
PHITSANULOK	RS	VTPP			
PHUKET/Phuket Intl	RS	VTSP	SAAS31 VTBB	FTAS32 VTBB	
RAYONG/Utapao Intl	RS	VTBU	SAAS31 VTBB	FTAS32 VTBB	
SONGKHLA/Hat Yai Intl	RS	VTSS	SAAS31 VTBB	FTAS32 VTBB	
SURAT THANI/Surat Thani	RS	VTSB			
UBON RATCHATHANI	RS	VTUU			
TONGA					
TONGATAPU/Fua'amotu Intl	RS	NFTF			
VAVA'U/Vava'u	RS	NFTV			
TUVALU					
FUNAFUTI/Funafuti Intl	RS	NGFU			
UNITED STATES					Tokyo
ANCHORAGE/Anchorage Intl	RS	PANC			
ANCHORAGE/Elmendorf AFB	AS	PAED			
COLD BAY/Cold Bay	AS	PACD			
EVERETT/Snohomish County	AS	KPAE			
FAIRBANKS/Eielson AFB	AS	PAEI			
FAIRBANKS/Fairbanks Intl	RS	PAFA			
FRESNO/Fresno Air Terminal	AS	KFAT			
HILO/General Lyman Field	AS	PHTO			
HONOLULU/Barbers Points NAS	AS	PHNA			
HONOLULU/Honolulu Intl	RS	PHNL			
KAHULUI/Kahului	AS	PHOG			
KING SALMON/King Salmon	AS	PAKN			
LOS ANGELES/Los Angeles Intl	RS	KLAX	**Not required for regular ROBEX exchange, but to be available on request through Tokyo RODB**		
OAKLAND/Metropolitan Oakland	AS	KOAK			
ONTARIO/Ontario Intl	AS	KONT			
PALMDALE/Palmdale P.F.T.I.	AS	KPMD			
PORTLAND/Portland Intl	AS	KPDX			
SACRAMENTO/Metropolitan	AS	KSMF			
SAN DIEGO/Lindbergh Field	AS	KSAN			
SAN FRANCISCO/San Francisco	RS	KSFO			
SAN JOSE/San Jose Intl	RS	KSJC			
SEATTLE BOEING FIELD/King County Intl	AS	KBFI			
SEATTLE/Seattle-Tacoma Intl	RS	KSEA			

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1	2	3	4	5	6
SPOKANE/Spokane Intl	AS	KGEG			
STOCKTON/Metropolitan	AS	KSCK			
WASHINGTON/Dulles Intl	RS	KIAD			
VANUATU					
PORT-VILA/Bauerfield	RS	NVVV			
SANTO/Pekoa	RS	NVSS			
VIET NAM					
DANANG/Danang	AS	VVDN	SAAS31	FTAS32 VTBD	Bangkok
HANOI/Noibai	RS	VVNB	SAAS31	FTAS32 VTBD	
HO-CHI-MINH/Tan-Son-Nhut	RS	VVTS	SAAS31	FTAS31 VTBD	
WALLIS ISLANDS(France)					
WALLIS/Hififo	RS	NLWW			

* Aerodrome required for ROBEX exchange but not in FASID Table MET 1A