INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE EIGHTEENTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/18)

Bangkok, Thailand, 3 to 7 September 2007

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

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

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PART I — HISTORY OF THE MEETING

PART I - HISTORY OF THE MEETING

1.1 Introduction

1.1.1 The Eighteenth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/18) was held in Bangkok, Thailand from 3 to 7 September 2007 at the ICAO Asia/Pacific Regional Office.

1.2 Attendance

1.2.1 The meeting was attended by 112 participants from 14 Member States (except for Bangladesh, Pakistan and Tonga), 6 non member Asia/Pacific States (Brunei Darussalam, Maldives, Mongolia, Nepal, Philippines and Sri Lanka) and 4 International Organizations (IATA, IFALPA, IFATCA and IBAC). Two experts from SITA were also present as observer during the meeting.

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

1.3 Opening of the meeting

Welcome address by Mr. L. B. Shah, Regional Director, ICAO Asia/Pacific Office

1.3.1 Mr. L. B. Shah welcomed the participants from the APANPIRG member States, non-member States and the International Organizations and conveyed the best wishes of the President of ICAO Council, Mr. Roberto Kobeh González, and the Secretary General, Dr. Taïeb Chérif.

1.3.2 Mr. Shah noted that APANPIRG/18 is convened at a very opportune time, just before the 36th Session of ICAO Assembly which will be taking place from 18 to 28 September 2007.

1.3.3 Mr. Shah recalled the Strategic Objectives that set out ICAO's priorities for the medium term and provided a global framework for international civil aviation. He highlighted ICAO's Business Plan, result based budget, and the progress made in several programmes including the ICAO Universal Safety Oversight Audit Programme (USOAP) under the comprehensive systems approach, the ICAO Universal Security Audit Programme, Environmental Protection, Global ATM System, and Performance Based Navigation (PBN)

1.3.4 In highlighting some of the regional issues from ICAO's perspective, he pointed out that the aggregate economy of the Asia/Pacific Region grew at 7.1percent and the Asia Pacific airlines carried some 29 per cent of the global scheduled air traffic. He commended the achievements of the five cooperative programmes- COSCAP, PASO, CASP, CAPSCA and CAEMSA.

1.3.5 He reiterated that the Group should be the guiding and coordinating organ for all activities conducted within ICAO concerning the Air Navigation System for the Asia/Pacific Region.

Opening remarks by Mr. W. L. Wong, Senior Director, Changi Airport Advisory Group, Civil Aviation Authority of Singapore and Chairman of APANPIRG

1.3.6 In his opening remarks Mr. W. L. Wong, Chairman of APANPIRG emphasized that the aviation industry continued to face new challenges as the air traffic growth in the region put greater demand on civil aviation administrations, regulatory authorities, air navigation services providers, airports and airlines to enhance their efficiency while ensuring safety and security of their business and operations are not compromised. The introduction of restriction on liquids, aerosols and gels (LAG) had serious impact on the services to passengers and the rising fuel costs put pressure on airport operators and air navigation service providers. Another main challenge is the possible spread of communicable diseases such as avian flu.

1.3.7 The Chairman noted further that under the able leadership of the ICAO Asia/Pacific Regional Office and with the commitment of States, APANPIRG and its Sub-Groups and Task Forces had made notable progress in many areas over the last year. Some of the major achievements were:

– Reduction in the number of deficiencies listed. Arising from the outcome of ALLPIRG/5, the Regional Office has developed a database which will allow the States to update their progress on the resolution of deficiencies.

– Implementation of the Performance Based Navigation (PBN) in the near future to enhance safety, capacity and efficiency. The use of the ADS-B for surveillance would further enhance safety.

– China is planning for the implementation of RVSM in its airspace. This is an important milestone. The expected increase in capacity and efficiency will enable operators to reduce operating costs.

– The implementation of RVSM in the region brought about benefits to both air traffic services providers and airspace users.

– Another major initiative is the ATFM system over the Bay of Bengal which has moved from the operational (trial) phase into an implementation phase.

1.3.8 Mr. Wong acknowledged that, although much had been achieved since APANPIRG/17, there was still a lot to do. There were also areas of concern. For example, there remained an urgent need to upgrade communications facilities and services in some parts of the region. Without good communications between pilots and controllers, it would be difficult to implement the next phase of improvements. Hence, it was important for States in the Region to ensure that good communications facilities were available.

1.4 **Officers and Secretariat**

1.4.1 Mr. W. L. Wong, Senior Director, Changi Airport Advisory Group, CAA Singapore, Chairman of the APANPIRG, presided over the meeting.

1.4.2 Mr. Lalit B. Shah, ICAO Regional Director, Asia/Pacific Office, was the Secretary of the meeting, assisted by Mr. N. C. Sekhar, Regional Officer/AGA.

1.4.3 The meeting was also assisted by Mr. H. V. Sudarshan, Planning and Coordination Officer, Mr. Wolfgang Sander-Fischer, Chief Asia/Pacific Section of Technical Cooperation, Mr. David Van Ness, Technical Officer, ANB-ICAO Headquarters, Mr. Rod Graff, Deputy Regional Director, Asia and Pacific Office, Mr. Kyotaro Harano and Mr. Polawat Chootai, Regional Officers/ATM, Mr. Li Peng and Mr. S. Saraswati, Regional Officers/CNS, Capt. Fareed Shah, Regional Officer/FS, Ms. Sarangtip Sundarachampaka, Administrative officer, ICAO Asia/Pacific Regional Office and Mr. K. P. Rimal ICAO Consultant.

1.5 Agenda of the Meeting

1.5.1 The meeting adopted the following agenda:

Agenda Item 1 Follow-up on the out come of APANPIRG/17 Meeting

1.1 Review of the action taken by the ANC and the Council on the Report of APANPIRG/17

1.2 Review Status of Implementation of APANPIRG/17 Conclusions and Decisions

1.3 Review Status of Implementation of APANPIRG Outstanding Conclusions and Decisions

Agenda Item 2 Global and Inter Regional Activities

2.1 Global Air Navigation Plan

2.2 Progress Report on Implementation of DGCA/06 Recommendations

2.3 Global Aviation Safety Plan

2.4 ICAO Business Plan

Agenda Item 3 Regional Air Navigation Planning and Implementation Issues

3.1 AOP

3.2 ATM/AIS/SAR

3.3 CNS/MET

3.4 ATS Coordination Group Activities

3.5 Other Air Navigation Matters

Agenda Item 4 Regional Air Navigation Deficiencies

Agenda Item 5 Future Work Programme

Agenda Item 6 Any other business

1.6 Working Arrangements, Language and Documentation

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

1.7 Conclusions and Decisions - Definition

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

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

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

1.7.2 Lists of Conclusions and Decisions are given on pages i-6 to i-9.

1.8 **Terms of Reference of APANPIRG**

1.8.1 The Terms of Reference of APANPIRG approved by the Council of ICAO (6th Meeting of its 171st Session on 27 February 2004) are as follows:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

<u>List of Conclusions</u>

Conclusion 18/1	**–**	**Bird Control Committee**
Conclusion 18/2	**–**	**Non-Provision of Safety-Related Data by States**
Conclusion 18/3	**–**	**Prevalence of LHDs from ATC Unit-to-ATC Unit coordination errors**
Conclusion 18/4	**–**	**Consequences of global RVSM long term height monitoring**
Conclusion 18/5	**–**	**Adopt Guidance Material for the Asia/Pacific Region ADS/CPDLC/AIDC Ground Systems Procurement and Implementation**
Conclusion 18/6	**–**	**Establishment of Japan RMA**
Conclusion 18/7	**–**	**Conduct regional ATFM Seminar**
Conclusion 18/8	**–**	**Adopt Version 3 Asia/Pacific AIDC ICD**
Conclusion 18/10	**–**	**Clarification of intent of Annex 2 in relation to variations in true airspeed**
Conclusion 18/11	**–**	**Endorsement of the Use of ICARD System**
Conclusion 18/12	**–**	**Assistance to States to improve AIS capability**
Conclusion 18/13	**–**	**Amendment to Chapter 3 of *Guidance Manual for Aeronautical Information Services (AIS) in the Asia/Pacific Region***
Conclusion 18/14	**–**	**Review of the NOTAM format**
Conclusion 18/15	**–**	**Strategies to implement eTOD**
Conclusion 18/16	**–**	**State Non-Compliance with AIRAC notification periods**
Conclusion 18/17	**–**	**JWG Review of Regional SAR Capability Matrix**
Conclusion 18/18	**–**	**Promulgate Recommendations of the ICAO February 2007 SAR Workshop**
Conclusion 18/19	**–**	**Registration of ELT Beacons**
Conclusion 18/20	**–**	**Promote relationships between APANPIRG, APMHSA and the ICAO-IMO Joint Working Group**
Conclusion 18/22	**–**	**Foundation Training and Training for Implementation Planners**
Conclusion 18/23	**–**	**Discontinuation of Asia/Pacific Regional Plan for New CNS/ATM Systems**

Conclusion 18/25	**–**	**Guidance Document for AMHS Conformance Testing**
Conclusion 18/26	**–**	**Amendment to FASID Table CNS-1E**
Conclusion 18/27	**–**	**ATN/AMHS Implementation Seminar/Workshop**
Conclusion 18/28	**–**	**Amendment to AMHS ICD**
Conclusion 18/29	**–**	**Aeronautical Mobile (R) Service Strategy**
Conclusion 18/30	**–**	**Strategies for the Provision of Navigation Services and GNSS Navigation Capability in the Asia/Pacific Region**
Conclusion 18/32	**–**	**The guidance material on comparison of various surveillance technologies**
Conclusion 18/33	**–**	**The Second Amendment to the AIGD**
Conclusion 18/34	**–**	**Guidelines on performance parameters for using ADS-B managed service**
Conclusion 18/35	**–**	**Mandate Regional ADS-B Out implementation**
Conclusion 18/36	**–**	**Concept of Use for Multilateration**
Conclusion 18/37	**–**	**Surveillance Strategy for Asia/Pacific Region**
Conclusion 18/38	**–**	**Establishment of a sub-regional ADS-B implementation Working Group in the South-East Asia area (SEA ADS-B WG)**
Conclusion 18/39	**–**	**Update of ISCS Operational Focal Points**
Conclusion 18/40		**Co-ordination between WAFCs and TCACs**
Conclusion 18/41	**–**	**Improvements of WAFS temperature forecasts near the tropopause over the Polar Regions**
Conclusion 18/42	**–**	**MET Deficiencies Related to OPMET Data Shortfalls**
Conclusion 18/43	**–**	**Harmonization of the content and format of Asia/Pacific OPMET data on the ISCS broadcast**
Conclusion 18/44	**–**	**Implementation of Changes to TAF Provisions in Amendment 74 to Annex 3**
Conclusion 18/45	**–**	**Enhancing Quality Control on OPMET Information by States**
Conclusion 18/46	**–**	**Issues related to Implementation Improvement of the SIGMET Provisions**

Conclusion 18/47	**–**	**New edition of the ASIA/PAC SIGMET Guide**
Conclusion 18/48	**–**	**Amendment to the MET part of the ASIA/PAC Basic ANP and FASID (Doc 9673)**
Conclusion 18/49	**–**	**Developing guidance on the ATM requirements for MET services and facilities**
Conclusion 18/50	**–**	**Replacing "km/h" with "m/s" as the SI unit of measurement of wind speed in ICAO Annexes**
Conclusion 18/52	**–**	**Establishment of a Regional Performance Based Navigation Task Force (PBN/TF)**
Conclusion 18/53	**–**	**Development of State PBN Implementation Plans**
Conclusion 18/54	**–**	**Globally Harmonized SARPS and Guidance Material for PBN**
Conclusion 18/55	**–**	**Designation of Contact Person for PBN Implementation**
Conclusion 18/58	**-**	**Asia/Pacific on-line air navigation deficiency database**
Conclusion 18/59		**Resolution of ATM and OPS deficiencies in the South West Pacific Small Island Developing States**
Conclusion 18/60		**Implementation aspects of the Regional Supplement to the Uniform Methodology for resolution of deficiencies**
Conclusion 18/62		**Resolution of air navigation deficiencies**

List of Decisions

Decision 18/9	**–**	**Dissolution of AIDC Review Task Force**
Decision 18/21	**–**	**ATM/AIS/SAR Subject/Task List**
Decision 18/24	**–**	**Revision to the Terms of Reference and the Subject/Tasks List of ATNICG**
Decision 18/31	**–**	**Revised Terms of Reference and Subject/Tasks List of ADS-B Study and Implementation Task Force**
Decision 18/51	**–**	**Updated Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group**
Decision 18/56	**–**	**Revised Terms of Reference for RASMAG**
Decision 18/57	**–**	**Dissolution of RASMC/TF**
Decision 18/61	**–**	**Dissolution of DRTF**

PART II — REPORT ON AGENDA ITEMS

AGENDA ITEM 1: FOLLOW-UP ON THE OUTCOME OF APANPIRG/17 MEETING

Agenda Item 1.1: Review of the action taken by the ANC and the Council on the Report of APANPIRG/17

Agenda Item 1.2: Review Status of Implementation of APANPIRG/17 Conclusions and Decisions

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

Agenda Item 1: Follow-up on the Outcome of APANPIRG/17 Meeting

1.1 Review of Action taken by ANC and the Council on the Report of APANPIRG/17 Meeting and Status of implementation of APANPIRG/17 Conclusions and Decisions

1.1 The meeting reviewed the actions taken by the Air Navigation Commission on the Report of the Seventeenth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) held in Bangkok from *21 to 25 August 2006.* The meeting also noted the follow-up actions by the States and the Secretariat on Conclusions and Decisions of the meeting as contained in **Appendix A** to the Report on Agenda Item 1.2.

1.2 Regarding the regional performance framework, the meeting noted that the Commission complimented APANPIRG on initiating the development of the regional performance framework (Conclusion 17/10 refers), recognized its value, and, therefore, requested the Secretary General to extend this approach to the remaining PIRGs and also review and align the planning methodologies of PIRGs to facilitate integration into the Air Navigation Integrated Programme (ANIP) in support of the Business Plan.

1.3 With reference to the implementation of automatic dependent surveillance — broadcast (ADS-B), APANPIRG considered the notion of presenting received ADS-B messages on the on-board airborne collision avoidance system (ACAS) display to improve the situational awareness of the pilot. Noting that the subject has been under investigation by the industry (under the titles of “hybrid surveillance” and “airborne surveillance applications”) the meeting was informed that the Commission, in its consideration of Conclusion 17/26, recommended that the Secretary General follow-up on relevant developments by the industry.

1.4 The meeting noted that the Commission recognized the viewpoint of APANPIRG for providing automatic air-reports in the Region through the use of ADS-B (via 1090 MHz ES) (Conclusion 17/49 refers). The Commission noted, however, that implementing additional extended squitter messages could adversely impact the capacity of 1090 MHz which is being shared by secondary surveillance radar (SSR) Modes A, C and S, ACAS and extended squitter. It was agreed that any further consideration by the Secretariat on this subject should be done after the report of the ongoing investigation of the radio frequency (RF) pollution problem associated with the use of 1 030/1090 MHz frequencies by the Aeronautical Surveillance Panel (ASP) becomes available.

1.5 The meeting was advised that the Commission, recognizing the advantage of having high resolution automatic aircraft reports received via aircraft communications addressing and reporting system (ACARS) along the approach and take-off paths, confirmed the request of APANPIRG in Conclusion 17/50. Consequently, the Commission requested that the Secretary General, with the assistance of the Low Level Wind Shear and Turbulence Study Group (WISTSG), consider developing the necessary provisions that would enable the detection of low-level wind shear affecting aircraft operations.

1.6 Regarding deficiencies, the meeting noted that the Commission supported Conclusion 17/51 which called upon ICAO to establish a special implementation project (SIP) with the objective of mitigating identified operational safety deficiencies in a group of States in the Asia and Pacific Regions with the understanding that the normal process for approval of that SIP would be followed.

1.7 Concluding the review, the meeting thanked the Council and Air Navigation Commission for their valuable guidance on various activities of the APANPIRG which would be taken into account in the development of ongoing action plan of the region.

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

1.2.1 The meeting reviewed the progress made on the outstanding Conclusions and Decisions of APANPIRG including the Conclusions and Decisions of its sixteenth meeting.

1.2.2 The actions taken by States and the Secretariat on the above mentioned Conclusions and Decisions were reviewed and the updated list is provided in **Appendix B** to the Report on Agenda Item 1.3. This updated list is in the new format in line with the ICAO Business Planning and Performance based approach

1.2.3 The list contained 14 Outstanding Conclusions/Decisions, 10 of which were in ATM/AIS/SAR field and 4 in the CNS/MET field. The meeting noted that the follow-up action on 9 of these Conclusions/ Decisions had been completed and they were proposed for removal from the List. Action has also been taken on the remaining 5 items; however they have not been completed by the time of APANPIRG/18. Subsequently, the meeting agreed that D16/59 and C14/24 are completed.

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

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Follow-up Actions taken on the APANPIRG/17 Conclusions/Decisions

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/1 **A , D**	**Implementation of ALLPIRG/5 conclusions by APANPIRG**	That the following conclusions of ALLPIRG/5 be studied by the concerned subgroups, that action be taken to implement them and that the outcome be presented to ensuing APANPIRG meetings: – Conclusions 5/2, 5/4, 5/5, 5/7, 5/8, 5/9, 5/11, and 5/13: ATS/AIS/SAR/SG; – Conclusions 5/2, 5/4, 5/5, 5/13, 5/16, and 5/17: CNS/MET/SG; – Conclusions 5/14, 5/15: DRTF	Allocate responsibility to contributory bodies Identify projects for implementation	APANPIRG – ATM/AIS/SAR SG – CNS/MET SG – DRTF	Decision Updated work programmes of sub-groups and other contributory bodies Implementation projects	Aug 2006 July 2007	**Closed** Relevant ALLPIRG/5 Conclusions presented to SGs for action. Copy of full text of relevany Conclusions included with ATM/AIS/SAR task list. Actions /outcome are available in WP/13, WP/14 and WP/19.
C 17/2 **A , D**	**Implementation of ALLPIRG/5 conclusions by States**	That States of the Asia/Pacific Region take action to implement the following conclusions of ALLPIRG/5: Conclusions 5/1, 5/4, 5/5, 5/7, 5/8,5/9, 5/11, 5/13 and 5/16	Implement conclusions	ASIA/PAC States	ICAO State letter Ref: AN 3/8:AP0106/06 dated 9 Nov 06	Oct 2006	**On-going**
C 17/3 **A , D**	**Implementation of ALLPIRG/5 conclusions by international organizations**	That international organizations take action to implement the following conclusions of ALLPIRG/5: Conclusions 5/2, 5/4, 5/5, 5/7, 5/13 and 5/16	Implement conclusions	Intl organizations	ICAO State letter Ref: AN 3/8:AP-MET 0109/06 dated 9 Nov 06	Oct 2006	**On-going**

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/4 **D**	**Long Term Monitoring of RVSM Height Keeping Performance**	That, in recognition of the desirability of global harmonization and interoperability, ICAO be invited to consider appropriate measures to ensure that any requirements for long term monitoring of RVSM height keeping performance be standardized and applied on a global basis.	Devlop requirements for long-term monitoring of height-keeping performance	ICAO HQ	Appropriate provisions	TBD	**Closed** SASP WHG/11 may/June 07 agreed on such requirements for submission to the ANC for adoption. Recommended 'closed' as matter subject to HQ action

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/5 **A**	**Establishment of WPAC/SCS RVSM Scrutiny Working Group**	Recognizing that: a) incompatibilities exist between the modified single alternate flight level orientation scheme (FLOS) in use in the Western Pacific/South China Sea (WPAC/SCS) area and the single alternate FLOS in use in areas adjacent to the WPAC/SCS area, and b) the RVSM Target Level of Safety in the WPAC/SCS area was not being satisfied and exhibited an adverse trend, a Scrutiny Working Group be established to identify, study and address problems in the safety, efficiency and harmonization of WPAC/SCS RVSM operations in accordance with the Terms of Reference in **Appendix A** to the Report on Agenda Item 2.1.	Creation of WG Conduct WG meeting Follow work programme established with TORs	APANPIRG Regional Office WG	TORs WG Report Report to APANPIRG/18	Aug 2006 Feb 2007 Aug 2007	**Closed** Scrutiny group established, WPAC/SCS/RSG meeting in Jan/Feb 07and WPAC/SCS RSG 2 meeting in June 07. Although TLS still exceeded, actions by States since RSG/1has reversed trend scenario. 3single alternate FLOS reached in principle agreement under final study by States

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/6 **A**	**Completion of the horizontal safety assessment for the South China Sea route structure**	That, recognizing that no horizontal safety assessment for the South China Sea parallel route structure had been conducted since implementation in 2001, the ICAO Regional Office urges concerned States to complete, by 30 June 2007, a horizontal safety assessment in accordance with ICAO ATS safety management provisions.	Urge States concerned Conduct safety assessment Thailand completed safety assessment on behalf of affected States in June 07. Result inconclusive as more traffic movement data required, however RASMAG/7(June 07) consider no evidence for any reason for concern. Safety assessment to be repeated in 12/18 months time.	Regional Office States concerned	State letter Safety assessment report	Oct 2006 30 June 2007	**completed**

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/7 **D**	**Implementation of Conditional ATS Routes**	That, recognizing the valuable practical examples established by recent regional implementations of enhanced ATS route segments in which the hours of operation, flight levels available and other parameters were subject to operating conditions, the ICAO Regional Office urges States to implement conditional ATS routes and route segments. *Note: Related to Global Planning Initiative # 1 (GPI-1) Flexible use of airspace*	Urge ASIA/PAC States to implement. Relevant working papers presented to all regional Office ATM meetings 2006/2007.	Regional Office	State letter Ref: T3/8.13, T3/8 13.1, T3/8 13.2 AP107/06(ATM) of 17 Nov 06	Dec 2006	**Completed**

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/8 **D**	**Definition of Conditional ATS Route and ATS Designator**	That, noting that States were addressing Global Planning Initiative #1 (*Flexible use of airspace)* by the increasing implementation of ATS route segments that were subject to restricted operational conditions in terms of hours/days of operation, usable flight levels available and/or other parameters, ICAO be invited to consider promulgating a definition of conditional ATS routes and an appropriate ATS route designator.	Develop definitions The ANC while recognizing the importance of these conditional routes was of the opinion that there already exists guidance in Annex 11Air Traffic Services, Appendix 1, para 2.2.1,c) and d) in reference to the designator for routes that do not form part of regional net works. The ANC also noted that routes through special use airspace were already implemented in many other States using the nomenclature of Annex 11 and was of the opinion that no further action on Conclusion 17/8 was required by ICAO.	ICAO HQ	Appropriate provisions	TBD	**Closed**
C 17/9 **A , D**	**Coordination of UAV Procedures Development**	That, noting the serious concerns held by some States of the Asia/Pacific Region in respect of Unmanned Aerial Vehicle (UAV) operations in mixed environments, ICAO invite Australia, India, Japan, Malaysia, New Zealand and Singapore to participate in the Informal ICAO Working Group on UAVs.	Invite concerned States to participate. ANC has established unmanned aircraft systems study group (UASSG) to progress these matters	ICAO HQ	Invitation letter	TBD	**Closed**

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/10 **D**	**Establish APANPIRG Regional Performance Framework Task Force**	That, recognizing the new regional planning methodologies precipitated by the second amendment to the Global Air Navigation Plan and the new ICAO business planning requirements, a Task Force be established to develop a proposal/framework for consideration by APANPIRG/18 for incorporating the performance based approach into the work programme of APANPIRG and its contributory bodies. The Terms of Reference of the Task Force are provided in **Appendix B** to the Report on Agenda Item 2.1.	Creation of TF Teleconference Follow work programme established with TORs	APANPIRG TF TF	TOR TF Report Regional performance framework Report to − ATM/AIS/ SAR/17 − CNS/MET/11 − APANPIRG/18	Aug 2006 Dec 2006 May 2007 June 2007 July 2007 Aug 2007	**On-going**
C 17/11 **A**	**Adoption of Model National ATM Contingency Plan**	That the National ATM Contingency Plans of Jakarta and Ujung Pandang FIRs, which were prepared as a result of the 2006 ICAO Special Implementation Project be adopted as a model for Asia/Pacific States in the preparation of national ATM contingency plans.	Adopt model contingency plan and distribute to States. Contingency plans for Jakarta and Ujung Paddang FIRs prepared and authorized by Indonesian authorities in April 07. Copies of plans circulated as model for Asia/Pacific States in accordance with Conclusion 17/11.	Regional Office	State letter Ref: T3/4.9 AP021/07(ATM) of 21 Jan 07	Dec 2006	**Completed.**

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/12 **A, D**	**Compliance with ATFM Operational Trial procedures**	That, recognizing the safety and efficiency benefits resulting from the implementation of effective air traffic flow management across the Bay of Bengal, South Asia and Pakistan through the Kabul FIR, the ICAO Regional Office request States and airspace users concerned, subject to safety considerations/enroute restrictions, to ensure:					**Completed**
		a) full compliance with the current ATFM Operational Trial procedures, and	Urge States concerned	Regional Office	State letter	Sept 2006	Ref: T 3/8.13.2 AP 115/06(ATM) of 12 December 06.
			Ensure compliance with AFTM Trial Procedures	States concerned, ANS Providers	Notify Regional Office of compliance with ATFM procedures	Dec 2006	
		b) affected ANSPs to take action to ensure that flights enter Kabul FIR in accordance with the slot parameters (flight level, ATS route and entry fix time) allocated to each flight.	Flights enter Kabul FIR in accordance with the slot parameters. ATFM/TF/10 (30 April-3 May 07) took 'GO' decision for implementation of ATFM procedures on 5 July 07 based on improvements to ANSP and airline performance.	Concerned ANSPs	Notify Regional Office of compliance with slot parameters	Dec 2006	

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/13 **D**	**Reconvening of the AIDC Task Force**	That the AIDC Task Force be reconvened for a single meeting to complete the outstanding task of defining the format of the FAN message and addressing other outstanding issues identified in the Asia/Pacific Regional Interface Control Document for ATS Inter-Facility Ground/Ground Data Communications Version 2.0.	Conduct meeting Complete the specified tasks AIDC Task Force met 6-9 Feb 07 and prepared version 3 Asia/Pacific AIDC ICD for adoption by APANPIRG/18	Regional Office, AIDC TF	Report to − ATM/AIS/ SAR SG/17 − CNS/MET SG/11	July 2007	Completed

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/14 **D**	**Improvement of aeronautical information exchange and management**	That, in order to increase the reliability and integrity of the aeronautical information in support of navigation functions, ICAO be invited to establish, as a matter of urgency, a standard model for the electronic exchange of aeronautical information.	Establish a standard model for the electronic exchange of aeronautical information. HQ response-ICAO to establish as a matter of urgency, a standard model for the electronic exchange of aeronautical information; HQ- Advise States of the Asia and Pacific Regions to await the outcome of that work which is expected to be completed in 2007	ICAO HQ	Appropriate provisions	TBD	Closed
D 17/15 **D**	**Terms of Reference of the AIS Implementation Task Force**	That, the AIS Implementation Task Force be directed to report to the ATM/AIS/SAR Sub-group and the Terms of Reference be amended accordingly.	Amend TOR AITF Terms of Reference Amended	Regional Office	Amended TORs	Aug 06	Completed

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/16 **A , D**	**Conduct of Comprehensive Regional AIS Survey**	That, recognizing that GPI-18 - *Aeronautical Information* requires real-time availability of quality assured electronic information (aeronautical, terrain and obstacle), the AITF, in conjunction with the Regional Office, conduct a comprehensive survey of all Asia/Pacific States in relation to AIS matters, including details of status in relation to the automation of dynamic data, automation of static data and availability of electronic terrain and obstacle data.	Conduct Regional Survey on AIS Matters. Regional Survey conducted, results reported to ATM/AIS/SAR/SG/17	AITF Regional Office States to provide input	Questionnaire for survey State letter Survey replies	June 2007 1Q 2007 1Q 2007	Completed
C 17/17 **D**	**Non-Compliance with Annex 15 provisions**	That, noting the regular and ongoing non-compliance with Annex 15 – *Aeronautical Information Services* provisions in respect to AIRAC notification periods, the ICAO Regional Office be requested to reinforce to States the critical safety nature of AIS and adherence to Annex 15 provisions, particularly those relating to AIRAC periods, as well as the need to ensuring accurate and timely publication of AIS data.	Urge States to comply with Annex 15 ATM/AIS/SAR/SG/17 raised appropriate draft Conclusion for consideration by APANPIRG/18	Regional Office	State letter State letter transmitted and AITF addressed this matter.	Jan 2007	Completed

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/18 **D**	**Additional Asia/Pacific Office ATM Resources**	That, in consideration of the significant actual and forecasted traffic growth in Asia/Pacific Region and the benefits to be gained from the APANPIRG CNS/ATM work programme through implementing the Global Plan Initiatives:					Closed. Sec Gen will address this issue as a matter of urgency. (Ref: WP/2 Appendix-item C 17/18 SIS.
		a) ICAO be requested to urgently address the inadequacy of ATM resources at the Regional Office; and	Consider establishment of additional ATM Officer	ICAO HQ	Creation of post	TBD	
		b) ASIA/PAC States be requested to consider possibilities of further supporting the Regional Office ATM programme.	Consider support to ATM programme. Seconded ATM Officer from Thailand. Japan, Australia, New Zealand assisting AITF. Singapore will host next RNP-SEA/TF meeting late 2007.	States	Proposals for support	Aug 2007	

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/19 **A , D**	**ATM/AIS/SAR Subject/Task List**	That the ATM/AIS/SAR Subject/Task List as contained in **Appendix I** to the Report on Agenda Item 2.1 be adopted as the current work programme for the ATM/AIS/SAR Sub-Group.	Adopt work programme Adopted	APANPIRG	ATM/AIS/SAR Subject/Task List	Aug 2006	Completed
D 17/20 **D**	**Revision to the Terms of Reference and the Subject/Tasks List of ATNICG**	That, the revised Terms of Reference and the Subject/Tasks List of the ATNICG provided in **Appendix A** to the Report on Agenda Item 2.2 be adopted.	Adopt revised TORs	APANPIRG	Revised TORs	Aug 2006	**Completed** Revised Subject/Tasks List adopted by APANPIRG presented in ATNICG/2
C 17/21 **D**	**Updating of the Strategy for Implementation of ATN**	That, the Strategy for implementation of ATN in the ASIA/PAC Region be amended as shown in the **Appendix B** to the Report on Agenda Item 2.2	Amend Strategy for implementation of ATN in the ASIA/PAC Region Publish on ICAO web	APANPIRG Regional Office	Strategy document Web page	Aug 2006 Sept 2006	**Completed** Strategy for ATN implementation available on ICAO APAC Website

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/22 **D**	**Amendment to FASID Table CNS 2**	That, FASID Table CNS 2, *Aeronautical mobile service (AMS) and aeronautical mobile satellite service (AMSS)*, be replaced with an updated Table in accordance with the established procedure.	Process amendment proposal for FASID Table CNS 2	Regional Office	Amendment proposal	Feb 2007	**Completed** Updated FASID Table CNS-2 approved. (ICAO APAC State Letter dated 4 July 2007)
C 17/23 **D**	**Performance Based Navigation Seminar/Workshop**	That, ICAO organizes appropriate workshop/seminar to facilitate the orderly adoption of the Performance Based Navigation (PBN) concept.	Conduct workshop/seminar	ICAO HQ, Regional Office	Workshop	TBD	**Completed** PBN Seminar being organized at Bangkok from 11 to 14 September and at New Delhi, India from 17 to 21 September 2007

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/24 **D**	**Revision of the Strategies for Approach Landing and Departure Guidance Systems and Implementation of GNSS Navigation Capability in the ASIA/PAC Region**	That, the updated Strategies for the Provision of Approach, Landing and Departure Guidance Systems and for the Implementation of GNSS Navigation Capability in the ASIA/PAC Region provided in **Appendices C** and **D** to the report of on Agenda Item 2.2 be adopted and provided to States	Update Strategy documents Publish on ICAO web	APANPIRG Regional Office	Strategy document Web page	Aug 2006 Sept 2006	**Completed** Updated Strategy for the provision of Approach, Landing and Departure Guidance in the Asia Pacific Region is posted on ICAO APAC Website **Completed** Strategy for implementation of GNSS Navigation Capability in Asia Pacific Region posted on ICAO APAC Website
C 17/25 **D**	**The First Amendment to the AIGD**	That, the amended ADS-B Implementation and Operations Guidance Document (AIGD) as provided in the **Appendix E** to the Report on Agenda Item 2.2 be adopted.	Amend AIGD Publish on ICAO web	APANPIRG Regional Office	AIGD document Web page	Aug 2006 Sept 2006	**Completed** Updated ADS-B Implementation and Operations Guidance Document posted on ICAO APAC Website

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/26 **D**	**Investigation and expedition of way to present ADS-B Data using ACAS hardware**	That, ICAO be requested to: a) take into account the importance and benefit of ADS-B IN applications and the role it will have in the final business case; and b) define and support the use of ACAS hardware and traffic displays to present ADS-B based flight identity and velocity vector.	Develop relevant provisions	ICAO HQ	Appropriate provisions	TBD	**Closed** Monitoring related activities being initiated by the industry
D 17/27 **D**	**Development of Strategy for the implementation of surveillance systems in the ASIA/PAC Region**	That, the strategy for the implementation of surveillance systems as contained in the in the **Appendix F** to the report on agenda item 2.2 be further refined for consideration by APANPIRG/18.	Finalize strategy	CNS/MET SG	Strategy document	July 2007	**Completed** Revised Surveillance Strategy being presented in the APANPIRG/18

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/28 **D**	**Revised Terms of Reference for ADS-B Study and Implementation Task Force**	That, the Revised Terms of Reference for the ADS-B Study and Implementation Task Force as provided in the **Appendix G** to the report under agenda item 2.2. be adopted.	Adopt revised TORs	APANPIRG	TORs	Aug 2006	**Completed** Revised Terms of Reference for ADS-B Study and Implementation Task Force presented in the ADS-B TF/6
C 17/29 **D**	**Mode S transponder inspection**	That, recognizing more Mode S Radar ground stations being introduced in the region, States in the Asia/Pacific Region be urged to have aircraft registered having Mode S transponder regularly inspected to ensure correct operation of the Mode S transponders.	Urge States	Regional Office	State letter	Dec 2006	**Completed** State Letter sent to States for conducting inspection. 7 States replied intimating the action taken.
C 17/30 **A , D**	**Preparation for World Radiocommunication Conference – 2007 (WRC-2007)**	That, ICAO consider convening Regional Preparatory Group Meeting for WRC-2007 in Bangkok during early 2007.	Conduct RPG Meeting	ICAO HQ, Regional Office	Meeting and development of Regional Strategy	1Q 2007	**Completed** Convened Regional Preparatory Group (RPG) meeting for WRC-2007 at Bangkok in January 2007 and recommendations circulated to the States

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/31 **D**	**RF interference on the protected DME frequency**	That, States' civil aviation administrations be encouraged to work closely with the respective regulatory authorities and undertake all necessary action to ensure that DME and SSR service are not interfered by devices such as wireless CCTV cameras.	Urge States CAAs	Regional Office	State letter	Dec 2006	**Completed** In line with the Conclusion, ICAO APAC Office issued State Letter dated 20 December 2006 advising States to take appropriate action with State Regulatory Authorities
C 17/32 **D**	**HF Interference**	That, States where aeronautical stations are experiencing HF radio interference, take necessary actions in coordination with respective radio regulators to identify the source of interference and to eliminate problem.	Urge States CAAs	Regional Office	State letter	Dec 2006	**Completed** ICAO APAC Office issued State Letter dated 19 December 2006 advising the States to identify source of interference and eliminate the problem in coordination with the State Radio Regulators

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/33 **D**	**Enhancement of ISCS/2 Operational Efficacy Survey**	That, the ISCS Provider State, in coordination with the SADIS Provider State and the ICAO Secretariat, be invited to enhance the survey questionnaire on the operational efficacy of ISCS/2, for consideration by the WAFSOPSG and SADISOPSG.	Invite ISCS and SADIS Provider States	Regional Office, ICAO HQ, UK, USA	New Survey questionnaire	1Q 2007	**Closed** ISCS agreed to conduct Survey with the existing questionnaire
C 17/34 **D**	**Continuation of PNG-formatted SIGWX Charts**	That, the WAFSOPSG be invited to consider continuation of the provision of PNG-formatted SIGWX charts by both WAFCs beyond 30 November 2006.	Inform WAFSOPSG of regional feedback	Regional Office, WAFSOPSG	Decision of WAFGSOPSG	Nov 2006	**Closed** Issues referred to WAFSOPSG – update presented in CNS/MET SG/11
C 17/35 **D**	**Survey on the transition from SADIS 1G to SADIS 2G in ASIA/PAC**	That, a survey to evaluate the States' progress in replacing the existing SADIS 1G receiving systems with SADIS 2G receiving systems in the ASIA/PAC Region be conducted in 2007 by the WAFS Implementation Task Force (WAFS/I TF) with assistance of the ICAO Regional Office.	Conduct regional survey	WAFS/I TF Regional Office SADIS user States	Questionnaire for the survey State letter Survey replies	July 2007 1Q 2007 2Q 2007	**Completed** Survey result presented to CNS/MET SG/11

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/36 **D**	**Further development of WAFS Output Performance Indicators**	That, the WAFSOPSG be invited to: a) include performance indicators for wind and temperature for the WMO defined verification area covering Australia and New Zealand, in their suite of existing output performance indicators; b) investigate the feasibility of producing wind and temperature performance indicators for all standard forecast levels; c) investigate the feasibility of providing wind and temperature performance indicators in a global gridded and chart format; and d) consider evaluating the SIGWX forecasts, in particular TC and VA symbols, in order to measure the harmonization of these forecasts issued by the two WAFCs.	Develop specified Output Performance Indicators	WAFSOPSG	Appropriate PIs	TBD	**Closed** Issues referred to WAFSOPSG – update presented in CNS SG/11
C 17/37 **D**	**Update of ROBEX Handbook**	That, the ROBEX Handbook be updated with the additional material on the quality control (QC) and regional bulletin update procedure, as shown in **Appendix H** to the Report on Agenda Item 2.2.	Update ROBEX Handbook Publish on ICAO website	Regional Office Regional Office	Updated chapters Web document	Sept 2006 Sept 2006	**Completed** The updated ROBEX Handbook (version Jan 2007) posted on the website

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/38 **A , D**	**Amendment to ASIA/PAC FASID Table MET 1A, Meteorological services required at aerodromes**	That, the ASIA/PAC FASID Table MET 1A be amended as shown in **Appendix I** to the Report on Agenda Item 2.2.	Process amendment proposal for FASID Table MET 1A	Regional Office	Amendment proposal	Jan 2007	**On-going** Included in a consolidated amendment proposal for the MET part of BANP and FASID
C 17/39 **D**	**Coordination of plan for transition to BUFR-coded OPMET information**	That, in order to expedite the finalization of the regional plan for transition to BUFR-coded OPMET information and related planning for AMHS, the appropriate WMO bodies be invited to confirm, as a matter of urgency, their plan for the use of BUFR code for OPMET information.	Notify WMO	ICAO HQ	Letter to WMO	Oct 2006	**Completed** Letter to WMO issued; expert team established to pursue the matter
C 17/40 **A**	**Standard message format for volcano observatories participating in IAVW**	That, IAVWOPSG be invited to develop a standard message format to be used by the States' volcano observatories designated in the Regional ANP to provide information to the associated ACC, MWO and VAAC.	Develop standard message format	IAVWOPSG	Appropriate provision	TBD	**Closed** Included in the work programme of IAVWOPSG

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/41 **A , D**	**Development of web page for monitoring SIGMET availability in the ROBEX scheme**	That, Hong Kong, China be invited to develop, in coordination with Singapore, a web page on the Hong Kong Observatory web site, providing real-time information on the valid SIGMETs and advisories issued by the MWOs and advisory centres in the ASIA/PAC Region for monitoring purposes within the ROBEX scheme. *Note: Authorized access to the web application to be provided to the RODBs, ROBEX centres, MWOs and the ICAO Regional Office.*	Develop and maintain web page	Hong Kong, China, Singapore, Regional Office	Web page	Nov 2006	**Completed** Webpage developed by HKO. States invited to apply for authorized access

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/42 **A , D**	**ASIA/PAC SIGMET Seminar**	That, a) ICAO, in coordination with WMO and the VAAC and TCAC Provider States in the ASIA/PAC Region, be invited to organize in 2007 a regional training seminar for the States' SIGMET Focal Points; and	Organize SIGMET seminar	Regional Office, ICAO HQ, WMO, VAAC Provider States, TCAC Provider States	SIGMET Training Seminar	2007	**Completed** Seminar held at the Regional Office, 11-13 July 07
		b) States' CAAs and meteorological authorities be strongly encouraged to ensure participation of the designated SIGMET Focal Points or other appropriate personnel in the above Seminar.	Ensure participation of appropriate personnel	ASIA/PAC States	Participation in the training	2007	

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/43 D	**Development of provisions on MET/ATM coordination**	That, in recognizing the importance of the meteorological support for the air traffic management, a) ICAO Regional Office conduct a survey of the evolving requirements for meteorological information and services in support of air traffic management; and	Conduct survey	MET/ATM TF, Regional Office	Questionnaire for the survey Survey Report to be presented to − ATM/AIS/ SAR/17 − CNS/MET/11	1Q 2007 Jun 2007	**On-going** Draft questionnaire presented to ATM/AIS/SAR/17 CNS/MET/11 Comments expected Survey to be completed by the end of 2007
		b) the results of the survey above, be referred to the appropriate ICAO body in view of potential extension of the existing provisions on the meteorological services for ATS, to cover the other ATM fields.	Develop SARPs	ICAO HQ	Appropriate provisions	TBD	
C 17/44 A , D	**Development of new windshear posters**	That, ICAO be invited to consider updating the windshear posters for training and educational purposes, based on the posters being developed by Hong Kong, China in collaboration with WMO and IFALPA.	Develop windshear posters	Hong Kong, China, ICAO HQ, WMO, IFALPA	Posters	2007	On Going. Ready for review by WMO & IFALPA. To be completed by end of 2007.

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/45 **D**	**Applicability of the turbulence metric based on EDR for approach/take-off**	That, ICAO be invited to consider: a) the applicability of the EDR metric for reporting of turbulence for approach/take-off; and b) developing guidance to States for implementation of automatic aircraft turbulence reporting for all phases of flight.	Develop guidance	ICAO HQ	Appropriate provisions	TBD	**Closed** Included in the work programme of METLINKSG
D 17/46 **A , D**	**Updated Subject/ Tasks List of the CNS/MET Sub-group**	That, the Subject/Tasks List of the CNS/MET Sub-group presented in **Appendix J** to the report of on Agenda Item 2.2 be adopted.	Adopt Subject/Task List	APANPIRG	Subject/Task List	Aug 2006	**Completed** Subject/Tasks List being presented in CNS/MET SG/11

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/47 **A**	**Task Force to establish Regional Airspace Safety Monitoring Committees**	That a Task Force be established to develop and distribute to States by 30 June 2007 implementation proposals for the establishment of Regional Airspace Safety Monitoring Committees (RASMC). The Task Force would work in accordance with the terms of reference in **Appendix A** to the Report on Agenda Item 2.4 and use, *inter alia*, recent ICAO guidance materials in relation to the global approach for the funding of airspace safety monitoring.	Establish TF Develop proposal for RASMB First meeting of RASMC/TF held on 15 Feb 07. Unable to deliver implementation plans in short time frame to 30 June 07. RASMAG/7 proposed amendments TOR of RASMC/TF for consideration by APANPIRG/18	APANPIRG TF	TOR Report to RASMAG	Aug 2006 May 2007	On- Going

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/48 **A**	**Funding of Pacific RMA & CRA**	In recognizing that the United States/FAA was the current service provider of CRA and RMA services for the Pacific Region (with the exception of CRA services for Japan), it was acknowledged that:	Acknowledge service provision	APANPIRG	Decision that FAA would remain the interim service provider for the Pacific Region	Aug 2006	**Closed**
		a) FAA would remain the interim service provider for the Pacific Region until more formal arrangements have been made, and	Provide service	USA	Service provider for the Pacific Region	Ongoing	
		b) Pacific States using these FAA services commit to reimburse the FAA for those CRA and RMA services rendered effective 30 June 2007. *Note: The FAA will be formally notifying each of these individual states that if reimbursement agreements are not in place by 30 June 2007, these services are at risk of being suspended.*	Commit to reimburse RASMAG/7 advised that analysis by USA indicates that use of bi-lateral agreements is cost prohibitive. USA will continue to fund existing arrangements until a long term solution can be implemented.	States concerned	Reimbursement agreement	30 June 2007	

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/49 **D**	**Use of ADS-B 1 090 MHz Extended Squitter for automatic air-reporting**	That, ICAO be invited to develop the necessary SARPs and guidance material to facilitate the implementation of ADS-B 1 090 MHz extended squitter for automatic air-reporting.	Develop SARPs guidance material	ICAO HQ	Appropriate provisions	TBD	**Closed** ASP is carrying out a study to evaluate the RF pollution problem associated with usage of 1090 MHz. The issue will be considered after the report on study is available.
C 17/50 **A, D**	**New ICAO abbreviations for windshear warning**	That, in order to facilitate inclusion in the windshear warnings of the windshear intensity in terms of headwind changes, ICAO be invited to include new abbreviations for “headwind gain” and “headwind loss” in the ICAO Abbreviations and Codes (Doc 8400) and to amend the windshear warning template (Table A6-3) in Annex 3 accordingly.	Amend provisions	ICAO HQ	Appropriate provisions	TBD	**Closed** Included in the work programme of the new study group on advisories and warnings

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/51 **A**	**Special Implementation Project to assist rectification of Deficiencies**	That, in order to facilitate mitigating action in relation to identified operational safety deficiencies in a group of States in the Asia/Pacific Region, ICAO undertake a special implementation project during 2007. The SIP would address difficulties with air/ground and ground/ground communications, poor ATC practices and non compliances with Annexes 14 and 15.	Establish and conduct SIP	Regional Office ICAO HQ	SIP proposal SIP establishment	Jan 2007 March 2007	**Completed** SIP missions were carried out by expert and Regional Officer to Bangladesh and Nepal during May/June 07.
C 17/52 **A**	**Special assistance for resolution of MET deficiencies in the South-West Pacific Small Island Developing States (SIDS)**	That, in recognizing the safety implications of the long-standing MET deficiencies in the South-West Pacific SIDS, ICAO, in coordination with WMO, be invited to consider providing further assistance to these States in order to build their capacity to provide the required services in a sustainable and cost-efficient manner. ***Note: It is suggested that the appropriate form of providing assistance to the South-Pacific SIDS would include assignment of ICAO expert to the sub-region and provision of training through technical cooperation project and/or extended SIP.***	Express support Assist in establishment of TC Project	ICAO HQ WMO	Letter to WMO TC Project	Oct 2006 2007	**Completed** Letter by Sec-Gen sent to WMO; WMO committed to support the project. TC project proposal developed and submitted for IFFAS grant. IFFAS approved a grant. TC project expected to be initiated sep/Oct 2007

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 17/53 **A**	**A regional on-line database of air navigation deficiencies in ASIA/PAC Region**	That, in order to ensure transparency and facilitate resolution of deficiencies, ICAO Regional Office be invited to establish a regional on-line database of air navigation deficiencies and provide secure access to States' Administrations and other users concerned.	Establish on-line database. Work to build database has progressed, RO will brief DRTF/3 and APANPIRG/18 on progress.	Regional Office, DRTF, ICAO HQ	On-line database	Aug 2007	**On-going** Online database of air navigation deficiencies has been created and is on trial
C 17/54 **A**	**Deficiency resolution objective for ASIA/PAC States**	That, a) all ASIA/PAC States listed in the APANPIRG List of deficiencies be urged to establish action plans with fixed target dates for resolution of all safety related deficiencies and inform ICAO Regional Office by mid 2007 of their plans; and b) the need for urgent action in resolving safety related deficiencies be brought to the attention of DGCA/43 conference in December 2006.	Establish action plans Report to DGCA. 43rd DGCA Conference addressed this issue in action item 43/1- Resolution of Deficiencies	States Regional Office	Action plan DP for DGCA	June 2007 Dec 2006	**On-going** Reported to DGCA/43 States urged to submit action plans Very low response from States

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D 17/55 **A**	**Third meeting of DRTF**	That, the deficiency review task force (DRTF) conduct a meeting in early 2007 with the following tasks: a) develop appropriate follow-up action to ALLPIRG Conclusions 5/14 and 5/15; b) review the implementation aspects of the regional supplement to the Uniform Methodology including an assessment of the current List of Deficiencies; and c) report to APANPIRG/18	Conduct meeting and act on a), b) and c). Meeting held on 23-24 July 07, reviewed ALLPIRG conclusion 5/14 & 5/15 and regional APAC supplement and prepared report for APANPIRG/18.	Regional Office, DRTF	DRTF/3 Report Report to sub-groups and APANPIRG/18 Database format document	Mar 2007 Jun, Jul, Aug 2007 Aug 2007	**Completed** Meeting held on 23-24 Jul 07

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

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

TBD = To be determined
Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

FOLLOW-UP ACTIONS TAKEN ON THE APANPIRG OUTSTANDING CONCLUSIONS/DECISIONS

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~**C 10/4**~~	~~**Implementation of Area Control Service and 10-Minute Longitudinal Separation using Mach Number Technique in the Bay of Bengal area**~~	~~1) That, States in the Bay of Bengal area~~ ~~a) Complete the upgrade of airspace from advisory and flight information services to area control service along ATS routes, as appropriate;~~ ~~b) identify ATS routes where 10-minute longitudinal separation minima for RNAV equipped aircraft using MNT could be applied and implement such minima.~~ ~~2) That, Sub-regional ATS Co-ordination Groups concerned place a high priority on items 1) a),and b) above.~~ ~~India reported to ATM/AIS/SAR/SG/17 that to improve HF operation over Mumbai FIR India has initiated several steps such as sectorization of HF AMS with~~	~~India issued NOTAM during 2006 regarding sectorisation plan for HF radio channels in the Arabian Sea area of Mumbai FIR. Three HF frequencies allocated to reduce congestion~~ ~~a) Some routes in the Mumbai FIR remain under advisory service due to inadequate communications which is being remedied~~ ~~Note: LOAs of some States require updating. The Regional Office to coordinate~~ ~~b) Implementation subject to provisions of ICAO separation standards.~~ ~~2) Implementation continues to be co-ordinated through the Bay of Bengal ATS Co-ordination Group (BBACG).~~	~~India~~ ~~ICAO APAC Office~~	~~Area Control Service and 10 minutes separation in Bay of Bengal area~~		~~**Closed**~~ ~~(Significant progress made. India assures to convert all its advisory routes to ATS routes)~~

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~A D~~		~~adequate frequency compliment, shifting of HF receivers to remote place and providing OFC connectivity to ATS complex and providing a digital media between transmitting station and ATS complex etc. These steps have resulted in significant increase in number of contacts and hence substantial improvement in HF operation in Mumbai FIR . Moreover with the deployment of ADS/CPDLC at Mumbai, dependency on HF communication has reduced. Not withstanding the above, India is seeking help from external expert agencies to progressively improve the performance of HF Communication in Indian Airspace further.~~ ~~The improved HF arrangements had been verified by ICAO CNS mission to Mumbai during early 2007.~~	~~BBACG/17 & BBACG/18 informed of enhancements in routes and services as well as commencement of ADS/CPDLC operational trial using datalink equipment. In view of continuing improvements in communications and routes, recommend Closed.~~				

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~C 14/9~~ ~~D~~	~~**AIRAC provisions**~~	~~That, ICAO be requested to again reinforce to States the critical safety nature of AIS and adherence to Annex 15 provisions, particular those relating to AIRAC, as well as the need to ensuring accurate and timely publication of AIS data.~~	~~The AIS Implementation Task Force (AIS/TF) to undertake a study of the application of Annex 15 requirements by the end of 2007~~ ~~First meeting of AIS Task Force (AITF/1) held 20-24 March 2006, second meeting to be scheduled in March 2007~~ ~~ATM/AIS/SAR/SG/16 raised draft Conclusion 16/5 proposing that the attention of States be drawn to the continued relevance of C14/9~~	~~ICAO APAC Office~~	~~Ensure adherence to Annex 15 provisions relating to AIRAC~~		~~**Closed**~~ ~~(Superseded by APANPIRG Decision 17/17)~~
~~C 15/8~~	~~**Implementation of a 2 NM lateral offset procedures in the ASIA/PACIFIC Region**~~	~~That, States in the Asia/Pacific Region implement the 2 NM lateral offset procedures to the right of centre line in accordance with ICAO guidance on a common AIRAC date to be coordinated by the ICAO Regional Office with States,~~	~~Generally implemented by affected APAC States on AIRAC 20 January 2005 and 17 March 2005. Other States advised to consider implementation.~~ ~~*Note: APANPIRG/16 incorporated Conclusion 14/7*~~	~~ICAO APAC Office~~	~~Promulgation of routes where offsets are authorized in the State AIP~~		~~**Completed**~~ ~~(Secretariat notes widespread AIP implementation in the vast majority of affected airspace)~~

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~D~~	*~~ANC~~*	~~ATS Coordination Groups and users concerned.~~ *~~Noted the conclusion and called upon the Secretary General to monitor its progress, recalling that revised guidelines on the use of strategic lateral offsets, as approved by the Commission, had recently been circulated to States and that global provisions were under development.~~*	*~~into Conclusion 15/8 and closed Conclusion 14/7. The following text was incorporated from Conclusion 14/7:~~* ~~Based on the ICAO revised guidelines, States to promulgate in State AIPs the routes and airspace where offsets are authorized as required by Annex 2 (Chapter 3, 3.6.2.1.1).~~				
~~**D 15/46**~~ ~~**D**~~	~~**Implementation of AN-Conf/11 (November 2003) Recommendations by APANPIRG**~~	~~That, the following recommendations of AN-Conf/11 be studied by the concerned Sub-Groups, action taken to implement them, and the outcome presented to APANPIRG:~~ ~~Recommendations 1/1, 1/10, 1/13, 4/1, 4/2, 6/11 and 7/1: ATM/AIS/SAR/SG~~ ~~Recommendations 1/1, 1/10, 1/13, 4/1, 4/2, 6/11, 7/1 and 7/3: CNS/MET/SG~~	~~Included on ATM/AIS/SAR Sub-Group and CNS/MET Sub-Group Task Lists, reviewed by the Sub-Groups.~~ ~~To be further reviewed by Sub-Groups during 2007.~~ ~~Attachment added to Sub Group Task list by ATM/AIS/SAR/SG/17 to enable continued visibility of these issues~~	~~ATM/AIS/SAR CNS/MET SG and DRTF~~	~~Implementation of AN-Conf/11 Recommendations~~		~~**Closed**~~ ~~(Included in the Sub-group Tasks List to enable continued visibility)~~

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
		~~Recommendations 4/8: DRTF~~					
~~C 16/15~~	**~~Special Implementation Project for Development of a State Contingency Plan~~**	~~That, in order to provide a model for States of the Asia/Pacific Region in preparing their national contingency plans, ICAO undertake a special implementation project (SIP) during 2006 to assist a State of the Region to prepare and implement a contingency plan in accordance with Annex 11, Appendix D, and in line with APANPIRG Conclusion 13/8. The SIP should also identify and prioritize other contingency circumstances that may affect civil aviation operations in the ATM context and make recommendations accordingly.~~ *~~Noted the conclusion and that the project would be~~*	~~SIP proposal prepared by Regional Office and approved by Council of ICAO. SIP field visits conducted July 2006 in Indonesia. Draft contingency plan with Indonesia for review.~~	~~ICAO APAC Office~~	~~Model Contingency Plan~~		**~~Completed~~** ~~(Model Contingency Plan developed, Ref APANPIRG/18 IP6)~~

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~A D~~	~~*C*~~ ~~*ANC*~~	~~*submitted for the Council's approval through established procedures.*~~ ~~*The ANC took note of the completion of the contingency plans of the Jakarta and Ujung Pandang flight information regions (FIRs) of Indonesia. In reviewing the plan, the ANC noted that the format followed closely the contingency plan format sent to Regional Offices as a model for ICAO States in early 2006. In this context, the ANC concurred with the APANPIRG Conclusion 17/11 proposing that the Jakarta model be adopted by other Asia/Pacific States in the preparation of their national air traffic management (ATM) contingency plans.*~~	~~SIP mission conducted in Indonesia during June 2006. Contingency plans for Jakarta and Ujung Pandang FIRs prepared and authorized by Indonesian authorities in April 2007. Copies of plans circulated as model for Asia/Pacific States in accordance with Conclusion 17/11. Regional Office State Letter Ref.: T3/4.9 – AP021/07 (ATM) of 21 Jan 2007 refers~~				
~~**C 16/18**~~	~~**Assistance to States to develop safety management systems**~~	~~That, recognizing that many States in the Asia/Pacific Region require assistance to implement safety management programmes in accordance with Annex 11, States with~~	~~Regional Office coordinating with CAD Hong Kong China for conduct of ATS Safety Management Workshop during first quarter 2007~~	~~ICAO APAC~~	~~Series of Seminars/Workshops on Safety Management System~~		~~**Closed**~~ ~~(Overtaken by events. Ongoing ICAO HQ SMS Training in place)~~

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~A D~~		~~expertise in implementing and operating ICAO compliant safety management systems inform ICAO by end of 2005 of their willingness to participate in a series of seminars/workshops to be arranged by ICAO during 2006-2007 to assist States.~~	~~SIP proposal for additional ATS SMS training via field visits was developed by Regional Office and approved by Council of ICAO, for implementation in last quarter 2006. SIP requires participation of one fully funded State safety management expert to assist~~ ~~No assistance from fully funded State personnel available so SIP SMS Workshop using modified proposal conducted 25-29 September 2006 at the Regional Office~~				
C 16/19	**Study of States' preparedness to implement safety management systems**	That, a study of States' preparedness to implement ICAO safety management systems in accordance with Annex 11 be undertaken by the Asia/Pacific Regional Office in conjunction with the ATS coordination groups and RASMAG by the first quarter of 2006, and a plan of action developed to be reported to APANPIRG/17 in September	Coordination with States in process. However SIP proposal for additional ATS SMS training via field visits was developed by Regional Office and approved by Council of ICAO, for implementation in last quarter 2006. SIP requires participation of one fully funded State safety	ICAO APAC Office	Report on States' preparedness to implement Safety Management System		**On-going**

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
D		2006.	management expert to assist. SIP Workshop conducted 25-29 September 2006, no availability of State official to assist.				
~~C 16/23~~ ~~D~~	~~**Special Implementation Project International Seminar and SAREX**~~	~~That, ICAO consider a proposal for an Asia/Pacific Special Implementation Project to be established with the primary objective to improve search and rescue services, coordination and cooperation between island States of the Pacific.~~	~~SIP proposal prepared by Regional Office and approved by Council of ICAO. SIP proposed for deferral to first quarter 2007 to align with other SAR activities planned for Pacific involving other international agencies.~~ ~~SIP SAR Workshop using modified proposal conducted 26 February – 2 March 2007 at the Regional Office~~	~~ICAO APAC Office~~	~~Improved Search and Rescue Services, coordination and cooperation between island States of the Pacific~~		~~**Completed**~~
~~**D 16/59**~~	~~**Decision 16/59 Review of the Regional Plan for the New CNS/ATM System**~~	~~That, the CNS/MET, ATM/AIS /SAR Sub-groups and RASMAG be tasked to review the Global Air Navigation Plan for the CNS/ATM System and the ASIA/PAC Regional Plan for the New CNS/ATM system with a view to avoiding any~~	~~Second Amendment to the Global Plan not yet published, expected late 2006.~~ ~~APANPIRG/17 established a task force (Dec 17/10) to conduct this review. Regional Performance Framework~~	~~ATM/AIS/SAR~~ ~~CNS/MET~~ ~~RASMAG Sub Groups~~	~~Updated Regional Plans in harmony with Global Air Navigation Plan~~		~~**Completed** (Amended Global Plan published and Regional Performance Framework Task Force meeting held)~~

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~D~~		~~duplication with the updated Global Plan. The work should commence immediately after issuance of new edition of the Global Plan.~~	~~Task Force has met on 2 September 2007 and has undertaken the Tasks.~~				
~~C 16/61~~ ~~A D~~	~~**UAV Operation**~~	~~That, ICAO develop, as a priority, appropriate provisions and guidance material for the operation of UAV.~~	~~UAV Exploratory meeting held at ICAO HQ in May 2006. ATM/AIS/SAR/SG/16 did not consider intent of C16/61 had been met and raised additional draft Conclusion re UAV for consideration.~~ ~~During mid 2007 ANC has established ICAO Unmanned Aircraft Systems Study Group (UASSG) to progress these matters~~	~~ICAO APAC Office~~	~~Guidance Material for the Operation of UAV (UAS)~~		~~**Closed**~~
~~C 14/24~~	~~**Preparation for World Radio Communication Conference 2007 (WRC-2007)**~~	~~That, States,~~ ~~a) assign high priority to aeronautical spectrum management;~~ ~~b) participate in the development of States' position for WRCs at the~~	~~As a follow up action this Conclusion was presented to the 41st DGCA Conference. States have been urged to nominate focal point of contact.~~ ~~30 States have designated focal point of contact and~~	~~ICAO APAC Office and States~~	~~States support ICAO Position on WRC 2007 Agenda Items to protect aeronautical spectrum~~		~~**Completed** (Most of ICAO position supported by Preliminary APT Common Proposals (PACP). States urged to project ICAO Position.)~~

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
		~~national level to ensure support to the ICAO position;~~ ~~c) ensure, to the extent possible that, aviation representatives are included in States delegations to the Asia-Pacific Telecommunity (APT) Conference Preparatory Group) meetings and at WRCs;~~ ~~d) to nominate an ICAO designated focal point or contact person for aviation issues related to the WRC-07; and~~ ~~e) ensure participation of the designated focal point or contact person at the ICAO Regional Preparatory Group Meetings for WRC-07, APT Conference Preparatory Group Meetings for WRC-07, and at WRC-2007.~~ ~~*Noted the Conclusion and requested the Secretary General to continue*~~	~~replies from 5 States awaited.~~ ~~42nd DGCA Conference further endorsed the Action Item 41/3.~~ ~~31 States have designated focal point of contact and replies from 4 States awaited.~~ ~~Second RPG meeting was held in Bangkok from 15 to 17 January 2007~~ ~~RPG/2 recommendations were circulated through ICAO APAC State Letter dated 29 March 2007~~ ~~ICAO Final Position on WRC-2007 agenda points was circulated through ICAO State Letter dated 3 July 2007~~				

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~A D~~		~~*encouraging the States to participate at various levels in different fora to provide support for the ICAO position at the forthcoming WRC-2007 so as to protect aeronautical frequency spectrum.*~~					
C 15/15 **D**	**Asia/Pacific Regional ATN Implementation System Management Operational Procedures**	That, the Asia/Pacific regional ATN Implementation System Management Operational Procedures be published to assist States in implementation of the ATN ground infrastructure in the Asia/Pacific region.	Considered premature due to lack of experience in operational aspect to develop a manual procedure. This task can be addressed only after gaining sufficient operational experience of AMHS. Asia/Pacific Regional ATN Implementation System Management Operational Procedures containing initial direction and guidance was published in August 2004. It is expected that sufficient operational experience would be gained by end of 2007.	ATNICG and CNS/MET SG	ATN Implementation System Management Operational Procedures		**On-going**

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
~~**D 15/40**~~ ~~**D**~~	~~**Planning for migration to BUFR-coded aeronautical meteorological messages**~~	~~That,~~ ~~a) the ATN Transition Task Force and the OPMET Management Task Force be tasked to address the issues related to the transition to BUFR-coded aeronautical meteorological messages by conducting studies, as necessary;~~ ~~b) the two Task Forces develop in coordination a regional plan for migration to BUFR-coded aeronautical meteorological information by the end of 2005.~~	~~The matter has been addressed by the OPMET/M TF/3 meeting, March 2005 and the ATN Transition TF meeting in April 2005; joint meeting of the two groups planned for 2006.~~ ~~OPMET/M TF/4 and ATN IC Group addressed the matter. A joint Project Team was formed; the first meeting of the PT planned as a side meeting during CNS.MET SG/10.~~ ~~OPMET/M TF/5 has been advised that WMO and ICAO will study the possibility of using XML in place of BUFR. The regional planning for the transition is suspended until the results of the study are made available.~~	~~CNS/MET SG ATNICG (OPMET Management Task Force)~~	~~Migration to BUFR Code~~		~~**Closed**~~ ~~(Overtaken by events. Possibility of using XML is being studied)~~
C 16/47	**Production of SIGMET posters**	That, in order to enhance the availability and quality of the SIGMET information, Australia and Hong Kong China be invited to produce in 2006, in coordination with the VA/TC Implementation TF,	Draft posters for WS and tropical cyclone SIGMET have been prepared by Hong Kong, China; draft poster for volcanic ash SIGMET has been prepared by Australia and New Zealand in	ICAO APAC Office and States	SIGMET Posters		**On-going**

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

Concl/Dec No. --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
		and in consultation with ICAO, WMO and the TCAC and VAAC Provider States in Asia/Pacific Region, SIGMET posters describing the SIGMET procedures for volcanic ash clouds, tropical cyclones and other hazardous meteorological phenomena, to be used as training material and quick reference tools by the MWOs.	coordination with the ICAO, WMO and Japan. Drafts have been reviewed during the SIGMET Seminar. The production of posters and their dissemination to States is planned to be done by the end of 2007.				

Ongoing – requiring further action(s)
Completed – Follow-up actions completed
Closed – superseded/overtaken by other actions/events

AGENDA ITEM 2: GLOBAL AND INTER REGIONAL ACTIVITIES

Agenda Item 2.1: Global Air Navigation Plan

Agenda Item 2.2: Progress Report on Implementation of DGCA/06 Recommendations

Agenda Item 2.3: Global Aviation Safety Plan

Agenda Item 2.4: ICAO Business Plan

Agenda Item 2: Global and Inter Regional Activities

2.1 Global Air Navigation Plan

Global ATM System

2.1.1 The Meeting received a report on progress made by ICAO toward implementation of a performance-based global ATM system. The report highlighted acceptance by the Council of ICAO of the second amendment to the Global Air Navigation Plan (GANP), work undertaken by the Air Navigation Commission on ATM system requirements and performance framework, and the outcome of the Worldwide Symposium on Performance of the Air Navigation System (Montreal, 26 to 30 March 2007). The meeting encouraged the States and International organizations to follow a common approach by utilizing the guidance provided in the GANP, toward developing and implementing a performance-based Global ATM system.

Environmental Benefits of CNS/ATM Systems

2.1.2 The meeting noted that in response to a request from the ALLPIRG/5 Meeting in March 2006, the ICAO Committee on Aviation Environmental Protection (CAEP), a Technical Committee of the Council, produced an updated paper on issues concerning environmental benefits of CNS/ATM systems at the global and regional levels. It set out the possible development of simplified tools and associated guidance for estimating environmental benefits of CNS/ATM systems at the national level and provided initial "rules of thumb" for the conversion of saving in fuel into environmental benefits and estimates of savings accrue from the implementation of specific measures such as reduced vertical separation minimum (RVSM).

2.1.3 When fuel consumption (fuel burn) data are available that show the change from base-case to CNS/ATM system implementation, the most direct assessment of GHG emissions is to use the following CO_2 conversion factor; namely, 3.16 kg CO_2/kg of fuel. As a part of future planning, the meeting was informed that the ICAO Secretariat was intending to develop a programme to establish potential fuel-burn/emissions reduction targets to be achieved in various ICAO regions in the upcoming years. The meeting invited States to harmonize their assessments by adopting the rules and guidance provided by CAEP, and in particular the CO_2 conversion factor in analyses of environmental benefits of implementing CNS/ATM enhancements.

2.1.4 Furthermore, the meeting noted FAA and strategic ANSP partners were pursuing a variety of near and mid-term initiatives to provide greater efficiencies in the oceanic environment, potentially neutralizing or reducing the production of greenhouse gas emissions. The meeting recognized the contribution made by FAA and called upon States, stakeholders and ANSPs to participate in the development and demonstration of technologies leading to the measurement and reduction of greenhouse gas emissions.

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2.2 Progress Report on Implementation of DGCA/06 Recommendations

2.2.1 The Directors General of Civil Aviation (DGCA/06) Conference on a Global Strategy for Aviation Safety was convened in Montreal from 20 to 22 March 2006 in order to build consensus on improving aviation safety through coordinated action by all Contracting States, ICAO, and the aviation industry.

2.2.2 The meeting reviewed the progress report on the implementation of the DGCA/06 recommendations covering three themes viz: Status of aviation safety today; Improving aviation safety; and Beyond the current framework. The follow-up action by ICAO includes inter alia, development of Global Aviation Safety Plan (GASP), operation of the ICAO Flight Safety Information Exchange website (FSIX), at http://www.icao.int/fsix, availability of a test version of aircraft registration data and the conduct of series of workshops for all the regions on Safety Management Systems. The meeting, while reviewing the progress report, observed that the transparency of information is very essential for ensuring harmonized implementation and enhancing of safety around the world.

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2.3 Global Aviation Safety Plan

2.3.1 The Meeting received a presentation on the recent development of the ICAO Global Aviation Safety Plan (GASP) that provides a common frame of reference for all stakeholders in order to allow a more proactive approach to aviation safety and to help coordinate as well as to guide safety policies and initiatives worldwide in order to reduce the accident risk for civil aviation.

2.3.2 The meeting noted that the GASP was finalized on the basis of the Global Aviation Safety Roadmap developed by the Industry Safety Strategy Group and that it includes twelve Global Safety Initiatives (GSIs) which support the implementation of the ICAO safety Strategic Objective. Each initiative relies on a set of best practices, metrics and maturity levels defined in the Global Aviation Safety Roadmap to ensure that implementation makes full use of the collective experience of the aviation community and that progress is measured in a transparent and consistent way. The GASP follows an approach and philosophy which is consistent with the Global Air Navigation Plan (Doc 9750) and calls for a collaborative approach in the formulation of an action plan that defines, at the regional, sub-regional or national level, the specific activities that should take place in order to improve safety. The meeting agreed that States should apply the GASP and Global Aviation Safety Roadmap principles and objectives and implement its methodologies in partnership with all concerned stakeholders to reduce the number and rate of aircraft accidents.

2/3/2 The meeting noted that the International Business Aviation Council (IBAC) has published their safety strategy in the IBAC website to address aspects of airspace users not included in the Global Aviation Safety Roadmap.

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2.4 ICAO Business Plan

2.4.1 The meeting received a presentation on how with the introduction of its Business Plan, ICAO is moving towards a result-oriented and performance-based Organization. The meeting also noted the number of new working methods being introduced by ICAO that would ensure prudent and efficient use of limited resources. The draft ICAO Business Plan for the next triennium 2008-2009-2010 has been developed and is accessible at: http://www.icao.int/icaonet. Based on the budget approved by the 36th Session of the ICAO Assembly for the triennium 2008-2009-2010, the programmes and tasks detailed in the draft Business Plan will be reviewed and reprioritized and subsequently the Business Plan will be finalized.

2.4.1 In the development of the Business Plan, the meeting noted that the functional integration between different units of the Organization, and especially between Headquarters and Regional Offices, received special attention. The Operational Plans, which are the subsets of the overall Business Plan of the Organization, serve as a tool for project managers to carry out their programmes in order to implement the Business Plan. As a part of functional integration, the Operational Plan of the Regional Programme is embedded in the Air Navigation Integrated Programme (ANIP), thus providing a unified approach to the management and implementation of air navigation projects. The ANIP aligns the technical leader at Headquarters with the Regional Technical Officer. The ANIP is an online environment that allows effective interaction between staff, improves tracking and monitoring of performance, while presenting opportunities for cost savings and more effective management. While still in development, access to this online planning system will be available in January 2008 to the decision-making bodies of the Organization, the Secretariat at Headquarters, as well as the Regional offices, thus providing transparency to the execution of the Business Plan. ICAO will continue to co-ordinate with the States for the implementation of Air Navigation System within the framework of ICAO Business Plan.

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AGENDA ITEM 3: REGIONAL AIR NAVIGATION PLANNING AND IMPLEMENTATION ISSUES

Agenda Item 3.1: AOP

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.1 Aerodrome Operations and Planning (AOP)

Aerodrome Operations and Planning requirements

3.1.1 The Asia Pacific Region is fast emerging as the world's fastest growing aviation market. To cope with the growing demand States have embarked on expansion plans for their airports. In view of these on going developments the Regional Air Navigation Plans (ANP) have to be updated to reflect the current status and future requirements on airport planning. The meeting noted that in light of this, Contracting States that wish to effect a change to Regional Air Navigation Plan should provide the Regional Office with two separate amendment proposals, one for Basic ANP and one for FASID. ICAO Secretariat will circulate a State letter inviting States to review and update the regional Air navigation Plans by 30 September 2007.

Aerodrome certification requirements

3.1.2 The meeting noted that the Standard introduced by ICAO in March 2001 requires that aerodromes used for international operations be certified in accordance with the specifications contained in ICAO Annex 14 with its applicability effective from 27 November 2003. The meeting also noted that as part of the certification process a certified airport is required to have in operation a safety management system as from 24 November 2005.

3.1.3 With the increasing trend towards privatization of aerodromes, the role of the airport operator has changed from the State to the Private sector. To ensure safety, regularity and efficiency of aircraft operations at aerodromes it is essential that the States enforce compliance by aerodrome operators with international standards through a well defined mechanism. India informed the meeting that 10 aerodromes out of 12 listed in the Basic ANP Doc 9673, Volume 1 have been licensed. DGCA India clarified that the procedure for aerodrome licensing contains the requirements specified by ICAO for aerodrome certification. Further the meeting took note that Japan has implemented SMS at all the 18 aerodromes listed in the Basic ANP Doc 9673.

3.1.4 The meeting noted from the ICAO survey that the level of implementation of both aerodrome certification and Safety Management System in the Asia Pacific Region is not satisfactory. The meeting urged the States to allocate a high priority and adequate resources in implementing the requirements of aerodrome certification and Safety Management System in aerodromes.

Bird Hazard Control and Monitoring

3.1.5 The meeting noted the severe extent of damage bird strikes could cause to aircraft and the consequent economic impact on the airline industry. The meeting took note that to this end ICAO has recently upgraded the Recommended Practices related to bird hazard reduction to a Standard (2003) and reporting of bird strikes to ICAO (2005). The meeting invited States to submit the bird strike reports to ICAO Regional Office in ICAO format (ICAO Doc 9332 refers).

3.1.6 Australia informed the meeting about their bird and animal hazard control programme being implemented at their aerodromes and willingness to provide assistance to other States.

3.1.7 In light of bird strikes to aircraft being a serious safety issue, the meeting formulated the following conclusion:

Draft Conclusion 18/1 – Bird Control Committee

That, States, establish by July 2008 a national bird control committee to

a) study, analyze and adopt measures to prevent bird hazards in its aerodromes and their vicinity, and

b) monitor the implementation of a bird control programme by the aerodrome operator, to evaluate its effectiveness and suggest measures for improvement.

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Agenda Item 3.2: ATM/AIS/SAR

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.2 ATM/AIS/SAR Matters

3.2.1 The meeting reviewed a consolidated report of the Sixth and the Seventh Meetings of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/6 and 7), held in November 2006 and June 2007 respectively, and the report of the Seventeenth Meeting of the Air Traffic Management/Aeronautical Information Services/Search and Rescue Sub-Group of APANPIRG (ATM/AIS/SAR/SG/17, July 2007).

3.2.2 The meeting was informed that full copies of the meeting reports were available on the web site of the ICAO Asia and Pacific Office at http://www.bangkok.icao.int/ under the 'Meetings' menu. The meeting expressed its appreciation for the many tasks that had been addressed by RASMAG and ATM/AIS/SAR/SG since reporting to the APANPIRG/17 last year.

Regional Airspace Safety Monitoring Advisory Group (RASMAG)

3.2.3 The meeting reviewed the general activities of the RASMAG, noting that whilst a primary task of RASMAG is to review the monitoring and safety assessment activities carried out by the regional safety monitoring agencies established by APANPIRG for implementation and operation of reduced separation minima, other airspace safety matters were also taken into consideration. Specifically, RASMAG considerations pertaining to the funding of regional airspace safety monitoring and the outcomes of the Regional Airspace Safety Monitoring Committees Task Force (RASMC/TF) have been discussed under Agenda Item 3.5.

3.2.4 The meeting recalled that, as a result of the work of RASMAG, APANPIRG/17 had identified two safety matters that required urgent attention. These were the overdue horizontal safety assessment for the South China Sea route network and the high number of Large Height Deviations (LHD) occurring in the Western Pacific/South China Sea area which had led to the RVSM Target Level of Safety (TLS) for this area not being met.

Completion of Horizontal Safety Assessment for South China Sea

3.2.5 To urgently address the lack of current horizontal safety assessment for the South China Sea route structure, APANPIRG had adopted Conclusion 17/6 urging concerned States to complete, by 30 June 2007, a horizontal safety assessment in accordance with ICAO ATS safety management provisions. Thailand had taken a decision to offer their full commitment in providing appropriate staffing and resources to the Monitoring Agency for the Asia Region (MAAR, hosted by AEROTHAI) in order to satisfy this task in accordance with the requirements of Conclusion 17/6.

3.2.6 Subsequently, MAAR provided the RASMAG/7 with a copy of the completed *Safety Assessment for the South China Sea Airspace where a 60NM Lateral Separation Minimum is applied* (**Appendix A)** to the Report on Agenda Item 3.2 refers) for review. The safety assessment utilized the standard collision risk model applicable to these circumstances and adopted a Sequential Sampling Procedure in order to provide an outcome by way of a Probability Ratio Sequential Test. The safety assessment took into account that there had not been any report of Gross Navigational Error (GNE) during the previous two year period and that there had been a total of 108,337 flight movements from the four designated monitoring areas.

3.2.7 As a result of the aggregate total flight movements being below the minimum movements' threshold to provide a clear outcome, the Probability Ratio Sequential Test was inconclusive, indicating that the Test should be continued. However, as the inconclusiveness resulted from insufficient traffic numbers data to fully conclude the test, inclusion of sufficient flight movement data would provide a clear outcome. Of significance was the fact that no GNE had been reported in the two year sample being used and there was no likely reason for this stable situation to change in the future.

3.2.8 Accordingly, RASMAG/7 agreed that the situation was stable and that there was no evidence to justify concern. The inclusion of flight movements and GNE reports for 2007 would provide sufficient traffic numbers to pass the minimum movements' threshold and was anticipated to push the Sequential Test into the "Route System meets Target Level of Safety" area. In this context, the RASMAG/7 agreed that the safety assessment should be repeated within about 18 months to formally demonstrate that the TLS was being met, and then again periodically or when a significant change was likely to impact the traffic volume and/or disposition. In the interim, the present GNE monitoring arrangements being managed among Hong Kong China, Philippines and Singapore should be continued to ensure data was available.

3.2.9 The meeting recognised that this was the first safety assessment to be conducted in five years since the implementation of the parallel route structure. On behalf of the States concerned, the meeting thanked Thailand for offering to absorb the costs in training for and undertaking this work, and demonstrating via a process compliant to Annex 11 – *Air Traffic Services* that there was no evidence for concern in respect to the safety of horizontal operations.

Progress towards Asia Safety Monitoring Agency (SMA)

3.2.10 MAAR provided information in relation to their intention to expand their RMA (i.e. vertical safety assessment) capabilities to include provision of SMA (i.e. horizontal safety assessment) services for the Asia Region in order to support the implementation of Required Navigation Performance (RNP)-based horizontal-plane separation minima in the Asia Region.

3.2.11 However, in attempting to move forward within AEROTHAI to undertake SMA functions, MAAR has noted that the major difficulty in fulfilling the SMA role is that the duties, responsibilities and other requirements for SMAs are not yet finalized. The meeting was informed that the regional SMA Handbook, which is intended to provide guidelines for the provision of the SMA service, is in the process of development by RASMAG, and MAAR noted that many areas in the document are yet to be completed.

3.2.12 MAAR will continue to interact with RASMAG and the Regional Office in expanding its RMA role to include SMA functions.

Large Height Deviations Occurring in the Western Pacific/South China Sea (WPAC/SCS) Area

3.2.13 APANPIRG/17 considered that the issues relating to high numbers of LHD and TLS being exceeded in WPAC/SCS RVSM operations should be urgently scrutinized by a dedicated working group and agreed to Decision 17/5 establishing the WPAC/SCS RVSM Scrutiny Working Group (WPAC/SCS RSG) and provided comprehensive Terms of Reference (TOR).

3.2.14 Details of the outcomes of the first meeting of the WPAC/SCS RSG (WPAC/SCS RSG/1, January 2007) and WPAC/SCS RSG/2 (June 2007) are provided in Agenda Item 3.4. The meeting was pleased to note the efforts made by the States of the WPAC/SCS RSG which had resulted in a dramatic reversal of the adverse trend in TLS. Also, the in-principle agreement to the Scenario 3 flight level allocation proposal was a notable achievement that was expected to lead to an acceptable solution to the RVSM flight level orientation scheme (FLOS) complexities in the WPAC/SCS area.

Plain Language Definition of Large Height Deviation (LHD)

3.2.15 In response to a request from the WPAC/SCS RSG/1 to RASMAG to develop a user friendly, plain language definition of LHD, the RASMAG/7 noted that there were a number of States also experiencing difficulties in verifying and concluding whether an observed incident would count as an LHD in the RVSM airspace. Accordingly, RASMAG adopted the following plain language definition of an LHD for regional application. RASMAG/7 also agreed to promulgate suitable guidance to support the plain language definition of an LHD, as shown in **Appendix B** to the Report on Agenda Item 3.2.

A RVSM large height deviation (LHD) is defined as any vertical deviation of 90 metres/300 feet or more from the flight level expected to be occupied by the flight.

Non-Provision of Traffic Sample Data and Large Height Deviation Reports

3.2.16 The meeting recalled that Conclusion 16/6 required that States not providing monthly LHD data and annual TSD for December each year in accordance with Conclusion 16/4 would be included on the APANPIRG List of Deficiencies in the ATM/AIS/SAR fields.

3.2.17 MAAR had drawn the attention of the RASMAG/7 to the situation where although the quantity and accuracy of data was slowly improving, MAAR still spent many hours trying to 'fill in the gaps' in data that had been submitted as the alternative was simply to discard the data as unusable. Despite MAAR's best efforts in following up with States, in a number of cases insufficient data had been forthcoming to complete a number of LHD reports, meaning that they had to be discarded from the sample.

3.2.18 The Pacific Approvals Registry and Monitoring Organization (PARMO) expressed similar reservations in relation to the quality of the data submitted. This had led the Federal Aviation Administration (FAA) to pursue a strategy of bi-lateral agreements in relation to the submission of data with the added cost and administrative burden again falling on the FAA.

3.2.19 Recalling that problems in the submission of appropriate quantity and quality of data had been raised many times previously and had led to APANPIRG endorsing Conclusions 16/4 and 16/6, the meeting adopted the following conclusion:

Conclusion 18/2 – Non-Provision of Safety-Related Data by States

That, as a result of the non-provision of safety related data to approved regional safety monitoring agencies as required by APANPIRG Conclusion 16/4, Fiji, Lao PDR, Myanmar, Papua New Guinea and Tahiti be included in the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields in accordance with APANPIRG Conclusion 16/6.

High Number of Errors in ATC Transition Messages

3.2.20 In reviewing the reports of the three regional monitoring agencies (RMAs) and Japan, RASMAG/7 recognized that the numbers and durations of LHDs reported was driving the risk results, with a large proportion of LHDs relating to difficulties in ATC-to-ATC coordination. RASMAG/7 considered that the high number, often in the order of 40% - 50%, of LHDs attributed to errors in ATC transition messaging was by far the most critical aspect of Asia/Pacific regional RVSM operations revealed by the RMA analyses. Gaining control of this aspect was critical to ensuring operations remained within the TLS and undertaking investigations in this respect would be a logical and necessary point for States to start in attempting to reduce the instances of LHD.

3.2.21 In this regard, the meeting recognized the value of ATS Interfacility Data Communications (AIDC) between ATS facilities in reducing the potential for ground-ground coordination errors by enabling routine coordination to be undertaken directly between the ATS equipment in respective ATC facilities. This removed the possibility of human readback and hearback errors, resulting in a decrease in all types of coordination errors and related decrease in LHD occurrences. The meeting was aware that a fully up to date version (Version 3) of the Asia/Pacific AIDC Interface Control Document was now available and urged States to consider the implementation of compatible AIDC capabilities based on the Asia/Pacific AIDC ICD as soon as possible. In recognition of these concerns, the meeting drafted the following conclusion:

Conclusion 18/3 – Prevalence of LHDs from ATC Unit-to-ATC Unit coordination errors

That, in noting the continued prevalence of RVSM Large Height Deviation (LHD) occurrences resulting from ATC Unit-to-ATC Unit coordination errors, as reported by RMAs assessing RVSM operations within Asia Pacific Region, the Regional Office:

a) draws to the attention of States that investigations into LHD should concentrate in this area, and

b) highlights the APANPIRG recommendation that States work towards the implementation of compatible AIDC capabilities based on the Asia/Pacific AIDC ICD between ATC units as soon as possible.

Statement of long term RVSM monitoring requirements

3.2.22 The meeting was informed that the ICAO Separation and Airspace Safety Panel (SASP) had agreed that globally applicable minimum long-term monitoring requirements were required as altimetry system error (ASE), which continued to show adverse drift trends, could not be detected without specialized monitoring systems and could therefore pose a serious risk if uncorrected.

3.2.23 As a result of the deliberations by SASP over a protracted period, it had provisionally adopted a statement of globally applicable long-term monitoring requirements for consideration by the Air Navigation Commission, as follows:

(1) 2 examples of each operator/aircraft-group combination be monitored at least once each 2 years or within intervals of 1,000 RVSM flying hours, whichever is longer, where monitoring data from any region may be used to satisfy requirements

(2) In addition, depending upon regional considerations, "P" percent of the airframes of an aircraft group of each operator accounting for "R" percent of the annual RVSM flying hours within a region be monitored at least once every "L" months or "U" flying hours, with the percentage determined from analysis of observed performance; monitoring data from any region may be used to conduct an analysis of groups and to satisfy monitoring data requirements

3.2.24 The meeting recognized that the pending implementation of long term monitoring requirements would have significant impacts in the way regional monitoring was managed, including the need for widespread regional height monitoring capability to be made available.

3.2.25 IATA highlighted that, in the case of the EUR & NAT areas for example, monitoring requirements were generally met by utilizing fixed installation ground based Height Monitoring Units (HMUs). However, as no such HMUs are readily available in the Asia/Pacific region, required monitoring is generally undertaken using portable GPS monitoring units (GMUs), a process which is comparatively cumbersome, slow and labor intensive.

3.2.26 Accordingly, IATA encouraged APANPIRG to study costs and operational issues associated with the installation of fixed ground based HMUs at various key points in the Asia/Pacific Region to facilitate required monitoring in an expeditious, orderly and managed fashion. IATA would prefer that use of portable GMUs be considered as a last resort, given the additional administrative requirements and added technical and financial complexities.

3.2.27 The meeting was of the opinion that work should be undertaken as soon as possible in order to assess the consequences for the Asia/Pacific Region of the implementation of long term monitoring requirements. In this regard, the RVSM airspace safety monitoring agencies were requested to prepare regional impact statement summarizing the estimated consequences for the Region, in accordance with the following Conclusion:

Conclusion 18/4 – Consequences of global RVSM long term height monitoring

That, the Regional Office draw to the attention of the RVSM airspace safety monitoring agencies within the Asia Pacific Region the ICAO proposed provisional global RVSM long-term height monitoring requirements and request that those agencies prepare a regional impact statement summarizing the estimated consequences for the Region, including consideration of numbers of airframes required to be monitored, for initial review by RASMAG/8 in late 2007.

3.2.28 Australia advised the meeting that there was potential for ADS-B derived data to be used for height monitoring. The meeting requested RASMAG to consider this potential in the regional impact statement. In addition, the meeting tasked the ADS-B Task Force with examining the use of ADS-B for height monitoring.

Guidance Material for Data Link Ground Equipment Procurement and Implementation

3.2.29 RASMAG/7 recalled that the drafting of *Guidance Material for the Asia/Pacific Region ADS/CPDLC/AIDC Ground Systems Procurement and Implementation* had continued since RASMAG/5 (June 2006), with a number of editorial corrections and enhancements being made. Subsequently the draft material had been presented to the 10th meeting of the CNS/MET Sub-group (July 2006, Bangkok) FIT-SEA/5(January 2007), FIT-BOB/8 (January 2007) and ISPACG/21 (March 2007) meetings for review and feedback.

3.2.30 RASMAG/7 reviewed the final draft of the *Guidance Material* and agreed to submit the material to the ATM/AIS/SAR Sub-Group and CNS/MET Sub-Group during July 2007 for review and subsequent submission to APANPIRG/18. ATM/AIS/SAR/SG/17 and CNS/MET/SG/11 suggested some minor editorial amendments to the document and both the Sub Groups endorsed the *Guidance Material* prepared by RASMAG, as amended. In adopting the regional guidance material, the meeting formulated the following Conclusion:

Conclusion 18/5 – Adopt Guidance Material for the Asia/Pacific Region ADS/CPDLC/AIDC Ground Systems Procurement and Implementation

That, the *Guidance Material for the Asia/Pacific Region ADS/CPDLC/AIDC Ground Systems Procurement and Implementation* as shown in **Appendix C** to the APANPIRG/18 Report on Agenda Item 3.2 be adopted and circulated as regional guidance material.

Asia/Pacific Regional RVSM Safety Assessments

3.2.31 The meeting was presented with a summary of the most up to date safety assessments of RVSM operations in airspaces of the Asia/Pacific Region, as prepared by APANPIRG Regional Monitoring Agencies (RMAs) - PARMO of the United States FAA, MAAR of the Aeronautical Radio of Thailand (AEROTHAI), and the Australian RMA of Airservices Australia.

3.2.32 RASMAG is presently working with the Japan vertical monitoring agency in order that Japan may take over RMA responsibility for the Fukuoka FIR. RASMAG/7 requested that Japan prepare a submission addressing the requirements of the RVSM Manual and the RMA Manual in order that RASMAG/8 (December 2007) could consider a recommendation to APANPIRG/19 (2008) that Japan be considered an APANPIRG RMA. Japan advised the meeting that it had demonstrated sufficient RMS capability and provided relevant information to the meeting. The meeting noted that PARMO and MAAR had expressed their support for Japan's RMA capability. Japan is progressing its RMA programme, which includes HMU implementation in Japan, and will commence the technical specification design process in early 2008, based on the appointment of Japan as an APANPIRG RMA in 2007. In order to provide the appropriate APANPIRG approval before APANPIRG/19, the meeting formulated the following Conclusion.

Conclusion 18/6 – Establishment of Japan RMA

That, subject to review by RASMAG/8, JCAB be approved as an APANPIRG Regional Monitoring Agency (RMA) for the Fukuoka FIR.

3.2.33 China advised the meeting that all aspects of work concerning the preparation for China to undertake full RMA functions and ongoing RVSM safety assessment for the China airspace had evolved smoothly since 2006 with the cooperation of PARMO and MAAR. China plans to submit a written report to RASMAG, in accordance with the process adopted by RASMAG, seeking their recommendation that China be appointed as an APANPIRG RMA.

3.2.34 In response to a question from IATA, Japan and China indicated that their RMA service would be provided at no additional cost.

3.2.35 Safety assessments were conducted by APANPIRG RMAs in their respective allocated areas on a periodic basis utilizing the continuous Large Height Deviation (LHD) reporting, including monthly "NIL LHD reports" and the annual December traffic sample data required under APANPIRG Conclusion 16/4. Safety assessments were submitted by RMAs to RASMAG for review.

Technical and Operational Risk

3.2.36 RMAs consider LHD performance in terms of two components. Technical risk relates to the technical performance of equipment, including altimetry systems. Operational risk relates to human performance error and, in simple terms, relates to errors made by pilots and air traffic controllers.

3.2.37 In reviewing the reports of the three APANPIRG RMAs and Japan, it was apparent to RASMAG that performance in terms of technical risk was meeting a good standard throughout all areas of the Asia/Pacific region. In no case had the technical Target Level of Safety (TLS) been exceeded and in general the technical TLS was achieved easily.

3.2.38 However, in terms of operational risk the TLS was not being achieved in some areas. A consistent theme in the analysis of these errors was that of difficulties in ATC-to-ATC coordination, which accounted for a large proportion of LHD. The meeting encouraged all States to be aware that this ground-ground communication interface exhibited weaknesses in all the regional examples examined.

Bay of Bengal area

3.2.39 Based on outcomes derived from the available TSD and LHD reports, the collision risk estimates for Bay of Bengal area satisfy the regionally agreed TLS value of no more than 5.0 x 10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1,000 ft due to all causes.

Western Pacific/South China Sea area

3.2.40 Based on outcomes derived from the available TSD and LHD reports, the collision risk estimates for the Western Pacific/South China Sea Bay of Bengal area **do not satisfy** the regionally agreed TLS value.

3.2.41 RASMAG/7 reviewed the adverse trend that had been evident in terms of the WPAC/SCS safety assessment, recalling that previous RASMAG reports had recorded total risk estimates as follows:

RASMAG/3 (Jun 2005) = 4.90 x 10^{-9} (provisional, due lack of data)
RASMAG/4 (Oct 2005) = 3.46 x 10^{-9} (provisional, due lack of data)
RASMAG/5 (Jun 2006) = 7.08 x 10^{-9}
RASMAG/6 (Nov 2006) = 11.3 x 10^{-9}
RASMAG/7 (June 2007) = 6.09 x 10^{-9}

3.2.42 The meeting was pleased to note that the latest safety assessment for the WPAC/SCS airspace had shown a dramatic reversal of the adverse trend. Although the TLS was still not being satisfied and it was too early to conclude that reversal was a stable trend, the meeting considered that it was a very pleasing result given the previous circumstances.

Australian Domestic and Indian Ocean area

3.2.43 The collision risk estimates determined by the Australian RMA for the Australian Domestic and Indian Ocean area satisfy the agreed TLS values.

Fukuoka FIR

3.2.44 The overall risk results of the RVSM safety assessment for the Fukuoka FIR **do not satisfy** the regionally agreed TLS mainly due to the LHDs caused by “Errors in ATC-unit-to ATC-unit transfer”. In addition to WPAC/SCS RSG activities relating to Fukuoka FIR, the meeting noted that the Japan Civil Aviation Bureau (JCAB) is actively investigating the circumstances and will continue to take remedial actions to reduce the overall risk and coordinate safety assessments to ensure the continuing safety of RVSM operations.

Pacific and North East Asia area

3.2.45 The collision risk estimates determined by PARMO for the Pacific and North East Asia areas satisfy the agreed TLS values.

Exceeding Target Levels of Safety

3.2.46 In noting that the RVSM TLS was being exceeded in both the WPAC/SCS airspace and the Fukuoka FIR, the meeting recalled discussions and advice that had been provided by RASMAG in this respect. Following its review of ICAO guidance, RASMAG had concluded that a single occasion in which airspace safety monitoring identified that the TLS had been exceeded was not sufficient cause to cease the application of the separation minimum. However, fluctuations about the TLS should serve as a warning bell to prompt intensive investigation of the circumstances to consider action to be taken in line with ICAO guidance, to continue monitoring and re-assess the safety on a regular basis to ensure that there was not an unsafe trend.

3.2.47 The meeting expressed appreciation to RASMAG and the RMAs who together continued to provide effective safety oversight of RVSM monitoring activities in the Asia/Pacific Regions in accordance with the regional programmes required under Annex 11 provisions.

ATM/AIS/SAR/ Sub-Group

RVSM Implementation

3.2.48 Since APANPIRG/17 (August 2006, Bangkok), the RVSM Implementation Task Force (RVSM/TF) had met four times as follows:

a) 14 - 16 November 2006, Bangkok, Thailand - RVSM/TF/29
(One-Year Review of RVSM Implementation in the Incheon, Naha and Tokyo FIRs);

b) 12 - 16 March 2007, Bangkok, Thailand - RVSM/TF/30
(China RVSM implementation);

c) 15 - 18 May 2007, Beijing, China - Special Coordination Meeting for the RVSM Implementation by China (SCM/RVSM China)
(Review progress made by China); and

d) 31 July - 1 August 2007, Bangkok, Thailand - RVSM/TF/31
(China RVSM implementation);

3.2.49 The meeting reviewed the outcomes of the RVSM/TF meetings as summarized below.

One-year Airspace Safety Oversight for the RVSM Implementation in Japan and the Republic of Korea

3.2.50 RVSM/TF/29 reviewed RVSM operations in Japan's domestic airspace and the Incheon FIR since implementation on 29 September 2005, and noted that Japan and the Republic of Korea were satisfied with the smooth implementation and efficient operations.

3.2.51 Japan informed the meeting that the Japan Civil Aviation Bureau (JCAB) had verified the RVSM approval status of civil (excluding military) aircraft flying in the RVSM airspace (domestic and oceanic) against the RMA databases of the Pacific PARMO, MAAR and EUROCONTROL, and almost 100 percent of the civil flights properly indicated “W” on the flight plan, and 97.6 percent of civil flights were conducted by those aircraft registered on the RMA databases.

3.2.52 The PARMO had carried out the risk assessment in terms of the technical, operational and overall risk, and the results satisfied the agreed TLS of 2.5 x 10^{-9} and 5.0 x 10^{-9} accidents per flight hour respectively.

3.2.53 As a result of its review, the RVSM/TF confirmed the continued safe and efficient operations in the Japan’s domestic airspace and the Incheon FIR.

Implementation of RVSM in China

3.2.54 In view of China’s plan to implement RVSM by 2008, APANPIRG/17 agreed that the RVSM/TF would work with China on RVSM implementation throughout the Chinese FIRs. China plans to implement RVSM in the Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi and Wuhan FIRs and Sector 01 (airspace over the Hainan Island) of the Sanya FIR at 1600 UTC on 21 November 2008. The oceanic airspace of the Sanya FIR (Sectors 02 and 03) had implemented RVSM along with the South China Sea area.

3.2.55 RVSM/TF/30 reviewed the status of China’s implementation. The RVSM flight level allocation to be implemented by China would be in accordance with the China metric system, which would provide a corresponding 1 000 ft separation. The Russian Federation supported the use of the China level allocation, whereby 8 400 m was equivalent to FL 280. However, as this level allocation was not in accordance with Annex 2 – *Rules of the Air*, China, supported by the Russian Federation, intended to submit a proposed amendment to Annex 2, Appendix 3 to ICAO.

3.2.56 RVSM/TF/30 noted the concerns of some States and international organizations in regard to use of the China metric levels for RVSM and transition procedures that would be required. In this regard, China advised they would hold bilateral meetings with neighboring States to consider amendment of the LOAs and transition issues. RVSM/TF/30 had worked out a table of transition activities listing the Chinese FIRs and its neighboring FIRs.

3.2.57 In regard to safety and airspace monitoring considerations, the United States Federal Aviation Administration (FAA) Technical Center examined the RVSM FLAS proposed by China using the FAA’s Safety Risk Management process. The result of this examination was a safety risk management document (SRMD), which was completed in January 2007, and a draft had been provided to the Air Traffic Management Bureau (ATMB) of the General Administration of Civil Aviation of China (CAAC).

3.2.58 RVSM/TF/30 agreed that the preliminary safety assessment should be conducted early before the Go/No-Go Meeting in September 2007 so that any safety-related problem could be identified and resolved at an early stage of preparation for RVSM implementation in China. China confirmed that they would be responsible for the safety assessment for RVSM implementation in Chinese airspace. RVSM/TF/30 was informed that the mechanism to collect the required traffic sample data (TSD) was being developed, and was expected to be completed by June 2007.

3.2.59 Under cooperation arrangements between the FAA and the ATMB, ATMB would acquire two Global Positioning System (GPS) monitoring units (GMUs) to conduct aircraft height-keeping performance monitoring activities in China.

3.2.60 The Special Co-ordination Meeting for the RVSM Implementation by China (SCM/RVSM China) was organized in order to facilitate the planning and implementation process. The SCM reviewed the implementation planning and, in particular, considered in detail the transition procedures and related issues.

3.2.61 The SCM expressed concerns about the breakdown of vertical separation during the transition between China RVSM levels and ICAO RVSM flight levels, which would happen when, for example, a Chinese ACC assigns an eastbound aircraft 8 900 m, which corresponds to FL 291, and a westbound aircraft was operating at FL 300 from a neighboring FIR. The SCM was of view that the procedures should be established to mitigate the breakdown of separation. The SCM also identified the matters to be progressed by China and timelines for the work to be completed.

3.2.62 At RVSM/TF/31 China presented draft RVSM transition procedures for review, noting that the proposals by China and some of these procedures were yet to be coordinated with States concerned. RVSM/TF/31 reviewed the proposals by China and made suggestions to be considered by both China and States concerned during the coordination process.

3.2.63 After safety-related working groups were established in every ACC in China, China started the trial TSD collection procedure in May 2007, in order to identify problems and errors associated with the collection process. The official TSD collection was undertaken nation-wide from 1 June to 1 July 2007 and had resulted in a one month TSD (June 2007) for the whole China sovereign airspace that was suitable for the preliminary risk assessment. During the early stage of the collection period, additional monitoring was conducted to ensure that all the data collected were without errors.

3.2.64 Although final figures still had to be collated for international and domestic operations, it was evident from examination of global RMA databases and domestic data that the 90 percent figure for airframe approvals would be readily achieved and it was anticipated that the final outcome would be in the order of 95 percent.

3.2.65 The outcome of the preliminary readiness assessment for the Shanghai FIR undertaken by China demonstrated that, based on the collision risk estimates from the received TSD and LHD reports, the technical risk for the RVSM implementation in Shanghai FIR was 1.43×10^{-10} and the total risk attributed to all causes was 3.936×10^{-9} fatal accidents per flight hour. Therefore, the risk estimates **satisfy the agreed regional TLS** value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 300 m and to all causes, respectively.

3.2.66 The following tentative schedule of meetings has been agreed by the RVSM/TF:

RVSM/TF/32 (Go/No-Go decision meeting)	17–21 September 2007	Beijing
RVSM/TF/33 (90 days review meeting)	April 2008	Beijing
RVSM/TF/34 (One year review meeting)	January 2009	TBD

3.2.67 The meeting noted the United States cooperative program, which began in July 2005, to assist China in its plan to implement RVSM,.

3.2.68 Several activities on RVSM implementation matters have taken place, including visits by ATMB specialists to FAA Technical Center and FAA's Forth Worth Air Route Traffic Control Center, visits by FAA air traffic specialist to several ACCs in China, and visits by specialists from the FAA Technical Center to Beijing.

3.2.69 The most recent visit was by the principal contributors to the ATMB's pre-implementation safety and readiness assessments to the FAA Technical Center during the week of 20 August 2007. The visitors presented the complete June 2007 TSD covering all of sovereign Chinese airspace and also ATMB archives of LHD information as well as the results of the recently established program to collect LHD reports explicitly for analysis in connection with RVSM implementation.

3.2.70 The ATMB and the FAA ATO had agreed that the FAA focus during the August meeting would be on constructive review and independent checking of the readiness and safety assessment, as opposed to the sharing of experience and provision of tools and results which have characterized previous ATMB – FAA Technical Center cooperative activities. Accordingly, the FAA Technical Center reviewed all pertinent readiness and safety assessments with the ATMB specialists.

3.2.71 The Technical Center examined the methodology used by the ATMB and examined the results through an independent crosscheck using its own databases of RVSM approvals. The Technical Center reviewed the overall approach to conducting the safety assessment. In particular, there was a thorough examination of parameter values used in risk model calculations. Following the August meeting, the Technical Center expects to present a paper to RVSM/TF/32 documenting its findings.

3.2.72 The meeting noted that China, with the assistance of the RVSM/TF, addressed vital issues such as RVSM level allocation, harmonization of flight level and transition, ATC and flight crew training, RVSM airworthiness and operational approval, and most importantly the safety assessment and monitoring to support the application of RVSM in China. China was also enhancing its coordination with ICAO, International Air Transport Association (IATA), International Federation of Air Line Pilots' Associations (IFALPA), neighboring States and all stakeholders operating in China's airspace including international airlines.

3.2.73 China presented the preliminary report of the airspace safety assessment for China's RVSM implementation, and reported to the meeting that all preparations would be completed on schedule by the end of October 2007.

3.2.74 IBAC expressed their support and encouraged the RVSM implementation by China in advance of the Olympic Games in 2008. The Chairman of the RVSM/TF indicated that with successful RVSM implementation by China most of the Region would have complete RVSM implemented.

Implementation of ATFM in the Bay of Bengal and South Asia

3.2.75 The meeting reviewed the outcomes of the Air Traffic Flow Management Task Force (ATFM/TF) convened under the auspices of the Bay of Bengal ATS Coordination Group (BBACG), that led to the decision taken by ATFM/10 (May - June 2007) to implement a full and permanent operational ATFM system across the Bay of Bengal and South Asia from July 2007 for air traffic transiting the Kabul FIR during the night time peak traffic period (2000-2359UTC).

3.2.76 The meeting recalled that the ATFM/TF commenced a ghosting phase of the ATFM Operational Trial on 29 June 2006, utilizing the ATFMU established at the Bangkok ACC as well as the web based automated Bay of Bengal Cooperative ATFM Advisory System (BOBCAT) developed by Aeronautical Radio of Thailand Limited (AEROTHAI) and the ATFM/TF specifically for this purpose. As a result of satisfactory ghosting performance, the ATFM trial advanced to the operational phase on 24 July 2006 and, pursuant to a comprehensive review by ATFM/TF/7 (August 2006), the operational phase of the trial was extended until further notice.

3.2.77 ATFM/TF/10 conducted a thorough review of all aspects of the ATFM operational trial, noting that the data analysis demonstrated continuous improvement by all involved. ATFM/TF/10 further noted that despite the substantial traffic increase of about 40% over the 9 - 10 month period since commencement of the trial, as a result of the ATFM procedures 73% of aircraft received their allocated flight level or a higher suitable flight level for Kabul FIR entry during February 2007, and this increased to 88% in May 2007. On 26 May, all aircraft received their allocated flight level or a suitable higher level. Additionally all four ATS routes available through the Kabul FIR were becoming more evenly used by airlines.

3.2.78 In making a 'Go' decision to advance ATFM procedures from operational trial to full and permanent operational implementation, with effect from 5 July 2007, ATFM/TF/10 recognized that there were still many areas in which improvements were necessary and that the continuation of the ATFM/TF and establishment of a BOBCAT Scrutiny group were essential. Accordingly, the ATFM/TF had agreed to pursue a number actions and enhancements.

3.2.79 The meeting was informed that Thailand would be making continuous upgrades to the ATFMU and BOBCAT system in order to improve the system performance and associated benefits. The meeting recognized some of the benefits that would accrue as result of the ATFM implementation, including:

a) Fuel savings: approximately 12 million kg per year,
b) Carbon emission reduction: approximately 50 million kg per year,
c) Airline operating cost savings: approximately US$12 million per year,
d) Minimize reroutes and diversions, and
e) Maximize route and flight level usage

3.2.80 The meeting agreed that this implementation of long range ATFM procedures was a milestone in enroute ATFM operations in the Asia/Pacific Region. The ATFM system provides a slot allocation service to aircraft that are departing airports up to 7 hours away from the allocated entry window into the Kabul FIR and which will transit up to 10 FIRs with different airspace and separation requirements before reaching Afghanistan.

3.2.81 IATA had indicated, by way of a June 2007 press release, their appreciation for the leadership of the Asia/Pacific Regional Office, the contributions of AEROTHAI to develop BOBCAT, and the efforts of States participating in the ICAO Air Traffic Flow Management Task Force.

3.2.82 In noting the outstanding actions and enhancements planned to increase the effectiveness of the ATFM procedures, the meeting supported the establishment of the BOBCAT Scrutiny Group to ensure the fully transparent and even-handed long term management of ATFM arrangements. Importantly, the meeting recognized the significant environmental benefits that would result from this important initiative and congratulated all the members of the ATFM/TF on the remarkable achievement in implementing the international long range ATFM procedures for the Bay of Bengal and South Asia.

Air Traffic Flow Management – Concepts

3.2.83 ATM/AIS/SAR/17 noted that ATFM was a service complementary to air traffic control (ATC) and the objective of ATFM was to ensure an optimum flow of air traffic to or through areas and aerodromes where traffic demand at times exceeds the available capacity of the ATC system. This optimum flow would be achieved by maintaining, in continuous cooperation with related ATC units and airspace users, a balance between the traffic demand and the ability to accommodate that demand.

3.2.84 The FAA detailed current ICAO documentation regarding air traffic flow management (ATFM) and described some of the on-going initiatives in the Caribbean and South American areas. With the assistance of relevant ICAO Regional Offices, this had led to the development of a formal Concept of Operations for the CAR/SAM areas, a draft version of which is shown at **Appendix D** to the Report of Agenda Item 3.2. Based on its experience with the ATFM system in the North American (NAM) region, the FAA outlined a number of operational benefits of ATFM to the meeting.

Common Air Traffic Flow Management Terminology

3.2.85 In regard to the ATFM implementation, Japan and the United States presented the meeting with details of the work accomplished between the FAA Air Traffic Control System Command Center (ATCSCC) and the Japan Civil Aviation Bureau Air Traffic Management Center (ATMC) to support a regional and global effort to standardize ATFM terminology and phraseology.

3.2.86 To address bilateral issues in the North and Central Pacific oceanic areas, the FAA and JCAB had agreed to an *Interim Guideline for ATFM Communication,* as shown at **Appendix E** to the Report on Agenda Item 3.2.

3.2.87 Japan informed the meeting that in addition to the coordination between ATCSCC and ATMC, international ATFM coordination would take place with their neighboring States in the Northeast Asia in the foreseeable future, and Japan and the United States considers there are advantages in adopting the guidelines for ATFM communication throughout the Asia/Pacific Region.

3.2.88 The meeting supported this initiative, and encouraged Japan and the United States to continue this work and present the documentation to the ATM/AIS/SAR/SG/18 meeting in 2008 in accordance with the established procedure of APANPIRG.

Development of ATFM in Asia/Pacific Region

3.2.89 In extension of the discussions above and recalling that APANPIRG had recently added an item to its List of Key Priorities in relation to development of ATFM regionally; the meeting recognized the need to actively endorse AFTM activities in the Asia/Pacific region. The meeting considered that a useful way forward in bringing existing ATFM provisions, techniques and procedures to the attention of States in the Asia/Pacific Region would be to conduct an ATFM seminar. Such a seminar would enable parties experienced in the provision of ATFM to pass on knowledge and guidance to States with less experience and was expected to lead to wider implementation of ATFM regionally, with associated efficiency and environmental gains. Australia, Japan, Thailand and the United States offered support for such a seminar and the meeting agreed to the following conclusion in this regard:

Conclusion 18/7 – Conduct regional ATFM Seminar

That, noting the provisions of GPI- 6 *Air Traffic Flow Management* and the increasing numbers of actual and planned ATFM implementations occurring in the Asia/Pacific Region, the ICAO Asia/Pacific Regional Office conduct, with assistance from States experienced in ATFM, a 3-day Air Traffic Flow Management Seminar during 2008.

3.2.90 Japan informed the meeting that Japan Civil Aviation Bureau (JCAB) established the Air Traffic Flow Management Center more than 10 years ago, which was recently integrated with the airspace management and oceanic ATC to be the Air Traffic Management Center. Japan offered to provide the assistance and invited the Air Traffic Flow Management Seminar to be held in Fukuoka, Japan. The meeting expressed appreciation to Japan and accepted the generous offer.

Traffic Movements and GNE Reports in the South China Sea

3.2.91 Singapore provided the ATM/AIS/SAR/SG/17 with the traffic movements and gross navigation error (GNE) reports from July 2006 to May 2007 in accordance with an Operational Letter of Agreement signed in 2001 for the Monitoring of Aircraft Navigation Errors in the South China Sea. The Sub-Group recognized that Singapore was the Monitoring Authority responsible for collating relevant data concerning flight operations along the designated RNAV routes in the South China Sea area, involving China, Hong Kong China, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam.

3.2.92 ATM/AIS/SAR/SG/17 had agreed to an initiative from Singapore that, in order to facilitate the implementation of RNP 10 based separations, i.e. 50NM lateral/50NM longitudinal, Singapore would monitor the GNE on the remaining two parallel routes in the Singapore FIR on the appropriate route segments. This was essential to enable any further horizontal safety assessments to be structured to assess RNP10 (50NM/50NM) operations as it was anticipated that this necessary step to RNP10 configuration would be taken in the foreseeable future.

3.2.93 The meeting noted that implementation of 50NM lateral and longitudinal separation was imperative in the short term to manage the increasing traffic levels in this area, and that implementation of 30NM/30NM separation should be considered as the medium term goal.

Implementation of ATS Routes in the Asia/Pacific Region

3.2.94 The meeting noted that the *Asia/Pacific ATS Route Catalogue* Version 1 was published in August 2005 and the most up-to-date version was now available from the ICAO Asia/ Pacific Office web site under the menu “e Documents”. On-going updates had been undertaken by the Regional Office based on the information made available by States and airspace users.

3.2.95 By July 2007, 14 routes in Chapter 5 of the Route Catalogue had been implemented. IATA placed on record its appreciation to all States and the Regional Office for their respective roles in route planning and implementation. In particular IATA wished to thank China and Vietnam, for their consideration to implement the route between DANANG and SANYA which could potentially save more than 730 NM.

3.2.96 IATA also applauded the Bay of Bengal States such as India, Malaysia, Myanmar and Thailand for their efforts in establishing four bypass routes between Hat Yai (HTY) and Ranong (RAN), Penang (VPG) and GIVAL, GIVAL and IBANI, and between Kota Bharu (VKB) and Ranong (RAN) in conjunction with the ATFM implementation, which had improved the flow of traffic in the evening peak over the Bay of Bengal and the Kabul FIR. IATA also thanked India and Pakistan for their ongoing efforts to connect BUTOP to JHANG, which would save up to 50 NM.

3.2.97 At the meeting, however, IATA highlighted that many routes in the Catalogue remain unimplemented with no forward visibility as to whether or when there would be a positive outcome. In IATA’s view, this delays the benefits that would accrue in fuel savings and environmental benefits envisaged by APANPIRG 15 which “acknowledged that a comprehensive ATS route review would assist with achieving positive environmental outcomes, primarily as a result of shortening routes whenever it was appropriate to do so.”

3.2.98 Accordingly, IATA requested that States consider, as a matter of priority, the implementation of more routes from the Route Catalogue and, if the entire route cannot be implemented, consider realignment of the requested route, implementation of segments of the required route or implementation of Conditional routes in accordance with Conclusion 17/7.

3.2.99 The meeting noted that ATS coordination groups review the ATS Route Catalogue continually in accordance with APANPIRG Conclusion 16/10, and take action on the route requests in the Catalogue. In light of the low responses from States and the request from IATA, the meeting agreed to delegate undertaking the comprehensive review of the Catalogue to the ATM/AIS/SAR/SG.

Review of RNP10 Operations on L642 and M771

3.2.100 IATA informed the ATM/AIS/SAR/17 that the introduction of the new South China Sea route structure in November 2001, together with the introduction of RVSM in February 2002, brought timely relief to a very crowded and inefficient airspace at a time when the traffic was experiencing double-digit growth. However, it was recently highlighted by Singapore that two of the routes i.e., L642 and M771 serving the Kuala Lumpur/Singapore and Hong Kong city pairs were beginning to experience congestion on account of a 40 % traffic increase from 2001 to 2005.

3.2.101 The first meeting of the South China Sea RNP Implementation Task Force (March 2006, Singapore) agreed among other things, that it would work towards the implementation of RNP10 operations on L642 and M771 as a first step. However, there had been no further progress. The meeting recalled that, as a result of the Regional Office being unable to assist with this matter because of resource limitations, Singapore had agreed to take primary carriage of this task force. The task force would operate with minimal resources from the Regional Office and report to ICAO through the South-East Asia ATS Coordination Group (SEACG).

3.2.102 Singapore agreed during ATM/AIS/SAR/SG/17 that they would take action to hold the Special Coordination Meeting involving China, Hong Kong China, Singapore, Viet Nam, ICAO and IATA on RNP10 operations on L642 and M771 and had issued invitations for this meeting on 25 – 27 September 2007. Singapore would also take action to hold the second RNP-SEA/TF in Singapore in the foreseeable future. The meeting thanked Singapore for their willingness to assist in this these matters and affected States, ICAO and IATA would look forward to participating in the SCM and Task Force meetings.

Oakland ARTCC ATS Route Realignment

3.2.103 The United States informed the ATM/AIS/SAR/17 that the FAA had been evaluating ATS routes and airspace structure in the vicinities of Guam and Hawaii. The proposed ATS route changes include:

- Five route changes in the vicinity of Guam and planned to be effective August 2007;
- Realignment of six ATS routes from Hawaii to South Pacific destinations; and
- Realignment two Central East Pacific (CEP) waypoints and A322 between the Continental United States.

3.2.104 After coordination with other air navigation service providers (ANSPs), the FAA will be responsible for completing the necessary ICAO coordination. Implementation of the route changes in the vicinity of Guam took place on 30 August 2007, with the changes in the vicinity of Hawaii occurring during 2nd Quarter 2008. These route realignments are expected to reduce total flying distance per year by 220,000 NM and 110,000 NM respectively. The United States thanked Japan for the flexibility that had been demonstrated in negotiations for the routes in the Guam area.

3.2.105 The meeting recognized the significant efficiencies that would be gained by the route realignments and congratulated the United States on this initiative that would result in quantifiable environmental benefits.

3.2.106 IATA highlighted the effectiveness of the project management approach that had been adopted by the United States in pursuing the route enhancements. The process had been initiated entirely by the United States using environmental benefits as the main justification and had made good use of consultative methodologies that included full coordination with affected neighboring States and airspace users. IATA considered that this was a ‘best practice’ approach that had resulted in dividends for all and requested that the methodology and success of these initiatives be highlighted as a model for other States to follow.

Review of North and Central Pacific Airspace

3.2.107 IATA highlighted to the meeting that some of the longest-range flights in the world operate within the North (NOPAC) and Central Pacific (CEPAC) airspace. Increasingly, ultra long-range operations are being initiated between Asia and North America and these operations will continue to increase as new ultra long-range aircraft and more point to point operations are initiated by operators.

3.2.108 However, although the PACOTS “flex” track system does provide useful efficiencies, further improvements could be made. Additionally, the fixed route structures of the NOPAC and CEPAC areas have not seen any appreciable change over the past decade.

3.2.109 IATA informed the meeting that the Oceanic Working Group (OWG), hosted by the FAA and attended by IATA, airlines, Air Traffic Service Providers from Anchorage and Oakland Air Traffic Control Centers, Nav Canada and other interested parties, reports to IPACG. In 2005 the OWG discussed a need to review the efficiency of the North and Central Pacific region’s airspace to identify constraints and potential improvements. A request was forwarded by OWG to IPACG/23 (Tokyo, July 2005) to conduct a review of the Pacific airspace, resulting in IPACG action item IP/23-2 calling for a study to evaluate the effectiveness of current airspace and route structures.

3.2.110 The matter was again discussed at IPACG/26 (Anchorage, May 2007), which took an opportunity to review progress made within the Eastern Pacific region of airspace in which Oakland, Anchorage, and Nav Canada’s Vancouver ACC provide ATS. Constraints within the PACOTS flew track generation process were identified for resolution. Outcomes from the Russian Far East Flex Track Trials, conducted in March 2007, illustrated how increased efficiency of operations was possible when some identified constraints were removed. In June 2007, the Russian Federation implemented several new routes in the Russian Trans East route system that have provided improved efficiency, reduced delays, and reduced emissions, with an overall improvement to operations.

3.2.111 In light of the foregoing, the meeting supported the concept of concerned States undertaking a Pacific Airspace review, with primary focus on ATS route structures in the NOPAC and CEPAC “fixed” route systems.

<u>Unmanned Aircraft Systems (UAS)</u>

3.2.112 ATM/AIS/SAR/SG/17 was provided with a progress report on work in relation to Unmanned Aircraft Systems (UAS), previously referred to as the Unmanned Aerial Vehicles (UAV) or similar, and the establishment of an ICAO Study Group to assist the Secretariat in coordinating work to address UAS issues.

3.2.113 The Sub-group was informed that the first UAV meeting (May 2006, Montreal) had reviewed the results of a questionnaire sent out by ICAO to selected States and international organizations, and the current status of ICAO work concerning UAVs. Consequently, the UAV meeting identified the following critical issues related to UAV activity that had to be addressed and resolved: certification, licensing, regulations, technical issues, human factors issues, public acceptance, environment, and security. The first UAV meeting agreed to form the *Informal ICAO Working Group on UAVs* to continue work in this regard.

3.2.114 The meeting noted that the second informal ICAO meeting (January 2007, Florida) concluded that work on technical specifications for UAV operations was well underway within both RTCA and EUROCAE and was being adequately coordinated through a joint committee of the two working groups. The main issue for ICAO was therefore, related to the need to ensure safety and uniformity in international civil aviation operations. In this context, it was agreed that there was no specific need for new ICAO SARPs at this early stage. However, there was a need to harmonize notions, concepts and terms.

3.2.115 Consequently, the meeting agreed that ICAO should coordinate the development of a strategic guidance document that would guide the regulatory evolution that, even though non-binding, would be used as the basis for development of regulations by the various organizations and States. As regulatory material developed by States and organizations gained maturity such material could be proposed for inclusion in the ICAO guidance document. The document would then serve as the basis for achieving consensus in view of later development of SARPs.

3.2.116 Also of significance from the work of the second meeting was the suggestion that the terminology *Unmanned Aircraft Systems (UAS)* be adopted for global use, in line with existing RTCA and EUROCAE language. Accordingly, the meeting agreed to adopt the terminology <u>***Unmanned Aircraft Systems (UAS)***</u> for regional use when referring to these matters.

3.2.117 Finally, it was concluded that ICAO should serve as a focal point with the aim of ensuring global interoperability and harmonization; to develop a regulatory concept; to coordinate the development of UAS SARPS; to contribute to the development of technical specifications by other bodies and to identify communication requirements for UAS activity. Subsequently, the Air Navigation Commission supported establishment of an ICAO study group to assist the Secretariat with this work. The terms of reference and work programme of the Unmanned Aircraft Systems Study Group (UASSG) are at **Appendix F** to the report on Agenda Item 3.2.

<u>ATS Interfacility Data Communication Review Task Force</u>

3.2.118 A meeting of the ATS Interfacility Data Communication Review Task Force (AIDC/TF, February 2007) was held primarily for the purpose of updating the Asia/Pacific Regional Interface Control Document for ATS Interfacility Ground/Ground Data Communications (AIDC ICD) as required by APANPIRG Decision 17/13.

3.2.119 The AIDC/TF meeting also noted the outcome of OPLIKP/1 on AIDC and reviewed the development of ACP and ATNICG on ATN/AMHS/AIDC. The main outcomes of the AIDC/TF meeting were as follows:

a) exchanged experience gained and lessons learned in the implementation of AIDC,

b) updated the Regional Office records on the status of regional implementation of AIDC,

c) developed an updated version (draft Version 3) of the Asia/Pacific ICD for AIDC,

d) endorsed a sample Template for bilateral letter of agreement on AIDC for inclusion in the AIDC ICD, and

e) updated the draft FASID Table CNS 1E on AIDC and the AIDC related information in the CNS/ATM Implementation and Planning Matrix.

AIDC Interface Control Document Version 3

3.2.120 In undertaking the development of an updated version of the Asia/Pacific ICD to meet the provisions of Decision 17/13, the AIDC/TF meeting reviewed a series of working papers that had been prepared by members of the Informal South Pacific ATS Coordination Group (ISPACG). The ISPACG had been working with differing AIDC implementations in various parts of the South Pacific for several years and had identified a number of matters in the ICD Version 2 document that needed updating.

3.2.121 The AIDC/TF meeting prepared a draft ICD Version 3 document which included all the amendments agreed by the meeting. The draft Version 3 was subsequently reviewed by ISPACG/21 and ATM/AIS/SAR/SG/17 and a number of editorial amendments were agreed and incorporated. Additional review was undertaken by the CNS/MET/SG/11 meeting which, in addition to editorial updates, noted and agreed to the changes made by ATM/AIS/SAR/SG/17.

3.2.122 As a result of the review process, the ATM/AIS/SAR and CNS/MET Sub-Groups jointly endorsed the AIDC ICD Version 3 document, as amended. In adopting the Version 3 ICD, the meeting formulated the following Conclusion:

Conclusion 18/8 – Adopt Version 3 Asia/Pacific AIDC ICD

That, the Version 3 *Asia/Pacific Regional Interface Control Document for ATS Interfacility Ground/Ground Data Communications* as shown in **Appendix G** to the APANPIRG/18 Report on Agenda Item 3.2 be adopted and circulated as regional guidance material.

Dissolution of the AIDC Review Task Force

3.2.123 With the completion of Version 3 of ICD for AIDC, outstanding matters with respect to ATN/AMHS Transition support as indicated in the section 3.2 of Part II of the AIDC ICD which need to be further addressed can be included in the work programme of the ATN Implementation Coordination Group and CNS/MET Sub-group of APANPIRG. In view of the foregoing, the ATM/AIS/SAR and CNS/MET Sub Groups jointly supported the dissolution of the AIDC Task Force and the meeting adopted the Decision below:

Decision 18/9 – Dissolution of AIDC Review Task Force

That, having completed the Version 3 of the Asia/Pacific AIDC ICD in accordance with the APANPIRG Decision 17/13, the AIDC Review Task Force be dissolved. Any residual tasks with respect to ATN/AMHS transition support be dealt with by the ATNICG and CNS/MET Sub Group of APANPIRG.

Global AIDC Interface provisions

3.2.124 The meeting noted that coordination errors across FIR boundaries are the most crucial aspect of APAC regional RVSM operations, and identified automation using AIDC as a means of mitigating errors in controller to controller verbal coordination. In this regard, the meeting noted the existing APANPIRG recommendation that States work towards the implementation of compatible AIDC capabilities based on the Asia/Pacific AIDC ICD between ATC units as soon as possible.

3.2.125 The meeting noted the complexities being experienced by States implementing AIDC in areas where several ICAO regions are involved. A variety of differing AIDC ICD provisions in ICAO regions adds to the complexity and expense in configuring automated systems to communicate with each adjacent ANSP.

3.2.126 The meeting recognized the lack of a common ICD for global implementation of AIDC and sought advice from ICAO on a suitable automated method of transferring planned and/or current aircraft data from one ANSP to another.

Annex 2 - Variations in True Airspeed

3.2.127 The meeting was informed about discussions during ATM/AIS/SAR/SG/17 regarding the rule set forth in Annex 2, paragraph 3.6.2.2 b, which requires ATC to be notified when the average true airspeed at cruising level between reporting points varies or is expected to vary from that given in the flight plan by plus or minus 5 per cent of the true airspeed. ATM/AIS/SAR/SG/17 noted that there was a general lack of a common understanding as to what the expression “inadvertent changes” in Annex 2, paragraph 3.6.2.2 meant.

3.2.128 It was evident from the discussions that there were a number of potential interpretations of the terminology “inadvertent changes” as used in paragraph 3.6.2.2 of Annex 2 and that, in the case of speed variations, the differing interpretations could lead to potentially unsafe outcomes, particularly where reduced longitudinal separation standards are implemented. The meeting agreed that clarification of the intent of paragraph 3.6.2.2 b) of Annex 2 in relation to the 5 per cent parameter was also necessary noting, for example, that a 5 per cent increase from M.80 was approximately M.84 and, conversely, a 5 percent decrease from M.84 was M.80. The meeting sought the assistance of the ICAO Air Navigation Commission in clarifying these matters and adopted the following Conclusion:

Conclusion 18/10 – Clarification of intent of Annex 2 in relation to variations in true airspeed

That, noting the importance of full ATC awareness of actual aircraft speed differentials in the application of reduced longitudinal separation and that a 5 percent variation in speed meant the difference between M.080 and M.084, ICAO be invited to:

a) clarify the intent of paragraph 3.6.2.2 of Annex 2 – *Rules of the Air* in relation to the terminology “inadvertent changes”; and

b) review the 5 percent parameter as applicable to variations in true airspeed described in paragraph 3.6.2.2 b) of Annex 2 to establish whether this parameter should be reduced in areas where reduced longitudinal separation standards were being applied.

Endorsement of ICAO Five Letter Name Codes and Route Designators Database (ICARD)

3.2.129 The meeting was informed on developments to expand the use of the ICAO Five-Letter Name-Codes and Route Designators Database (ICARD) Internet based application. At present, the coordination of Five-Letter Name-Codes (5LNC) among States and ICAO Regional Offices was a very complex and time-consuming process using a paper-based methodology. Since October 1995, the ICAO European and North Atlantic (EUR/NAT) Office and EUROCONTROL had been working together to develop and maintain a common database of facilities and services required for international air navigation within the EUR Region. In February 1998, the first application on the EUROCONTROL website was developed to support the allocation process of 5LNC used for significant points on ATS routes.

3.2.130 The web-based ICARD system would allow end-users to electronically view, search, reserve, allocate, modify and receive a confirmation of the assigned code. If the user was an authorized member State user or an ICAO Regional Officer, the user can search, reserve, allocate and modify 5LNC from the reserve list of 140,000 codes while ensuring worldwide uniqueness, as well as browse the entire assigned 5LNC database. One of the important aspects of ICARD was enabling resolution of the existing duplicate 5LNC for en-route, as these would be readily identified by the electronic processes of the database.

3.2.131 In light of this, ICAO EUR/NAT Office was willing to assist in expanding the application of ICARD outside of the EUR/NAT Region and the ICAO Middle East Region, who had also implemented ICARD in September 2005. During late 2006, the Asia/Pacific Regional Office was invited to join ICARD and selected a small group of States to join a trial implementation. Since early 2007, Australia, Japan, Malaysia and New Zealand had been participating in the initial phase of trial operations of ICARD.

3.2.132 The meeting noted the recent developments and that agreement between ICAO and EUROCONTROL had been reached regarding the use of ICARD on a global basis. The ICAO EUR/NAT Office would also assist the ICAO Western and Central African (WACAF) and Eastern and Southern African (ESAF) Offices in the implementation of ICARD.

3.2.133 The meeting recognized the considerable benefits of using the ICARD system and encouraged all States in the Asia/Pacific Region to join the operation at the earliest opportunity, noting that arrangements for appropriate training would need to be put in place by the Regional Office as resources permitted. In support if this initiative, the meeting agreed to the following Conclusion

Conclusion 18/11 – Endorsement of the Use of ICARD System

That, so as to facilitate and enhance the management of the five-letter name-codes in the Asia and Pacific Region:

a) States endorse the use of the ICAO Five-Letter Name Codes and Route Designators (ICARD) database, initially developed by the EUR/NAT Office and Euro control; and

b) the Regional Office provide all necessary guidelines to facilitate the regional implementation of ICARD.

Proposed amendment to the ICAO Flight Plan

3.2.134 Attention was drawn to the State Letter (Ref.: AN 1312.5-07135, 25 May 2007) containing a proposal developed by the Secretariat, assisted by the ICAO Flight Plan Study Group (FPLSG), for a comprehensive amendment of the flight plan provisions of the PANS-ATM. Substantial parts of this proposal had been developed by the FPLSG in collaboration with the Operational Data Link Panel (OPLINKP) and the Required Navigation Performance and Special Operational Requirements Study Group (RNPSORSG). The meeting noted the information in the State Letter in relation to amendments to the ICAO Flight Plan and that an implementation date of November 2010 was proposed.

Regional Survey of Meteorological Information in Support of ATM

3.2.135 ATM/AIS/SAR/SG/17 was informed of a planned survey of the meteorological requirements for ATM to be conducted by the MET/ATM Task Force of the CNS/MET Sub Group as a result of Conclusion 17/43. The importance of the meteorological information for ATM has been outlined in the ICAO Global ATM Operational Concept. The performance of most of the ATM system components were weather dependent. Paragraph 2.9.18 of the Operational Concept outlines the main benefits for the ATM system from improved meteorological information.

3.2.136 The effect of the expected improvements of the meteorological information and services would be much greater if the new products and services were based on well defined ATM requirements for MET. The Asia/Pacific MET/ATM Coordination Seminar (February 2006) recommended that the ATM requirements should be further studied. APANPIRG/17 endorsed this recommendation and requested the MET/ATM/TF to conduct a regional survey. It is the intention of the Task Force to use the results of the survey to identify common requirements and identify areas to be considered for further development.

3.2.137 The meeting agreed that feedback in relation to the proposed survey questionnaire, a copy of which is provided at **Appendix H** to the Report on Agenda Item 3.2, would be transmitted directly to the Rapporteur of the MET/ATM Task Force, Mr. Ted Williams of the Australian Bureau of Meteorology, at T.Williams@bom.gov.au as soon as possible to allow the questionnaire to be finalized and distributed. The survey is expected to be completed by the end of 2007.

Operational Performance Requirements for End-to-End Satellite Communications

3.2.138 The United States informed the ATM/AIS/SAR/SG/17 that initial findings of the 30/30 Scrutiny Group established to evaluate the 30NM lateral/30NM longitudinal operational trial which commenced in December 2006 in the Oakland FIR indicated that the initial trials were a success, with one notable exception. The exception was the reliability of the Perth Ground Earth Station (GES) which had suffered several outages over the course of the 30/30 trials.

3.2.139 Based on this information and the knowledge that the Perth GES was still subject to outages due to known and unknown problems, the FAA made the determination to expand the 30/30 trials on the planned date of March 13, 2007 but with a different operational concept. The FAA restricted the use of ADS based separation (30/30 and 50NM longitudinal) to application for climb/descent only, not for cruise flight.

3.2.140 On April 18, SITA successfully made the last planned calendar year 2007 upgrade to the Perth GES. This action corrected all of the problems known at that time with the Perth GES that caused the FAA to restrict the use of reduced separation standards that rely on data-link services (Controller-Pilot Data Link Communications/Automatic Dependent Surveillance-Contract, CPDLC/ADS-C). Subsequently, on June 9, 2007, Oakland ARTCC removed the restrictions to the use of ADS-C based reduced separation.

3.2.141 The meeting noted the availability of the *Guidance Material for End-to-End Safety and Performance Monitoring of ATS Data Link Systems in the Asia/Pacific Region* and the *Required Communications Performance Manual.* However, the situation in relation to the difficulties with the Perth GES served to highlight that the existing mechanism may not be satisfactory to enforce adequate end-to-end performance of satellite communications systems (i.e. GES, datalink services providers, satellites etc) which are used for the provision of operational ATS, including reduced separation applications using CPDLC, ADS etc such as 30NM lateral/30NM longitudinal. The meeting also noted the lack of alternate GES for most of the region and considered that this comprised a single point of failure in the end-to-end system.

3.2.142 The meeting recognized that there were a number of data link trials under way in the Asia/Pacific Region that would move to permanent implementation over the next two years with the intention of facilitating reduced separation applications. As the Perth GES is essentially the sole GES available for most of the region, this would place significant additional message loadings onto the existing system. Doubts were expressed as to the capability of regional Data Services Providers (DSPs) to adequately carry this message load at an end-to-end performance level that was suitable for operational use, particularly with reduced separations.

3.2.143 Discussions during the meeting suggested that the difficulties described above were not solely confined to FANS data link applications, rather they were inherent in satellite based communications and would therefore also affect ATN based implementations.

3.2.144 The meeting expressed strong concerns at the circumstances being reported and, noting the history of poor communications performance associated with the provision of regional data link services and the increasing regional implementations of data link based reduced separation applications, sought the assistance of ICAO to urgently provide further guidance on suitable mechanisms that enforce adequate end-to-end system performance of satellite communications systems to meet current and future data link (ADS/CPDLC) operational demands.

State Focal Point for Safety-Related Activities

3.2.145 In an effort to address regional deficiencies and, in particular, to provide an ATS safety contact point in each State who would act as a focal point for safety related activities including the timely submission and coordination of ATS incident reports, APANPIRG/16 adopted Conclusion 16/62 requesting States to nominate a suitable contact point.

3.2.146 The Regional Office had established the list of the ‘Safety Contact Officers’ called for by APANPIRG, and the list had been submitted to the various contributing bodies of APANPIRG for regular updating. Despite this, IATA informed the meeting that attempts to contact the officials listed had often been unsuccessful as a result of incorrect email addresses and telephone numbers and officials retiring or changing jobs. The meeting agreed that this was a disappointing outcome which severely limited the effectiveness of the list.

3.2.147 Accordingly, the meeting requested States to review and update the list which is included as **Appendix I** to the Report on Agenda Item 3.2, taking particular care to ensure that all details on the list were accurate. States that had not already done so were urged to identify a responsible officer for inclusion on the list. Feedback should be provided to the Regional Office as soon as possible.

Review of ALLPIRG/5

3.2.148 ATM/AIS/SAR/SG/17 was informed of the APANPIRG/17 review of the results of the fifth meeting of the ALLPIRG (ALLPIRG/5, March 2006) and noted that ALLPIRG/5 had developed 18 Conclusions encompassing a wide range of issues. As a result of analysis of the conclusions of ALLPIRG/5, APANPIRG/17 identified those conclusions which required follow-up by APANPIRG and, under Decision 17/1, assigned responsibility for ALLPIRG/5 Conclusions 5/2, 5/4, 5/5, 5/7, 5/8, 5/9, 5/11, and 5/13 to the ATM/AIS/SAR Sub Group for study and action.

3.2.149 The meeting agreed that although the ALLPIRG/5 Conclusions assigned to the ATM/AIS/SAR Sub group represented a significant body of work that would require significant time and resources to address, in many instances, component parts of the respective ALLPIRG/5 Conclusions were already included in Sub Group tasks and the other ICAO related groups active in the Asia/Pacific Region.

3.2.150 In relation to Conclusion 5/7 which dealt with environmental issues, the meeting recognized the importance of addressing environmental matters as a high priority and highlighted that implementation of ATM enhancements brought environmental gains as a direct result of the efficiency gains. This was true in virtually all cases, including many recent Asia/Pacific implementations of reduced separation applications such as RVSM and RNP, ATS route realignments, ATFM implementations and so forth.

3.2.151 The other initiatives required by the ALLPIRG/5 Conclusions were also expected to be fruitful in the longer term. However, pragmatic difficulties existed with initiating and managing actions to address them. The ALLPIRG/5 Conclusions were diverse and required ongoing and regular attention to long term work programmes, therefore dedicated work groups would need to be established in some instances. However, as the Regional Office and many States were already experiencing significant resource limitations, ATM/AIS/SAR/SG/17 considered that it was unlikely that attempts to create additional work groups would prove a viable way forward.

3.2.152 In attempting to address APANPIRG Decision 17/1 relating to the study of ALLPIRG/5 Conclusions assigned to the Sub-Group, the ATM/AIS/SAR/SG/17 meeting adopted the following positions:

a) Refer the ALLPIRG/5 Conclusions to the Regional Performance Review Task Force that had been established under APANPIRG Decision 17/10 for planning action, noting that as a result of the resource limitations at the Regional Office the Task Force had not yet been able to be convened;

b) Recognize that as there had not been substantive action in increasing ATM resources at the Regional Office as required by APANPIRG Conclusion 17/18, work would necessarily be delayed in addressing the ALLPIRG/5 Conclusions;

c) Recognize that the existing programme of ongoing regional ATM implementations was already resulting in efficiency gains as well as the environmental benefits highlighted by ALLPIRG Conclusion 5/7 and that this situation would continue;

d) Adopt a perspective for all parties under which all actions, however small, should be taken as opportunities arose;

e) Include the relevant ALLPIRG/5 Conclusions as an attachment to the Task

List of the ATM/AIS/SAR/SG to enable continual ease of reference;

f) Recognize that States primarily held many of the responsibilities to act unilaterally and bilaterally in moving forward in these matters; and

g) Acknowledge that as a result of the difficulties outlined above, implementation of ALLPIRG/5 Conclusions was likely to be slower than was desirable or originally anticipated;

Aeronautical Information Services (AIS) Implementation Task Force

Improving AIS Capability

3.2.153 The second meeting of the AIS Implementation Task Force (AITF/2) was held in February 2007 in Bangkok, Thailand. AITF/2 undertook a thorough review of the comprehensive AIS survey that had been conducted as a result of Conclusion 17/16, noting that many States in the Region had not implemented AIS system improvements as required by ICAO, especially in the field of computerization and automation. The meeting considered ways to assist these States to improve their AIS capability and formulated the following Conclusion:

Conclusion 18/12 – Assistance to States to improve AIS capability

That, in follow up to the comprehensive survey on AIS conducted in the Asia/Pacific Region in 2006/2007, ICAO undertake a special implementation project during the second half of 2008 for a workshop/seminar to be held on AIS automation.

Adopt Asia/Pacific OPADD

3.2.154 AITF/2 considered proposals in relation to updates to Chapter 3 of the regional AIS Guidance Manual to adopt the new Euro OPADD (Operating Procedures for AIS Dynamic Data) Edition 2.0, with the exception of Section 6 which describes specific European arrangements, and agreed to recommend an amendment to the AIS Guidance Manual of this kind.

3.2.155 In conducting a review of the recommendation by AITF/2, the ATM/AIS/SAR/SG/17 meeting conducted a review of the proposed amendment to Chapter 3 of the Guidance Material and agreed to the revised guidance material as shown in **Appendix J** to the Report on Agenda Item 3.2. ATM/AIS/SAR/SG/17 commended Japan for their excellent work in progressing with this amendment. Accordingly, the meeting agreed to adopt the Chapter 3 amendment, formulating the following Conclusion:

Conclusion 18/13 – Amendment to Chapter 3 of *Guidance Manual for Aeronautical Information Services (AIS) in the Asia/Pacific Region*

That the amended Chapter 3 (OPADD) of the *Guidance Manual for Aeronautical Information Services (AIS) in the Asia/Pacific Region* as shown in **Appendix J** to the APANPIRG/18 Report on Agenda Item 3.2 be adopted and circulated as regional guidance material.

Item B) of the NOTAM Format in Appendix 6 of Annex 15

3.2.156 AITF/2 was informed that amendment 34 to Annex 15 with regard to Item B) of the NOTAM Format had been proposed as follows:

5. Item B

For date-time group use a ten-figure group, giving year, month, day, hours and minutes in UTC. This entry is the date-time at which the NOTAMN, NOTAMR OR NOTAMC comes into force. ~~In the cases of NOTAMR and NOTAMC, the date-time group is the actual date and time of the NOTAM origination.~~

3.2.157 AITF/2 recognized the possibility of different interpretations, potential confusion and system impact when a 'future' date-time in Item B) of NOTAMR and NOTAMC is allowed. In accordance with the Asia/Pacific OPADD, AITF/2 considered that:

a) The actual date-time of NOTAM origination should be set in Item B) of NOTAMR or NOTAMC; and

b) The issuance of NOTAMR and NOTAMC with future validity should not be allowed.

3.2.158 In light of the above and taking into consideration the EUROCONTROL Operating Procedures for AIS Dynamic Data, ATM/AIS/SAR/SG/17 agreed that further clarification of Amendment 34 and related guidance material was necessary. The meeting supported the following Conclusion in this respect:

Conclusion 18/14 – Review of the NOTAM format

That, in light of various terminologies in common use for NOTAM, such as date-time of filing, date-time of origination, effective, applicable, period of validity, comes into force and the need for NOTAMC and NOTAMR to be explicit and unambiguous, ICAO be invited:

a) to review and revise Annex 15 – *Aeronautical Information Services*, Appendix 6 - NOTAM Format, Instructions for the Completion of the NOTAM Format, Section 5 – Item B to provide that NOTAMC and NOTAMR shall have immediate effect and prohibit a NOTAMC and a NOTAMR with a future date-time coming into force; and

b) to define the terminologies used for NOTAM in the Instructions for Completion.

Implementation of Electronic Terrain and Obstacle Data (eTOD) in Hong Kong, China

3.2.159 Hong Kong, China had presented ATM/AIS/SAR/SG/17 with their experiences in regard to the preparation for the provision of electronic terrain and obstacle data (eTOD) numerical requirements in Annex 15 for implementation in November 2008 and November 2010. Hong Kong, China had studied the draft ICAO *Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information* (Doc 9881) and the RTCA reference including DO-276A and DO-291, but had been unable to conclude the exact requirements of eTOD and urged ICAO to make available the Guidelines as soon as possible.

3.2.160 The meeting noted that, as indicated by Hong Kong, China, ATM/AIS/SAR/SG/17 had also recognized that there were difficulties in implementing eTOD from November 2008 as required by Annex 15. Based on the review of the information, the meeting adopted the following Conclusion:

Conclusion 18/15 – Strategies to implement eTOD

That, in light of the experiences encountered by States attempting to implement Annex 15 provisions on eTOD, ICAO be invited to:

a) hold an eTOD Workshop in the Asia and Pacific Region during 2008;

b) make available the *Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information* (Doc 9881), as soon as possible; and

c) provide specific guidance on cost recovery and property rights of eTOD material.

3.2.161 The meeting noted the intention to conduct a global AIS Congress in Singapore during mid 2008 and agreed that, in order not to overload State AIS resources, the Regional Office consider deferring the next AITF until early 2009. In this context, the meeting commended Australia, Japan and New Zealand for their comprehensive support of the AIS Implementation Task Force, noting that without this assistance it was unlikely that the Regional Office would be able to conduct the Task Force.

Non-adherence to AIRAC Provisions

3.2.162 AITF/2 was informed of the continuing examples of implementations occurring without sufficient notice and not in alignment with the 28 day AIRAC cycle. This matter was ongoing issue regionally and had been the subject of APANPIRG Conclusions 14/19 and 17/17 to attempt to solve this persistent problem, regrettably to little effect.

3.2.163 AITF/2 recalled that ATM/AIS/SAR/SG/16 (June 2006) had highlighted that, in many instances, matters were outside the control of AIS officials as they were driven by political and institutional agendas that lacked knowledge of AIS matters. The AITF/2 meeting considered that addressing the lack of knowledge in the field of AIS among the administrations, project managers, navaid maintenance technicians, etc. was potentially one way to move forward on this issue. In accepting the recommendation of the AITF and ATM/AIS/SAR/SG/17 in this regard, the meeting adopted the following Conclusion:

Conclusion 18/16 – State Non-Compliance with AIRAC notification periods

That, in light of the longstanding concerns of APANPIRG in respect to the importance of regular and ongoing compliance by AIS service providers with Annex 15 – *Aeronautical Information Services* provisions on AIRAC notification periods, and in order to make stakeholders aware of the AIRAC system, the Regional Office urge States to:

a) implement robust measures as soon as practicable to promulgate relevant information to aviation administrations, airport authorities, project managers, airspace planners, construction companies, etc, and

b) specifically include this item in their safety oversight programmes.

3.2.164 In light of the foregoing, the meeting agreed that the 44th Conference of DGCAs to be held in Xian, China on 22-26 October 2007 should be informed of APANPIRG's concerns in this regard. State civil aviation authorities concerned should take action to put in place measures to ensure that AIS service providers strictly observe the Annex 15 AIRAC provisions and ensure that implementation project time lines that required AIS notification were harmonized accordingly. In this regard, the Regional Office would bring this matter to the attention of the 44th Conference of DGCAs.

Search and Rescue (SAR) Matters

3.2.165 The meeting noted recent successful efforts by ICAO for Search and Rescue (SAR) in the Asia/Pacific region but noted that there were minimal follow-on activities planned to build upon the awareness and momentum generated by these efforts. With the forecast unprecedented growth in air traffic in the region, the meeting considered that it would be prudent for all States in the region to consider how to improve their SAR capability as well as how to assist States that have difficulty in providing SAR services.

3.2.166 The United States highlighted attempts to improve coordination and information sharing, where appropriate, with maritime SAR authorities and other regional forums, and encouraged participation of aeronautical SAR authorities in the SAR Workshop for Pacific Island States which would be held from 26 – 30 November, 2007 in Honolulu, Hawaii. The intention was to make such a SAR Workshop a regular event to be held a two yearly intervals and support from affected States would greatly assist in achieving this aim.

3.2.167 The meeting reviewed and updated the APANPIRG list of SAR Agreements and the SAR Capability Matrix Table as presented in **Appendices K and L** to the Report on Agenda Item 3.2. Further updates should be passed to the Regional Office as soon as possible.

JWG Review of SAR Capability Matrix

3.2.168 In respect to the format of the SAR Capability Matrix, the meeting heard feedback that had been received in terms of the column headed Local User Terminal (LUT). Of equal or more importance to having LUT capability was whether or not States had nominated a SAR Point of Contact (SPOC) to COSPAS SARSAT to enable quick and effective coordination to take place. As such, the meeting considered that the inclusion of a column in the Matrix for SPOC was important and debated whether the LUT column should be discarded in favor of a SPOC column.

3.2.169 The meeting recognized that the format of the SAR Capability Matrix had been established many years ago and that no review of the format had taken place since that time. In light of the LUT/SPOC discussions above, it was timely that a full review of the format took place to ensure that it was still fit for the purpose intended. As the United States was an active member of the ICAO-IMO Joint Working Group on SAR, the meeting sought assistance from the United States in bringing the Asia/Pacific Matrix before the Joint Working Group for overall review, drafting the following Conclusion in this respect:

Conclusion 18/17 – JWG Review of Regional SAR Capability Matrix

That, the Regional Office seeks the assistance of the United States in coordinating a review of the format of the Asia/Pacific SAR Capability Matrix by the ICAO-IMO Joint Working Group on SAR, with particular guidance sought in relation to COSPAS SARSAT capabilities including Local User Terminal and SAR Point of Contact.

Outcomes of SAR Workshop

3.2.170 The ICAO SAR Workshop (Bangkok, Thailand, 26 February – 2 March 2007) formulated a list of recommendations which have been reproduced as **Appendix M** to the Report on Agenda Item 3.2. Upon reviewing the recommendations, the meeting agreed that they should be taken into account by States in the region and the Regional Office when considering their SAR activities, and formulated the following Conclusion:

Conclusion 18/18 – Promulgate Recommendations of the ICAO February 2007 SAR Workshop

That, the recommendations made by the ICAO SAR Workshop held at Bangkok, Thailand on 26 February - 2 March 2007, as shown in **Appendix M** to the APANPIRG/18 Report on Agenda Item 3.2, be promulgated regionally by the ICAO Asia/Pacific Regional Office and be taken into account by States and the Regional Office in considering their future SAR activities.

Phasing-out of 121.5 MHz Satellite Alerting Services

3.2.171 The meeting was informed in relation to the COSPAS – SARSAT decision to phase out the satellite alerting services on 121.5 and 243 MHz from 1 February 2009. Subsequent to February 2009, satellite alerting service will be available only to 406 MHz Emergency Locator Transmitter (ELT) equipped aircraft. This issue had also been presented during the February SAR Workshop and Recommendation 7 of the Workshop called for States to be made aware of this issue and, accordingly, Regional Office State Letter Ref.: T 3/11.4 – AP041/07 (ATM), dated 18 May 2007, highlighting the technical issues involved was transmitted. In addition, the meeting considered that States would need to provide to airspace users education on the transition to 406 MHz ELT. The requirements for registering all the ELT beacons by States were discussed. In view of the foregoing, the meeting endorsed the following Conclusion:

Conclusion 18/19 – Registration of ELT Beacons

That, States be requested to designate by March 2008 a registering agency for registering ELT Beacons, coded with the country code of the State and unique code of that beacon in a database as specified in paragraph 5.3.2.2 of Annex 10 Volume III and the guidance provided in Appendix I to Chapter 5 ‘Emergency Locator Transmitter Coding’ of the Annex.

Sharing of regional SAR information

3.2.172 The meeting was informed that Annex 12 – *Search and Rescue* (SAR) and the *International Convention on Maritime SAR* under the International Maritime Organization (IMO) call for harmonization of maritime and aeronautical SAR. The maritime counterpart in the Asia/Pacific region is the Asia-Pacific Heads of Maritime Safety Agencies (APHMSA), which meets each April. The meeting was informed that both APANPIRG and APHMSA discuss common SAR matters but there appeared to be a very limited sharing of information between the two regional groups.

3.2.173 The United States drew the attention of the meeting to the annual cycle of meetings relevant to the Asia/Pacific region in relation to the SAR matters. The annual meeting of APHMSA was generally held in April, followed by the ATM/AIS/SAR Sub Group in late June/early July, then APANPIRG in late August/early September and finally the ICAO-IMO Joint Working Group for SAR which generally met in September. This existing meeting cycle meant that information could be readily passed from meeting to meeting without delay.

3.2.174 The meeting recognized the benefits of sharing resources and information between aeronautical and maritime SAR agencies and agreed that taking advantage of this flow of meetings would lead to more effective coordination and efficient use of limited SAR resources. The meeting agreed that coordination was necessary with, and between, these respective groups and the United States agreed to attempt to progress work in this area by taking advantage of its membership of each of the nominated groups to stimulate discussions in this respect. Accordingly, the meeting agreed to the following Conclusion:

Conclusion 18/20 – Promote relationships between APANPIRG, APMHSA and the ICAO-IMO Joint Working Group

That, recognizing that APANPIRG, the Asia-Pacific Heads of Maritime Safety Agencies (APHMSA) and the ICAO-IMO Joint Working Group on SAR discuss common SAR matters of relevance to the Asia/Pacific Region, the Regional Office seek the assistance of the United States in coordinating the SAR reporting activities of APANPIRG with the other two groups on a reciprocal basis.

Task List for ATM/AIS/SAR Sub Group

3.2.175 The meeting reviewed the updated Task List for the ATM/AIS/SAR Sub-Group, as approved by APANPIRG/17 and reviewed and updated by the ATM/AIS/SAR/SG/17 meeting. The meeting recalled that in undertaking the review of the Task List, ATM/AIS/SAR/SG/16 had recognized that the Task List was in need of a complete overhaul in order to ensure that it remained fit for the purposes for which it was intended. In this respect, the Secretariat had prepared a “new format” Task List for review by the ATM/AIS/SAR/SG/17 meeting, incorporating ICAO Strategic Objectives and GPIs as well as other guidance attempting to align the Sub Group Task List with the new ICAO business planning practices.

3.2.176 The ATM/AIS/SAR/SG/17 meeting rejected the new format Task List considering it to be too cluttered and too high level, resembling a Key Priorities list rather than a working list intended to effectively support the implementation work programme of the Sub Group. The inclusion of Strategic Objectives and GPIs was considered to be suitable for policy making forums like APANPIRG but did not assist at the working group level.

3.2.177 Agreeing that the previous format Task List was also not suitable, the meeting requested that the Secretariat attempt to compile a simplified Task List that reflected the specific work item to be undertaken, responsible party, target date and remarks column. The objectives specified by

ATM/AIS/SAR/SG/17 were that the Task List be simple, functional, uncluttered and able to be effectively used to progress the work programme of the Sub Group.

3.2.178 In the interim, ATM/AIS/SAR/SG/17 agreed to retain both the old Task List and the new format Task List, as shown in **Appendices N and O** to the Report on Agenda Item 3.2, to ensure that work items were not misplaced. ATM/AIS/SAR/SG/17 also agreed that the relevant Conclusions and Recommendations from ALLPIRG/5 and the 11th Air Navigation Conference should be carried as attachments to the ATM/AIS/SAR/SG Task list for ease of reference. The meeting agreed to the Decision below:

Decision 18/21 – ATM/AIS/SAR Subject/Task List

That, the ATM/AIS/SAR Subject/Task Lists as contained in **Appendices N and O** to the APANPIRG/18 Report on Agenda Item 3.2 be adopted as the current work programme for the ATM/AIS/SAR Sub-Group.

Summary additional information

3.2.179 The meeting noted additional information in relation to the following:

a) Second Inter-Regional Coordination Meeting (IRCM/2),

b) Update of the Universal Safety Oversight Audit Programme (USOAP)**,**

c) ICAO Website for the Flight Safety Information Exchange (FSIX)**,**

d) Airbus A380 Wake Vortex – Revised Guidance Material,

e) North American Sustainment of Aviation Operations during a Pandemic Influenza Outbreak – A Concept of Operations and Agreement,

f) Implementation of a Safety Management System (SMS) for ATS in Japan,

g) Business Case Development for ADS-C In-Trail Procedures (ITP),

h) RNAV implementation in Japan,

i) Automating Operational Contingency Planning, and

j) Civil Military Air Traffic Management Summit (CMAC ’07)

3.2.180 The meeting was informed that the next ATM/AIS/SAR Sub-Group meeting would be held from 23 – 27 June 2008 at the ICAO Asia/Pacific Regional Office.

Language Proficiency Requirements

3.2.181 The meeting was provided with a progress report on the implementation of the language proficiency requirements which will come into effect from 5 March 2008. In order to assess the progress of its implementation, the Secretariat conducted two worldwide surveys. While both surveys showed that significant progress had been made by the States, the concerns on the global implementation could not be alleviated due to insufficient feedback. Therefore, a change in the applicability date of 5 March 2008 could not be justified.

3.2.182 The meeting, noting that ICAO undertook several initiatives to support the implementation of the language proficiency requirements, called upon States to implement the provisions with a high level of priority.

First Meeting of TRASAS

3.2.183 The meeting noted information on the establishment of the Trans-Regional Airspace and Supporting ATM Systems Steering Group (TRASAS), supported by the North Atlantic System Planning Group (NAT SPG) and Europe Air Navigation Planning Group (EANPG), to continue work already done concerning the traffic flows in the Northern Arctic area, and to respond to the new requirements for increased efficiency and further developments.

3.2.184 The first meeting of the TRASAS (TRASAS/1, May 2007) noted the activities of the following forums: the ICAO Asia/Pacific RVSM/TF/30 (March 2007, Bangkok) concerning RVSM implementation by China; the Cross Polar Trans East Air Traffic Management Work Group (CPWG), which was formed to ensure international cooperation on airspace issues in the subject area; and the Sixth Meeting of the Route Development Group – Eastern Part of the ICAO EUR Region (EDGE/6) in April 2007, which worked on matters related to ATS route planning in the Eastern part of the ICAO EUR Region.

3.2.185 TRASAS/1 (May 2007, Paris) reviewed work currently underway to enhance the ATS route network, using current and future technologies, and to plan for a transition towards a performance based navigation system. In respect to traffic growth in the Russian Federation, along the Cross Polar Routes traffic was expected to increase at the level of 40 % annually for the foreseeable future. To meet this traffic growth and aircraft operators' requirements, new ATS trunk-routes and feeder-routes were being developed. TRASAS/1 established a suitable work programme in this regard, as shown at **Appendix P** to the Report on Agenda Item 3.2.

3.2.186 Following the review of the terms of reference of TRASAS (as shown at **Appendix Q** to the Report on Agenda Item 3.2) and the report of TRASAS/1, the meeting agreed that the overall concept that had led to the formation of TRASAS was valid. However, concerns were raised at the ability of the TRASAS to effectively engage in the operational details of the ATM arrangements required. As the TRASAS was at Steering Group level, it was apparent that TRASAS would be primarily a policy meeting, rather than an ATS coordination/implementation working group. The extensive membership proposed for the TRASAS was expected to result in large meetings that would perhaps not be conducive to the finer detail work required for ATS implementation.

3.2.187 The meeting also recalled the very effective role played by the CMRI in implementing operational arrangements for the polar operations. As the areas under the responsibility of CMRI moved forward, in terms of sub regional RVSM implementation and the capacity enhancements being pursued by Mongolia for example, it was evident that close coordination between the three States involved would be necessary. The CMRI forum was expected to continue to enable effective working relationships between States at an operational level whilst providing an opportunity for airspace users to directly provide operational input. Accordingly, the meeting agreed that there was an ongoing role for the CMRI in it is present format.

3.2.188 Nonetheless, the meeting supported the continuation of the TRASAS in accordance with the proposed Objectives and Terms of Reference and recommended that affected Asia/Pacific States engage actively in the TRASAS process. The meeting noted that the next meeting of TRASAS had been tentatively scheduled at the Regional Office in Bangkok, from 18 – 19 March, 2008.

Increasing Efficiency and Reducing Emissions in the Oceanic Environment

3.2.189 United States informed the meeting about a number of initiatives that were occurring in the Oceanic airspaces under the jurisdiction of the USA. In addition to the route improvements for the Guam and Honolulu FIRs described in *Oakland ARTCC ATS Route Realignment* above, these included the following:

- **User Preferred Route Expansion (UPRs)** – Due to recent advancements in ground automation, the FAA can now offer UPRs to all flights in the South Pacific. Through ISPACG and IPACG, the FAA and ANSP partners are seeking to expand the use of UPRs into additional airspace and on new routes. A paper trial conducted with Air New Zealand showed potential savings of $2 million per year for a UPR program between New Zealand and Japan.

- **Dynamic Airborne Reroute Programs (DARP)** – Using DARP, the FAA is promoting the availability of airborne re-routes for more efficient trajectories for all flights not on oceanic fixed or flex track systems. The FAA, Airservices Australia and Airways New Zealand are working with other ANSPs including Fiji and Tahiti to expand DARP across FIR boundaries in the South Pacific.

- **ADS-C In-Trail Procedures (ITP) -** The FAA is developing a reduced separation standard based on DME in-trail procedures, but using ADS-C surveillance to verify distance between aircraft pairs. A business case for ADS-C ITP indicated that, although benefits were directly tied to the level of FANS ADS equipage, significant benefits could be gained in Pacific airspace. The FAA will conduct a safety assessment and collision risk activity in 2008.

- **Oceanic Tailored Arrivals (OTA) -** An OTA is a comprehensive trajectory based arrival clearance to a coastal destination airport using a low power, continuous descent approach designed to reduce fuel burn, noise and emissions. In 2006, the FAA conducted OTA trials to coastal airports in Sydney and San Francisco. Although significant work remains to prove the viability of OTA during moderate or heavy traffic periods, the FAA will continue development of OTA technology and procedures for expanded trials in 2008.

- **Pre-Departure Oceanic Trajectory Management 4-D (OTM4D) –** As part of the NextGen programme, the FAA is developing a concept to improve the probability that an aircraft's oceanic entry altitude and in-flight preferred profile will be available by suggesting minor adjustments to track, altitude or oceanic entry time. In-Flight proof-of-concept trials are planned for the FAA's Atlantic airspace during 2008.

- **Russian Trans-East (RTE) Flex Routes -** In 2007, the FAA, with Nav-Canada and airline partners, conducted paper and flight trials for flexible route allocations from US West Coast airports to Russian gateway fixes. Thirty-two aircraft participating in the trials showed significant fuel savings - on average 535 kilos per flight. Although numerous operational issues remain unresolved the trials will be expanded in late 2007.

3.2.190 The meeting commended the United States for these initiatives some of which have been implemented and are already realizing significant savings in environmental emissions and encouraged collaborative participation by States and ANSPs in promoting partnerships to develop mechanism leading to the measurement and reduction of aviation greenhouse gas emissions.

Finalization of Model ATM Contingency Plan

3.2.191 The meeting recalled that, in reviewing the draft ATM Contingency Plans for the Jakarta and the Ujung Pandang FIRs prepared in conjunction with the Regional Office, the APANPIRG/17 meeting recognized that the final version of the Contingency Plan would serve as a useful model for other States of the Region in preparing contingency plans. APANPIRG/17 called upon States (Conclusion 17/11) to adopt this model as the basis for preparation of national ATM contingency plans in accordance with the requirements of Annex 11 – *Air Traffic Services,* paragraph 2.28 and Attachment D.

3.2.192 The meeting was informed that the Contingency Plan Finalization Meeting (April 2007, Jakarta) reviewed and formally adopted the Indonesia contingency plans. The plans would be implemented by Indonesia in the event of disruption of air traffic services to ensure safety of flight and to facilitate limited flight operations commensurate with the prevailing conditions.

3.2.193 The plans were developed in coordination with Australia, Malaysia, Philippines, Singapore, Sri Lanka, IATA and ICAO. To insure timely updating of the plans, the States concerned agreed that signing an operational coordination agreement (OCA) between affected parties would be sufficient. Key elements arising from the planning process that may be useful for other States in preparing their own plans were also identified and promulgated by the Finalization Meeting.

3.2.194 Recognizing that ATM Contingency Plans are now available for the entire Indonesian international airspace, the meeting commended Indonesia, the Regional Office and all other parties involved for their excellent efforts in establishing the Indonesian contingency plans. The meeting noted that the contingency plans were available from the DGCA, Indonesia and as appendices to the Report of the Contingency Plan Finalization Meeting on the ICAO Regional Office website, and encouraged other States in the region to follow this example and develop similar plans based on the Indonesian model.

Automating Operational Contingency Planning

3.2.195 The FAA presented information on its ATC operational contingency plan (OCP) development, management and activation. The purpose of the OCP was to reduce the impact and risk to the National Airspace System (NAS) in the event a facility is unable to safely and efficiently provide ATC services as required by FAA directives and orders.

3.2.196 The Air Traffic Organization (ATO) Automated Contingency Tool 2 (ACT2) enabled all FAA and FAA contract ATC facilities to share their OCPs with one another in real time throughout the NAS. The OCP developed by each ATC facility outlines the roles and responsibilities and instructions for executing an OCP for the parent and supporting facility or facilities.

3.2.197 The FAA supports the ICAO global goal to have every State develop contingency plans for human or natural disasters that affect operations of civil air traffic.

3.2.198 The FAA is willing to assist the Regional Office and interested States with the development of OCPs in the ACT2. Access to the ACT2 through appropriate international communications protocols will allow trained facility personnel to develop, manage, maintain and distribute national plans through secure networks that may not require new or additional hardware or software. Housing standardized OCPs in the ACT2 that may be quickly shared and reviewed by other affected border States will help to ensure the continuity of national aviation operations when a major outage occurs.

Establishment and Revision of ATS Routes

3.2.199 Viet Nam reported that since January 2005, the Civil Aviation Authority of Viet Nam (CAAV) had implemented four new domestic routes (W3, W19, W20 and W21) and an international route (L644) based on the results of the first meeting of the ICAO ATS Route Network Review Task Force (ARNR/TF/1, disbanded). At that time, their ATS route system consisted of 19 domestic routes and 23 international routes (including 14 RNAV routes).

3.2.200 Since September 2005, CAAV had implemented new three international routes (A206, R575 and M755), revised six routes (B468, W1, W8, R474, M768 and L644) based on the results of the ARNR/TF/2 and 3. At present, their ATS route system consisted of 19 domestic routes and 26 international routes (including 15 RNAV routes).

3.2.201 CAAV was now considering the realignment and rename of domestic ATS routes such as W2, W7, W10, W11, W15 and W17 with reasons of changing routes' track to DVOR, corrected coordinates, etc.

3.2.202 The meeting noted that CAAV has recently coordinated with the relevant agencies of Viet Nam and the Civil Aviation Authority of China for implementation of the following new routes, based on APANPIRG Conclusion 16/4 and ATS Route Catalogue, in order to meet traffic operation requirements,

a) New ATS route R471 serving traffic between Ha Noi and Kunming;

b) Combining ATS routes A1 and P901 with alignment DAN-BUNTA-IKELA; and

c) New ATS route G221 with alignment BUNTA-SAGSU-SYX-WL.

The proposed target date of implementation of these routes is the end of 2007.

3.2.203. The meeting noted new proposals by Vietnam which will be addressed by normal procedures.

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RASMAG/7 – WP/18
4/06/07

International Civil Aviation Organization

The Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/7)

Bangkok, Thailand, 4-8 June 2007

Agenda Item 5: Review the airspace safety monitoring arrangements in the Asia/Pacific Region and the activities of regional airspace safety monitoring agencies.

SAFETY ASSESSMENT FOR THE SOUTH CHINA SEA AIRSPACE WHERE A 60NM LATERAL SEPARATION MINIMUM IS APPLIED

(Presented by Monitoring Agency for Asia Region)

Summary

This paper provides a safety assessment for the South China Sea Airspace where a 60NM lateral separation minimum between RNP 10 approved aircraft is applied. The safety assessment is carried out for lateral separation on parallel tracks using December 2006 traffic sample data.

1. Introduction

1.1. This paper provides a safety assessment for the parallel tracks in the South China Sea Airspace where a 60NM lateral separation minimum between RNP 10 approved aircraft is applied.

1.2. The traffic sample data collected in December 2006 is used for this safety assessment.

2. **Background**

2.1. The standard collision risk model applied for this analysis is

$$N_{ay} = P_y(S_y)P_z(0)\frac{\lambda_x}{S_x}\left\{E_y(same)\left[\frac{\overline{|\Delta V|}}{2\lambda_x}+\frac{\overline{|\dot{y}(S_y)|}}{2\lambda_y}+\frac{\overline{|\dot{z}(0)|}}{2\lambda_z}\right]+E_y(opp)\left[\frac{\overline{|V|}}{\lambda_x}+\frac{\overline{|\dot{y}(S_y)|}}{2\lambda_y}+\frac{\overline{|\dot{z}(0)|}}{2\lambda_z}\right]\right\}$$

2.2. **Table 1** presents the individual parameters used in the risk model, together with their definitions and assumed values. The values have been taken to be the same as in reference 5, where appropriate.

Model Parameter	Description	Value	Source for Value
N_{ay}	Number of fatal accidents per flight hour due to loss of lateral separation.	See below	
S_y	Lateral separation minimum.	60NM	Airspace characteristics
$P_y(S_y)$	Probability that two aircraft assigned to routes separated by the lateral separation minimum S_y are in lateral overlap.	See below	
$P_z(0)$	Probability that two aircraft operating at the same flight level are in vertical overlap.	0.538	Conservative value commonly used in most assessments
λ_x	Average aircraft length.	0.0318 NM	Analysis based on the submitted TSD
λ_y	Average aircraft wingspan.	0.0289 NM	
λ_z	Average aircraft height with undercarriage retracted.	0.0087 NM	
S_x	Length of longitudinal window used to calculate occupancy.	120NM	Airspace characteristics
$E_y(same)$	Same direction lateral occupancy.	0.00	Analysis based on the submitted TSD
$E_y(opp)$	Opposite direction lateral occupancy.	0.78	
$\overline{\lvert\Delta V\rvert}$	Average relative along-track speed between aircraft on same direction routes separated by the lateral separation minimum.	13 Knots	Conservative value commonly used in most assessments
$\overline{\lvert V\rvert}$	Average absolute aircraft ground speed.	480 Knots	
$\overline{\lvert\dot{y}(S_y)\rvert}$	Average absolute relative cross track speed for an aircraft pair that lose all of their assigned lateral separation.	75 Knots	
$\overline{\lvert\dot{z}(0)\rvert}$	Average absolute relative vertical speed of an aircraft pair that is assigned to the same flight level on adjacent routes.	1.5 Knots	

Table 1: Parameters associated with the Collision Risk Model for the Lateral Dimension.

2.3. Lateral occupancy is a measure of the density of traffic on a parallel route system. Lateral occupancy may be defined in terms of proximate pairs.

2.4. A pair of aircraft on adjacent parallel routes is said to be proximate if the aircraft cross adjacent fixes at the same level on their respective routes within the longitudinal window, S_x of each other, travelling in either the same direction for same direction occupancy, or in opposite directions for opposite direction occupancy.

2.5. Same (Opposite) direction lateral occupancy is defined as twice the number of same (opposite) direction proximate pairs divided by the total number of flights considered in the occupancy estimation.

2.6. The value of $P_y(S_y)$, the probability that two aircraft assigned to routes separated by the lateral separation minimum S_y are in lateral overlap, depends on the core lateral navigational accuracy of the aircraft as well as on the prevalence of gross lateral deviations. It is assumed that the core lateral navigational accuracy is RNP 10, namely that 95 percent of the time the lateral deviations will be within 10NM of the route centerline.

2.7. Using the standard collision risk model presented above and using the parameter values in Table 1, with E_y(Same) = 0.00 and E_y(Opposite) = 0.78, it can be seen that the maximum allowable values of the lateral overlap probability, $P_y(S_y) = 2.73 \times 10^{-9}$

2.8. Modeling the overall lateral errors of aircraft by double-double exponential densities, $DDE(y;\alpha,\lambda_1,\lambda_2)$, where λ_1 is related to the RNP value, and assuming that $\lambda_2 = S_y$, as is usually done in lateral collision risk estimation, $P_y(S_y)$ may be readily calculated, see for example reference 4. Reference 4 also gives a relationship between $P_y(S_y)$ and ζ, the probability of a lateral error within 10NM of an adjacent route, and also between $P_y(S_y)$ and η, the probability of a lateral error at least as large as half of the route spacing.

2.9. Given the parameters and other values assumed above, if $\eta \le 1.30 \times 10^{-4}$ or $\zeta \le 1.26 \times 10^{-6}$, then N_{ay} will be less than the Target Level of Safety of 5×10^{-9} fatal accidents per flying hour.

2.10. Provided the gross lateral errors in the South China Sea will be such that they satisfy $\eta \le 1.30 \times 10^{-4}$ or $\zeta \le 1.26 \times 10^{-6}$, then the lateral collision risk will be less than the Target Level of Safety of 5×10^{-9} fatal accidents per flying hour.

2.11. To determine whether a route system meets the target level of safety for lateral dimension, Sequential Sampling Procedure is applied. (Reference 6)

2.12. **Table 2** presents parameters used in Probability Ratio Sequential Test, together with their definitions and assumed values.

Model Parameter	Description	Value
η_0	Rate of gross error applicable to H_0	1.04×10^{-4} (80% of η_1)
η_1	Rate of gross error applicable to H_1	1.30×10^{-4} (η_m)
α	Type-I error: The test rejects H_0 (and accepts H_1) when H_0 is true (and H_1 is false)	0.05
β	Type-I error: The test accepts H_0 (and rejects H_1) when H_0 is false (and H_1 is true)	0.05

Table 2: Parameters used in Probability Ratio Sequential Test

2.13. Choosing the two hypothetical values (η_0 and η_1) close to each other would make the test more accurate. However, the cost of reducing the difference is a large increase in the number of trials needed for the sequential test to reach a decision.

2.14. There has been no report of Gross Navigation Error (GNE) during the past 2 years or a combine of 108,337 flight movements from four designated monitoring areas that are DULOP-DUMOL, AKOTA-AVMUP, LULBU-LEGED, and MELAS-MABLI.

2.15. The result from probability ratio sequential test is provided in the **Figure 1**.

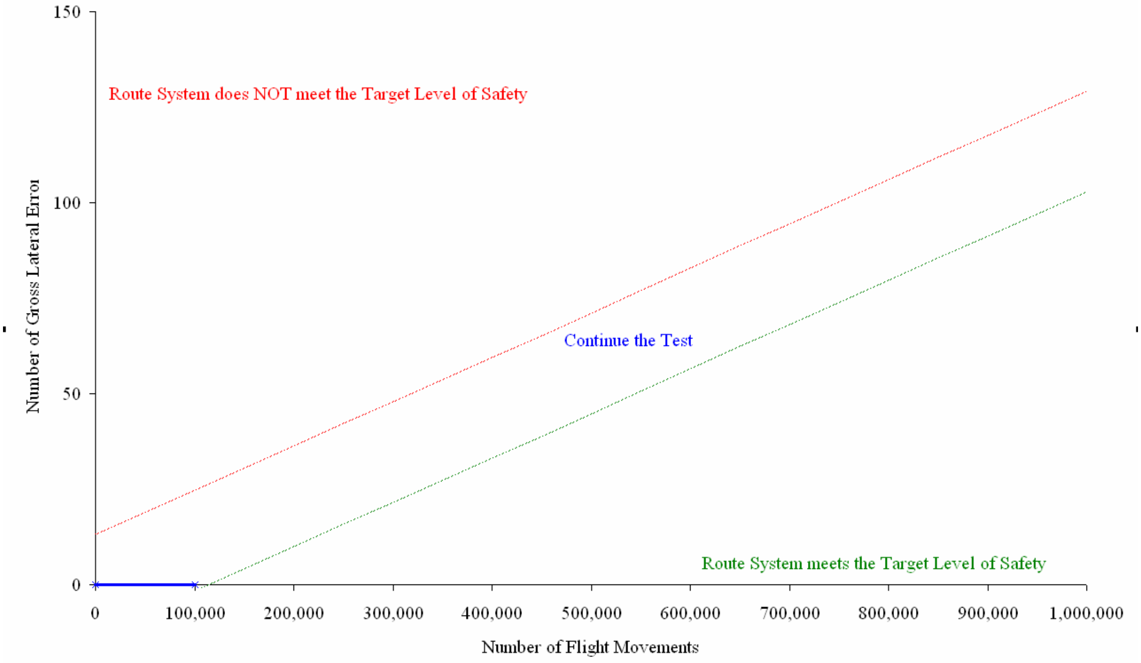

Figure 1: Result from Probability Ratio Sequential test

3. Conclusion

3.1. Based on information available, the result is still inconclusive as it neither accepts nor rejects the hypothesis as number of flight movements is below the minimum movements required even without a report of gross navigational error.

3.2. Nonetheless, it is expected that the target level of safety will be met provided that no significant gross navigational error occurs.

…………………………

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— END —

Asia/Pacific Regional Airspace Safety Monitoring Advisory Group (RASMAG)

Reporting of RVSM Large Height Deviations

Since June 2007, RASMAG has adopted the following guidance for internal application by Asia/Pacific RVSM Regional Monitoring Agencies (RMAs) – The Monitoring Agency for the Asia Region (MAAR), the Pacific Approvals Registry and Monitoring Organization (PARMO), and the Australian RMA. RASMAG has agreed to make the RMA guidance widely available to States in order to assist States in verifying and concluding whether an observed incident should also be reported to the responsible RMA as a Large Height Deviation (LHD) in RVSM airspace.

RASMAG notes that LHD reporting does not take the place, in any way, of the normal ATS incident reporting requirements promulgated under respective State ATS Safety Management System requirements and considers that, in most cases, situations leading to a LHD occurrence would have already met the criteria for reporting as an ATS incident. Notwithstanding, supplementary reporting of LHD occurrences to Asia/Pacific RMAs in accordance with the published requirements of the RMAs is an essential part of the regional airspace safety monitoring requirements called for under Annex 11, paragraphs 3.3.5.1 & 3.3.5.2.

Definition of Large Height Deviation

Based on, amongst others, the *Guidance Material on the Implementation of a 300 M (1,000 ft) Vertical Separation Minimum (VSM) between FL290 and FL410 Inclusive for Application in the Airspace of the Asia Pacific Region* and discussions during RASMAG meetings, RASMAG has adopted the following plain language definition of a Large Height Deviation:

> ***A RVSM large height deviation (LHD) is defined as any vertical deviation of 90 metres/300 feet or more from the flight level expected to be occupied by the flight.***

Possible causes of Large Height Deviation

The causes of a LHD occurrence may include:

- Operational errors (aircraft operating at a flight level other than the assigned flight level due to ATC/Pilot loop errors and incorrect clearance), which are categorized into three causes:
  - Flight crew not following the correct ATC clearance
  - ATC issuing an incorrect ATC clearance
  - Receiving ATC unit unable to apply the separation standards during a transfer of control responsibility between two ATC units.

- Aircraft contingency events occurring in situation where the pilot cannot initially follow normal contingency procedures and is forced to climb/descend through flight levels before diverting from track,

- Deviation due to the effect of high level meteorological conditions, and/or

- Deviation due to Traffic Collision Avoidance System (TCAS) advisories, which includes:
  - Flight crew correctly following the TCAS Resolution Advisory (RA), ***[see note below],***
  - Flight crew incorrectly following the TCAS RA, and
  - Any vertical displacement not conforming to the resolution advisory.

Note: *LHD resulting from actions complying with a TCAS resolution advisory would not necessarily reflect risk in the RVSM airspace since it is a proper remedial action of flight crew. Nonetheless, it is strongly recommended that all LHD occurrences related to TCAS resolution advisory be reported to the responsible RMA for detailed airspace safety analysis.*

Categorization of LHD in RVSM Safety Monitoring Reports

In order to be consistent with the plain language LHD definition and associated guidance listing possible causes of LHD occurrences adopted by RASMAG in June 2007 (see above), revisions to the LHD categorizations applied by regional RMAs prior to June 2007 were necessary. Accordingly, RASMAG adopted the revised LHD categorizations described in Table 1 below for adoption by all RMAs serving the Asia/Pacific Region.

Code	**RVSM Operations** **Large Height Deviation Categorization**
Operational Errors	
A	flight crew failing to climb/descend the aircraft as cleared;
B	flight crew climbing/descending without ATC clearance;
C	Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearances etc);
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message);
E	coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late or non-existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters);
F	coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues;

Code	RVSM Operations Large Height Deviation Categorization
Operational Errors	
Aircraft Contingency Events	
G	aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure);
H	airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors);
Deviation due to Meteorological Condition	
I	turbulence or other weather related causes;
Deviation due to TCAS RA	
J	TCAS resolution advisory; flight crew correctly following the resolution advisory; ***Note:*** *LHD resulting from actions complying with a TCAS RA would not necessarily reflect risk in the RVSM airspace since it is a proper remedial action of flight crew. Nonetheless, it is strongly recommended that all LHD occurrences related to TCAS resolution advisory be reported to the responsible RMA for detailed airspace safety analysis.*
K	TCAS resolution advisory; flight crew incorrectly following the resolution advisory
Others	
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RSVM approval but aircraft not approved, ATC misinterpretation of flight plan)
M	Other

Table 1: Large Height Deviation Categorizations

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

DRAFT GUIDANCE MATERIAL

FOR THE ASIA/PACIFIC REGION

FOR ADS/CPDLC/AIDC GROUND SYSTEMS

PROCUREMENT AND IMPLEMENTATION

Draft V-0.9

Issued by the ICAO Asia/Pacific Regional Office, Bangkok

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CHAPTER 1 INTRODUCTION

This material has been developed under an initiative of the Regional Airspace Safety Monitoring Advisory Group (RASMAG) of the Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to assist air navigation service providers (ANSP) with the implementation of datalink-based air traffic management (ATM) systems.

For the purposes of this document, a datalink-based ATM system is one which supports automatic dependent surveillance (ADS), controller-pilot datalink communications (CPDLC) and air traffic service (ATS) interfacility datalink communications (AIDC).

Integrated datalink systems are playing an increasingly important role in air traffic management. Datalink operations support reduced separation minima and so directly contribute to increased airspace capacity. Controller and pilot workload is reduced, and operational safety enhanced, by the automation enabled by datalink systems. As the use of these systems spreads, so more ANSPs must equip with the appropriate facilities.

The material covers two main aspects of implementation: specification and deployment.

Technical systems must be carefully specified from both the technical and operational aspects, and at the right level of detail: enough to ensure that the requirements are met, but not so much that good solutions may be excluded.

The deployment of a new system involves a number of vital steps, such as testing, training, integrating and commissioning.

This material offers guidance, rather than solutions, with the emphasis on specifying systems supporting ADS, CPDLC and AIDC.

It is not the intention of this document to provide the detailed technical information required to specify datalink applications: this information may be found in the various ICAO and other documents referenced.

1.1 OBJECTIVE

The objective of this document is to provide guidance on the specification, procurement and implementation of datalink systems for States and service providers unfamiliar with these systems.

1.2 SCOPE

The material is divided into three sections. The first covers the generalities of procuring and implementing a new system, the second is concerned with the requirements of a datalink-based ATM system, and the third gives guidance on specifying a system.

For the purposes of this material, it is assumed that the ANSP is the organisation setting out to procure a system.

1.2.1 Procurement and Implementation

Procurement and implementation includes:

- Planning and contracting
- Supervision and inspection
- Preparation for operation
- Operational transfer

1.2.2 Requirements

The Requirements section covers general requirements for datalink systems and specific requirements for:

- Datalink Initiation Capability (DLIC)
- ADS
- CPDLC
- AIDC

1.2.3 Specification

The Specification section offers guidance on the specification of:

- System configuration
- Interfaces
- Functionality
- Human-Machine Interface
- Capacity and parameters
- Recording and data analysis

1.3 SYSTEMS OVERVIEW

A key objective of datalink systems is to support reduced separation minima: any new datalink system should be capable of supporting 30NM lateral and 30NM longitudinal separation based on RNP 4.

1.3.1 ADS

Automatic Dependent Surveillance is a surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position, and additional data as appropriate. There are two forms of ADS:

broadcast ADS (ADS-B) and contract ADS (ADS-C). With ADS-B, aircraft broadcast positional data up to twice per second; the data may be used by ground systems (and other aircraft). With ADS-C, aircraft report directly to one or more ground systems with specified data at predetermined intervals (usually tens of minutes).

Note: Throughout this document, the abbreviation ADS refers to ADS-C.

The ADS data link application allows the implementation of reporting agreements, or "contracts", which, with the exception of an aircraft in an emergency situation, are established exclusively by the ground. An ADS contract is an ADS reporting plan which establishes the conditions of ADS data reporting (i.e. the data required by the ATC system and the frequency of the ADS reports which have to be agreed upon prior to the provision of the ADS services). ADS information may be exchanged between the ground system and the aircraft by means of a single contract or a series of contracts. An ADS contract specifies under what conditions an ADS report will be initiated, and what data groups will be included in the reports.

There are three types of contract:

- *Periodic contracts* provide a report at a regular periodic interval determined by the ground system.
- *Event contracts* provide a report when or if a specified event or events take place.
- *Demand contracts* provide a single report when requested by the controller.

1.3.2 CPDLC

Controller Pilot DataLink Communications (CPDLC) is a data link application that provides a means of communication between controller and pilot, using data link for ATC communications.

Sending a message by CPDLC consists of selecting the addressee, selecting and completing, if necessary, the appropriate message from a displayed menu or by other means which allow fast and efficient message selection, and executing the transmission. The messages include clearances, expected clearances, requests, reports and related ATC information. A "free-text" capability is also provided to exchange information not conforming to defined formats. Receiving the message will normally take place by display and/or printing of the message.

CPDLC overcomes a number of the shortcomings of voice communication, such as voice channel congestion, misunderstanding due to bad voice quality and/or misinterpretation, and corruption of the signal due to simultaneous transmissions.

1.3.3 AIDC

ATS Interfacility Datalink Communications is a data link application that provides the capability to exchange data between ATS units in support of critical ATC functions.

AIDC defines messages which are related to three phases of coordination as perceived by an ATSU.

- *Notification*, in which the aircraft trajectory and any changes may be conveyed to an ATSU from the current ATSU prior to coordination.
- *Coordination*, in which the aircraft trajectory is coordinated between two or more ATSUs when the flight approaches a common boundary.
- *Transfer*, in which communications and executive control authority is transferred from one ATSU to another.

Other AIDC messages support ancillary ATC data changes between ATSUs, including the exchange of free-text messages.

Other than the formal international communication protocol standards, internet protocol (TCP/IP) as a flexible and low cost de-fact industry standard is recommended.

CHAPTER 2 PROCUREMENT

2.1 GENERAL

2.1.1 System Quality

The overall quality of a system, the Total System Quality, is the product of three main elements: the quality of the design, the quality of production and the quality in operation.

The ***Design Quality*** is a measure how well the design process has translated the operational requirements into user specifications and the user specifications into product specifications. The design quality depends upon both the definition of operational requirements and development of user specifications by the ANSP and the system design skills of the vendor. If the operational requirements are not well defined, the specification will be compromised and the system design cannot be expected to be meet the real requirements. Similarly, if the specification does not correctly reflect the operational requirements, neither will the system design.

The ***Production Quality*** is a measure of how exactly the products match the specifications, and applies to the hardware, the software and the integration of these to form the system as a whole. In general, the vendor is responsible for production quality.

The ***Operational Quality*** is a measure of how the actual operation of the system realizes the operational objectives. This depends primarily on the way the system is operated: a badly operated system is not a good system. The operational quality is mainly influenced by the operational management of the ANSP.

The ***Total System Quality*** is the product of design quality, production quality and operational quality. To achieve high total system quality is clearly necessary to maintain the highest possible quality in each of the three areas.

Cooperation between the ANSP and the vendor is essential to achieve a high total system quality.

2.1.2 Roles and Responsibilities of the ANSP

The ANSP is ultimately responsible for successful implementation of the system. It is therefore vital that the ANSP takes a positive and active role throughout the system procurement and implementation.

The vendor is only responsible for developing and integrating a system to the ANSP's specific requirements.

Air traffic controllers, as the end-users of the system, must play a positive and active role throughout the procurement and implementation activities. The clear and complete definition of operational requirements and the final testing in an operational environment are both critical and are unlikely to be completed successfully without significant controller input. Clearly defined system requirements and specifications are vital in order for potential vendors to be able to offer a suitable system.

Controllers should also be able to contribute to the design, development and integration activities, and must be directly involved in the testing and commissioning processes.

2.1.3 Relationships: Requirements, Specification and Test/Evaluation

The figure below shows the relationships between the operational requirements, the system requirements, the specification, the design and the test and evaluation process. Only the combination of a complete and feasible definition of the requirements, consistent design, quality assured development and adequate review, testing and evaluation at each stage can provide a quality system.

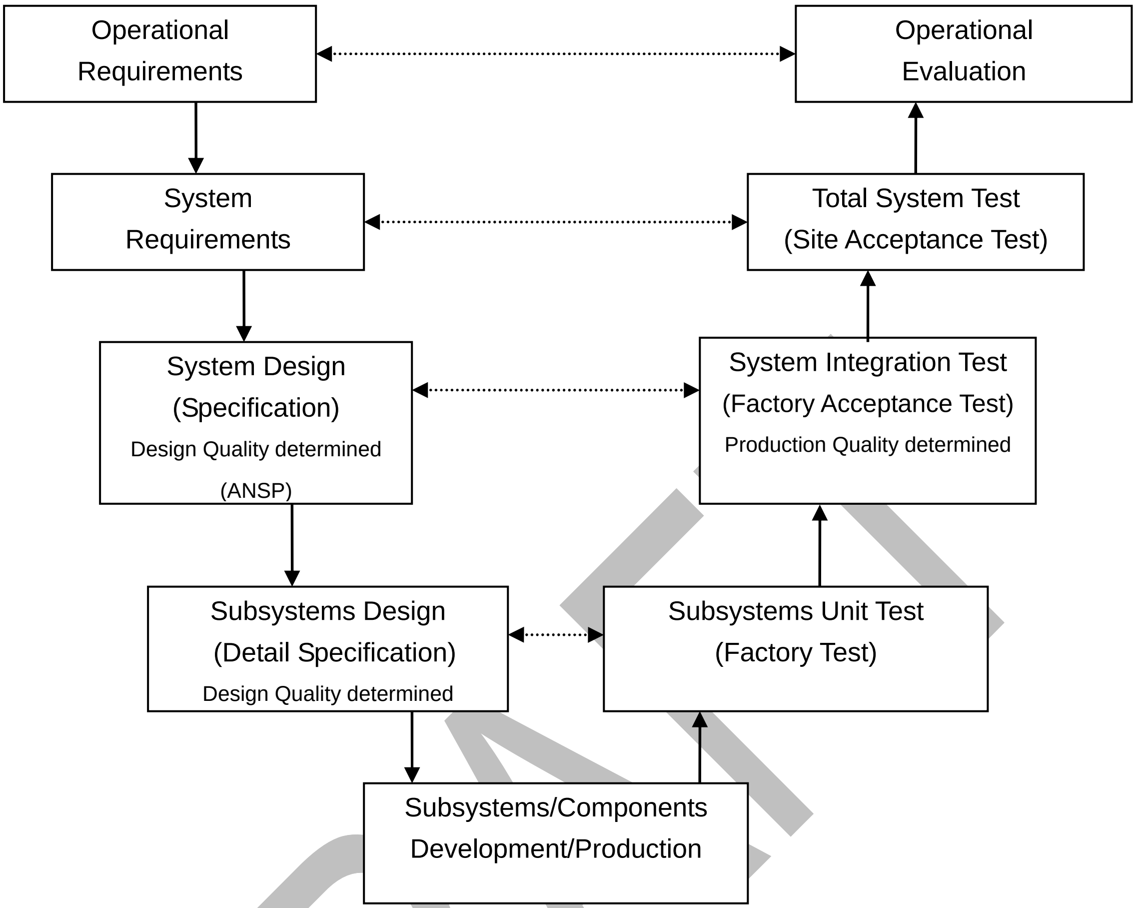

Figure1. Relationship between Requirement, Specification and Test/Evaluation

2.2 PROJECT MANAGEMENT

A project manager should be appointed as early as possible in the project. The basic role of the project manager is to ensure that the project proceeds within predetermined time, resource and cost boundaries. Project management requires a range of special skills, and serious consideration should be given to employing a professional project manager for the duration of the project.

The project manager must be given appropriate levels of financial and organisational authority so that he or she can make project decisions without constant recourse to higher management. It is essential that the terms of reference of the project manager are clearly documented and that they detail these authorities.

The project manager will be responsible for managing all aspects of the project, with particular emphasis on scheduling the many activities of ANSP personnel to match those of the system supplier. He or she will also play a major role in keeping the project within the time and budget constraints by determining what, if any, changes are made to the scope of the contract.

2.3 PLANNING AND CONTRACTING

2.3.1 Operational Requirements

The first, and perhaps most critical, stage of the planning and contracting phase is the definition of the ATS Operational Requirements; these must clearly define precisely what the system is to do. Operational requirements should not define how the results are to be achieved – that can be done in the specification.

There is no place for choice in a requirement, and the wording must reflect this; “must”, “shall” and “will” make requirements mandatory. The use of words such as “may”, “should” and “could”, “maximum” and “minimum” and “if”, “except” and “unless” make a requirement imprecise, because the reader does not know exactly what is required. “There should be 10 sectors” or “there should be at least 10 sectors” is vague. “There will be 10 sectors” is precise and leaves no doubt as to what is required.

The operational requirements should be established by a team of experienced controllers whose professional knowledge and experience encompasses all aspects of the ATS operation; the team should also include engineers and, as necessary, other specialists.

2.3.1.1 Studies of Existing Systems

The operational requirements team must have an appreciation of how datalink systems work in the operational environment; this is best achieved by studying existing systems and talking to experienced controllers, engineers and managers in other ATS facilities. The study should cover operational and technical practices and should pay particular attention to problems encountered and lessons learnt.

Controllers using these systems will be well aware of any features that do not work well or are not user-friendly, and will have suggestions for how the system could be improved. This is valuable information that should be considered when developing the specification and during the contract negotiation phase; in the latter case, a supplier could be invited to change such features in an otherwise satisfactory system.

2.3.1.2 Confirmation of Service Environments

The operational requirements team should establish the current ATS environment as the baseline, taking into account:

- Airspace structure and major airports.

- Sector configuration and VHF/radar coverage.
- The required separation minima (30/30NM horizontal separation or better)
- Traffic flows (routes, number, flight levels, etc.).
- ATS procedures.
- Related ATS facilities.

2.3.1.3 Operational Requirement Analysis

From the baseline, the team should analyse trends to determine the likely changes in the operational environment over the projected life of the system. The operational requirements can then be determined, if necessary using the projected environment at several points during the projected system life, and should detail, at the very least:

- The anticipated peak and mean traffic levels.
- The number of sectors, based on the traffic levels.
- Specific services for each sector.
- Inter-sector services.
- Inter-ATSU services.

Once these are established, the specific requirements to provide these services, such as displays and communications, can be determined.,

2.3.2 Design and Review

The next stage is for the team to define the system concept in terms of both operational requirements and technical feasibility, perhaps using other facilities as a base reference. The concept should be reviewed by controllers and managers who are not part of the team; any changes proposed should be discussed with the team and the concept modified accordingly.

2.3.2.1 Conceptual Design

The conceptual design must be documented clearly and should include the following:

- ATS functions needed (e.g. ADS reports, traffic display).
- Performance goals for the targeted airspace.
- Sector configuration.
- Physical configuration and layout.

- System operation (e.g. redundant parallel operation, automatic recovery, etc.).
- Standards to be applied (e.g. ARINC-745, RTCA DO-258A).
- Interface requirements for related ATS facilities.
- Datalink Service Provider (DSP) and its interface.
- Human Machine Interface (e.g. display size, use of colour, input devices).

The document should also identify any new operational procedures that may be required, both for new techniques, such as the use of ADS, CPDLC and AIDC, and for other changes.

2.3.2.2 Technical Feasibility Study

The team may then determine the technical feasibility of meeting the operational requirements, particularly in terms of the functionality required, the characteristics and performance of existing systems and the available budget. Preliminary information from vendors will give an indication of the systems and capabilities that are available, so that the team can decide on the most appropriate procurement option:

- A standard “off-the-shelf” system.
- A customized off-the-shelf system.
- A custom-built system.

The criteria to be used in evaluating systems in the market will include:

- Functionality meeting the requirements.
- Adequate performance and capacity to handle future traffic.
- User-friendly and intuitive operation.
- High reliability under all anticipated service conditions.
- Simple connection with related systems and facilities.
- Required standards are met.

2.3.2.3 Specification

When the operational requirements and the feasibility studies have been completed the specification can be developed. This is discussed in detail in CHAPTER 5.

2.3.2.4 Design Review

The purpose of this design review is to ensure that the conceptual design meets each and every one of the operational requirements and that it is technically achievable and attainable.

The design review team should be independent of the requirements team but should also comprise controllers, engineers and managers. The review may take the form of a walk-through of the conceptual design documents or a desk-top simulation.

The design review report should cover:

- Compliance with operational requirements.
- Connectivity with related systems and adjoining facilities.
- Flexibility and expandability in the future.
- Any operational or technical issues.

2.3.3 Request for Proposal (RFP)

A fully-documented and approved Request for Proposal (RFP) should be submitted to prospective vendors.

2.3.3.1 Objective

The objective of the RFP is to secure fully compliant proposals from a number of competent vendors.

2.3.3.2 Content

The RFP should contain all the information required for prospective vendors to make a complete and compliant proposal. Any omissions will result in enquiries from vendors, which will take time and effort to respond to. The RFP should contain:

- The specification.
- Operating environment, including:
    - External temperature and humidity ranges.
    - Temperature and humidity ranges in the equipment area and operational area.
    - Mains power supply voltage and frequency.
- Acceptance testing requirements.
- Maintenance support requirements.
- Training requirements.

- Warranty requirements.
- A draft contract, to allow vendors to see what contract requirements they will have to meet, and what arrangements they may have to make to meet them.
- Bidding conditions, including:
  - Submission of separate technical and financial bids.
  - Confidentiality.
  - The enquiry process.
  - The closing date for enquiries.
  - The closing date for bids.
  - Notification of short-listed bidders.
  - Notification of preferred bidder.
- Financial conditions, including
  - Bid bonds (if required).
  - Requirements for financing (if necessary).
  - Proposed payment schedule.
- The proposal evaluation process, including the evaluation criteria.

2.3.3.3 Enquiry Process

It is inevitable that some bidders will ask for clarification of details or for additional information. To avoid giving advantage to any particular bidder, there should be a formal process to ensure that all bidders receive the same information. This may be done by issuing a bulletin to all bidders containing each question received and the response. This should be done at frequent intervals so that vendors have time to adjust their proposals if necessary.

2.3.4 Evaluation of Proposals

Proposals must not be opened before the stated final date for bids.

The evaluation of proposals must be, and be seen to be, fair and traceable. All stages of the evaluation process should be clearly documented and the reasons for each decision recorded.

Ideally, the evaluation team will include all the members of the team that drew up the specification, complemented by other personnel as necessary. It is good practice to isolate the evaluation of the financial proposal from the rest of the process. Besides maintaining the confidentiality of the financial bids, this avoids any influence of the technical evaluation on the financial and *vice versa*.

The evaluation process and criteria stated in the RFP must be strictly followed: this should avoid any protest by unsuccessful bidders.

Proposals are not always perfect, nor do they always fully cover every item of the RFP, and so there may be a need for clarification during the evaluation phase. It may be necessary to request additional technical or financial information in order to complete the evaluation; this should take the form of a simple request for the specific information required. However, there should be no negotiation at this stage, of either technical or financial elements.

Once the preferred bidder has been selected, the other bidders should be informed that they may be invited to negotiate if a contract cannot be concluded with the preferred bidder.

2.3.5 Contract Negotiation

There should be no negotiation with bidders before the selection process has been completed. Once the preferred bidder has been determined, negotiations on the detailed conditions are acceptable. Negotiations may be by correspondence or face-to-face, and should involve the appropriate experts from the ANSP.

It is important that the negotiations cover all aspects of the contract, including the vendor’s schedule. The negotiating advantage is with the purchaser until the contract is signed; it then passes to the vendor. Changes made after the contract has been signed are inevitably costly and often time-consuming.

The negotiations must be clearly documented.

If a satisfactory contract cannot be concluded, the next preferred bidder may be invited to negotiate a contract; alternatively, the tender process may be started again, but this is a costly process and is unlikely to produce a better outcome.

When the contract has been signed, the other bidders should be informed.

CHAPTER 3 IMPLEMENTATION

The implementation phase begins when the contract is signed.

Typically, the vendor's activities during the implementation phase include design review, manufacture, factory testing, documentation, training, delivery, installation, site acceptance testing and handover.

The ANSP is involved in all these activities to some degree, except manufacture; but the ANSP must also prepare for the operation of the system. This will involve developing test requirements, planning training, organising staff deployment, developing procedures and planning the operational transfer from the existing to the new system.

3.1 IMPLEMENTATION SCHEDULE

The project manager can now use the vendor's schedule as the basis for finalising the overall project schedule. The project schedule should detail all anticipated activities, including system design reviews, factory and site acceptance tests, training (both vendor training and internal training), commissioning and operational transfer. The schedule should also show related activities such as development of operational and technical procedures and preparation of operational material such as charts.

3.2 CONTRACT SUPERVISION

The project manager is normally responsible for supervision of the contract works. This can generally be achieved by monitoring the vendor's progress reports, at least until the vendor starts work on site.

It is likely that desirable changes to the specification or the contract will be identified during design reviews or factory testing. However, careful management of change is essential. Every change will incur costs and delays.

A formal change control system should be implemented, with every change being submitted for approval only after costs and delays have been established. The procedure should identify the levels of cost and delay that the project manager can approve.

3.3 SYSTEM DESIGN REVIEW

This review takes place after the vendor has completed the design for the system, and, as with the concept design review, is intended to ensure that the design meets all the operational and technical requirements. The design review is the point at which the design quality is determined It is also the last stage at which design changes should be made; however, changes made at this stage are likely to incur costs and delays.

3.4 FACTORY ACCEPTANCE TEST

The factory acceptance test is the last opportunity for the ANSP to identify problems before the system is shipped out from the factory and is the point at which the production quality is determined. It is also usually the first opportunity for ANSP personnel to examine and try out the system, and is often combined with factory-based training. It is important that operational as well as technical personnel attend the factory acceptance: it should be a test of operational features as well as of technical compliance.

The vendor should produce a detailed test schedule well before the beginning of the test, so that the ANSP can consider whether the tests meet the requirements and whether any additional tests should be included.

The results of any tests performed by the vendor before the acceptance test should be made available at the start of the acceptance test.

Any problems that are encountered during the factory test should result in agreed corrective actions to be undertaken by the vendor. These may be carried out before shipping or on site, according to the nature of the problem. The results of the factory test form an important part of the contract documentation, as they record the performance of the system and the agreed corrective actions.

3.5 PREPARATION FOR OPERATION

There are a number of items that the ANSP must address in preparation for operation of the new system. These include:

- Development of operational procedures.
- Development of system management procedures.
- Preparation of system data (for maps, etc).
- Establishment of system parameters.
- Development of internal training courses for controllers, system operators and technical staff.
- Development of operational transfer plan.
- Safety assessment.

The ANSP is responsible for carrying out these tasks, although some assistance and information from the vendor will be necessary to complete them. Some of the work can be carried before the installation begins, but it may be more convenient to leave some until the vendor's specialists are on site.

While it is not appropriate for this guidance material to address each item in detail, some items do merit discussion.

3.5.1 Operational Procedures

The FANS 1/A Operations Manual (FOM) has been adopted for Regional use and contains the procedures for the use of the datalink applications.

The ANSP may need to develop other procedures.

3.5.2 System Management Procedures

Procedures for managing the system must be developed. These should cover such topics as system start, changeovers between "main" and "standby" systems, contingency operations, map data management, data recording and monitoring,

3.5.3 Preparation of System Data

The ANSP will be required to provide data to define, for example, FIR boundaries for hand-off processing and airspace maps for the display system. The vendor will provide details of the information required and may either process the data into the system or, preferably, train and assist the ANSP staff to do so.

The preparation of this type of data can be a very detailed and time-consuming process, and due allowance should be made in the project plan.

3.5.4 Establishment of System Parameters

System parameters are used to set values for a number of variables used in the software. These parameters can be changed, but normally only by software specialists. Typical system parameters include timer intervals, for example to set the default interval between ADS periodic contracts, standard range settings, display colours, etc.

The vendor will detail the system parameters and will be able to suggest suitable values; however, the ANSP must make the final decision on each parameter. The parameters should be set before site acceptance testing, so that their effect can be determined. The parameter values should be finalised before operational transfer and changes avoided during the initial period of operation.

3.5.5 Development of Training Courses

It may not be practical or appropriate for the vendor to provide initial training for all personnel, and future training requirements must also be considered. The ANSP must develop its own training courses to complement the initial training by the vendor and to meet its future training requirements.

3.5.6 Operational Transfer Plan

The operational transfer plan should detail each step of the transfer, particularly with regard to contingency measures to recover from system problems or unexpected operational difficulties.

For each step, the plan should give details of the timing, the people involved and any other resources that may be required. It is important to clearly define the measures or events that determine that each step has been satisfactorily completed.

It is also important that the plan is made widely available so that everyone involved understands what will happen.

The operational transfer process is discussed in 3.8 below.

3.5.7 Safety Assessment

It is most important that a safety assessment (or safety case) is prepared for the introduction and operation of the system. The purpose of the safety assessment is to identify all the risks associated with the introduction and operation of the system, to establish the level of each risk and to determine how those risks can be removed or reduced to an acceptable level.

Examples of risks are ADS link failure, workstation failure, inadequate controller training, and failure to close a CPDLC message sequence.

The resulting safety assessment document will list all the risks that have been identified, the associated risk levels and the measures adopted to remove or mitigate each risk.

Safety assessments are described in detail in ICAO Doc 9859, Safety Management Manual.

3.6 TRAINING

Comprehensive training is vital so that controllers, system operators and maintenance personnel must all be able to carry out their tasks competently and effectively as soon as the system becomes operational. A comprehensive training plan is a prerequisite for a successful training programme.

Training is perhaps the most important of all the preparatory tasks.

3.6.1 Controller Training

While the separation standards that controllers apply will probably not change, at least not immediately on introduction of the new system, the tools they use will have changed significantly. The training must cover both the operation of the new workstations and the associated tools and, equally importantly, the procedures for using the datalink applications.

Training on the manipulation of the displays and controls should be provided initially by the vendor, and the ANSP's training staff should be included in the first courses. The training staff can then develop and deliver that training.

The procedures for the use of datalink applications have been developed within the Region and are laid out in regional documents. The vendor cannot be expected to provide training on datalink procedures; this is a task that must be performed by professional training controllers. The training modules must be developed well in advance, ideally in cooperation with the training sections of other ANSPs that have experience of datalink operations.

The timing of the training is important. There will almost certainly be several courses to train all controllers, and all training should be completed before operational transfer. The controllers on the earliest courses may have difficulty remembering what they have been taught; one solution is to provide short refresher courses shortly before operational transfer.

3.6.2 System Operator Training

The operation of the system includes starting and stopping the system, switching between operational and standby units, rebooting, system recovery, changing system parameters, loading data for maps, etc, and installing software changes.

The vendor must provide the first training courses for system operators. The syllabus must include the items identified above, with sufficient background to allow the operators to understand the implications of the various actions that they will be expected to perform. They should also be given a good understanding of the various functions of the system.

The training should include practical sessions using the full system, so that the operators experience the various tasks at first hand.

3.6.3 Maintenance Training

The first training courses for maintenance technicians must also be carried out by the vendor. With systems of this type, technicians must be able to diagnose faults down to circuit board level. However, as these systems include a number of computers, technicians must have an understanding of the general software structure. They should also be trained to differentiate between hardware and software faults, and to undertake simple software recovery activities.

3.6.4 Simulator Based Training

If simulator facilities are provided as part of the system, a large proportion of the training can be carried out using these facilities. Simulators are particularly valuable in allowing controllers to experience unusual or exceptional conditions, such as traffic overloads, weather deviations, route changes, emergency descents, conflictions and system failure.

3.7 SITE ACCEPTANCE TEST

The site acceptance test is the last stage before handover by the vendor. This test is crucial. It is the last opportunity to identify problems while the system remains the responsibility of the vendor and should be resolved at the vendor's expense. Once the acceptance documents are signed, the vendor can fairly claim that any new problems are the responsibility of the ANSP and will seek costs if asked to rectify them.

The vendor should produce a test schedule well before the tests are due to start, but it is unlikely that the schedule will contain tests that exercise operational procedures. The ANSP, in consultation with the vendor, should develop operational scenarios that will test a wide range of procedures and functions and add these to the schedule.

3.7.1 Physical Checks

The first stage is typically a physical inspection and inventory check to ensure that all items are present and serial numbers recorded accurately. It is important to inspect the physical condition of all units and record any defects.

3.7.2 Technical Tests

This is generally followed by the technical tests which establish whether the system is correctly set up and is working properly. The system parameters are usually set during these tests, though some may need to be adjusted during the operational tests. System start-up, changeover and shut-down procedures, as well as contingency degradation and recovery processes, must also be tested.

3.7.3 Operational Tests

The operational tests determine whether the operational characteristics are correct, the controls function as expected and the system handles incoming and outgoing data correctly. There should also be tests to ensure that the system operates correctly under the specified maximum load.

These tests will typically take several days to complete as all functions must be tested from all workstations. A number of typical scenarios should be prepared in advance so that the tests can be carried out in a realistic environment.

It is essential that live testing of the datalink functions takes place. Tests of ADS and CPDLC will require the cooperation of either one or more airlines or alternatively an aircraft manufacturer with a suitable test-bench. If airlines are used, it must be quite clear that ATS instructions passed are for test purposes and are not to be complied with.

3.7.4 Results

As with the factory test, it is most important to record, in detail, all problems and unusual occurrences.

The outcome of the test should include an list of corrective actions to be undertaken by the vendor within an agreed timescale.

3.8 OPERATIONAL TRANSFER

The most usual ways of transferring operation to a new system are the phased transfer and the parallel operation transfer.

3.8.1 Parallel Operation Transfer

The parallel operation transfer starts with old system being used operationally and the new system running in parallel with its controllers going through their tasks as though that system was operational. When the time comes to switch over to the new system, the old is system is operated in parallel for a short time as a fall-back in case of unforeseen problems. Operation of the new system need not be full-time until shortly before transfer: for example, it would be appropriate to start parallel operations during low traffic periods and work up to busy periods. H24 parallel operation is not necessary until immediately before and after transfer.

The parallel operation transfer is generally preferable as it allows the new system to be run, in its entirety, in an environment that is as close as possible to fully operational before actually taking over the operational load. However, it does require full staffing of both systems during periods of parallel operation.

3.8.2 Phased Transfer

In the phased approach, operations are transferred bit by bit, typically one sector at a time, until the whole operation is running smoothly on the new system. This type of transfer may be more appropriate where the space available dictates that only one or two positions can be transferred at a time or where limited staff numbers mean that it is impossible to operate both systems simultaneously.

In this type of transfer, it is good practice to keep at least one sector available on the old system as a contingency position.

3.8.3 Preparation for Transfer

The transfer must be carefully planned; in particular, there must be close coordination with external ATS units that may be affected. Staff must be thoroughly briefed before the start of the transfer process and must be kept informed of any changes to the plan.

The criteria for deciding when operations can be transferred to the new system must be clearly defined in advance. If a phased transfer is planned, transfer criteria should be set for each phase.

It is quite possible that problems will arise and it may be necessary to return the operation to the current system or to the last successful step, as appropriate. The reversion process should be established in advance – if contingencies have not been planned for, it is very likely that mistakes will be made and the problem compounded.

After the transfer has been successfully completed, it is useful to hold a debriefing to determine what went well and what did not. This can identify potential problems and possible areas of concern with both the technical and the operational aspects of the system and the new procedures.

CHAPTER 4 REQUIREMENTS

4.1 GENERAL REQUIREMENTS

The integrated ATS datalink system will incorporate AFN, ADS, CPDLC and AIDC.

The system will be linked with other automated systems. The FDP system provides flight plan data, such as the flight identification and flight path. The ATS operation will be enhanced if the system has the ability to feedback current aircraft positions to the FDP system to update the flight data.

The system will be linked to aircraft by a datalink service provider (DSP).

The system will be capable of transmitting and receiving AFN, ADS and CPDLC messages complying with RTCA/DO258A-EUROCAE/ED-100 and AIDC messages complying with the Asia/Pacific Regional Interface Control Document for AIDC (ICD).

The system will include the ACARS Convergence Function (ACF) to convert messages between the character-oriented data of ACARS and the bit-oriented data used in ADS and CPDLC.

The system will provide air traffic controllers with:

- Display of message exchanges.
- Display of updated aircraft positions and maps.
- Tools for measuring separation in distance or time.
- Tools for measuring angles between aircraft flight paths.
- Information on aircraft flight status.
- HMI tools for composing ADS and CPDLC messages.
- Alerts for exception conditions (e.g. expected message not received, coordination overdue).
- Conflict probe capability.
- Electronic flight progress strips, and paper strips if required.
- Presentation of emergency status.
- Other information pertinent to ATS operations.

The system capacity will be determined from:

- Traffic density at the peak hours.
- Frequency and size of messages per aircraft.

- Airspace size and number of waypoints.
- Number of FANS capable aircraft operating in the airspace.
- Anticipated growth of FANS operation.
- Number of displays.
- Number of connections for terminal systems.

4.1.1 Notification of Error Messages

The system will be capable of performing the cyclic redundancy check (CRC) on each message.

The system will be capable of format and validity checks appropriate to each message.

Controllers will be notified when the system detects:

- A message error.
- A message sequence error.
- A duplicate message identification number.
- Message non-delivery.
- An expected response not received.

4.1.2 Time Stamps and Timers

CPDLC and AIDC messages will be time-stamped; however, the form of some timestamps is actually set differently from that specified in Doc 9694.

By setting and/or deactivating various timer values for the messages received in response to transmitted messages, the system will monitor whether or not aircraft responses arrive within a specified time limit.

Timers are generally based on the operational requirements of each ATSU. However, the timers for sending messages relating to the automatic transfer of CPDLC connection and to AIDC will be set according to bilateral agreements with adjacent ATSUs concerned.

A timer file will be provided in the system for:

- Timeout settings for delayed response.
- Timing to initiate actions in ADS/CPDLC operations for:
  - Connection request (CR).
  - ADS periodic, event and demand requests.
  - Automated transfer of connection to the next ATSU.

  - Sending Next Data Authority (NDA) message.
  - Sending AFN Contact Advisory (FN_CAD): at least 30 minutes prior to FIR boundary message.
  - Sending End Service message prior to the aircraft crossing the FIR boundary (e.g. 5 minutes before).
- Timer to trigger actions for sending AIDC messages.
- Timer for re-transmission of the message when no response is received within a specified time.

4.1.3 Applicable Documents

4.1.3.1 ICAO Documents

Annex 10, Volume III, Communication Systems

Manual of Technical Provisions for the Aeronautical Telecommunication Network – Doc 9750

Manual of Air Traffic Services Data Link Applications – Doc 9694

Regional Supplement to the ASTERIX Interface Control Document (ICD) for the Asia/Pacific Region

Asia/Pacific Regional Interface Control Document (ICD) for ATS Inter-facility Data Communications (AIDC), version 2

Guidance Material for End-to-End Safety and Performance Monitoring of ATS Datalink Systems in the Asia Pacific Region

FANS 1/A Operations Manual

4.1.3.2 Industry Standards

The industry standards for ATS datalink systems are described in the latest versions of the following documents.

- ARINC 622: ATS Datalink Applications over ACARS Air-Ground Network (end-to-end).
- RTCA DO-258/EUROCAE ED-100: Interoperability Requirements for ATS Applications Using ARNC 622 Data Communications.
- ARINC 620: Datalink Ground System Standard and Interface Specification (ground-to-ground).
- ARINC 619: ACARS Protocols for Avionics End Systems (Airborne).
- ARINC 429: Mark 33 Digital Information Transfer System (DITS).

Note: It should be noted that some message parameters for avionics are categorized as ‘option’ data, but provide information useful for ATS operations.

4.1.4 Data Recording

The contents and timestamps of all messages will be recorded by the system. There will be a facility to retrieve, display and printout the recorded data.

4.1.5 System Performance Monitoring Tool

The Central Reporting Agencies (CRAs) perform safety assessments of datalink performance, and to support this function, in accordance with the FOM, ATSUs are required to produce monthly statistics of end-to-end system performance in daily operations. The system performance criteria from the FOM are reproduced at APPENDIX C. The system should have appropriate tools for monitoring and analysing the performance data for reporting to the appropriate monitoring agency.

4.2 DATALINK INITIATION CAPABILITY

4.2.1 AFN Logon Functions

The AFN logon functions provide the necessary information to enable ADS and CPDLC communications between the system and aircraft avionics systems for:

- Logon.
- Forwarding logon information to the next ATSU.

Note: Details of Datalink Initiation Capability (DLIC) functional capabilities are provided in Doc 9694 Part 2.

The required capacity for AFN logons will be determined from the operational requirements, such as estimated number of FANS aircraft at the peak hours and anticipated growth of FANS traffic.

The system must be capable of accepting or rejecting AFN logon requests.

The system will be linked with the FDPS to correlate the AFN logon data automatically with the aircraft flight plan.

The controller’s workstation should be capable of displaying the following data:

- Address and version number of the aircraft applications, if required.
- Response from the aircraft with timestamp.
- Status of correlation of the aircraft with its stored flight plan.
- Indication of ‘Acceptance’ or ‘Rejection’ to the logon request from aircraft.

When an aircraft downlinks its supported applications and their version numbers in an FN-CON message, the ground system response must indicate whether or not it supports those version numbers.

The system must be capable of sending the Acceptance message or the Rejection message with reason, as appropriate.

4.2.2 Use of AIDC for Forwarding AFN Message

The ATS system should be capable of sending the FANS application message (FAN), in accordance with the ICD. When possible, the system should use the AIDC FAN message for address forwarding in preference to the AFN application.

4.3 CPDLC

4.3.1 General

The required capacity of the CPDLC function will be determined by taking account of the operational policy and procedures and the airspace characteristics, such as the number of FANS-capable aircraft, airspace size and number of waypoints, the communications necessary in ATS operations, and of the estimated future growth of datalink operations.

The system will be capable of processing the specified number of message exchanged with each of the aircraft.

Down-linked CPDLC messages will be displayed to controllers. Tools must be provided to allow simple and intuitive initiation of, or response to, CPDLC messages.

Note: The size of the free text field is limited to 80 characters (instead of 256) for some specific aircraft types.

CPDLC position reports should be used to display aircraft positions when no ADS report is available.

The system will have the capability of terminating CPDLC connection with the aircraft.

4.3.2 Transfer of CPDLC between ATC Sectors

The system will allow transfer of CPDLC between sectors of an ATSU without changing the data authority and with the same CPDLC link.

4.3.3 CPDLC Message Exchange Requirements

The system will be capable of handling the message set and the standardized free text messages defined in the FOM, as well as free text.

The system will allow controllers to review uplink messages prior to sending.

4.3.4 Message Handling Order

Messages will be handled in order of priority.

Messages with the same priority will be processed in the time order of receipt.

The controller will be alerted to unsuccessful receipt of the required response in the specified time or receipt of Message Assurance Failure (MAF).

4.3.5 Responses

The system will allow controllers to send any response messages linking with the reference number of the message received. The relationship between the message and its intent and the response requirement is defined in the FOM.

4.3.6 Message Closure

A CPDLC dialogue will not be closed until an appropriate closure response for that message with same reference number is received.

When the closure response message is sent, the dialogue is closed and the system will reject any further attempt to send a response message.

The capability of closing a CPDLC dialogue, independent of CPDLC closure message receipt, will be provided.

4.4 ADS

4.4.1 General

The capacity of the ADS function will be determined from the operational policy and procedures and the airspace characteristics, including number of FANS capable aircraft, periodic reporting rate, airspace size, waypoint event report frequency, usage of event and demand contracts, and projected traffic growth.

The system will be capable of initiating periodic, event and demand contracts.

The system will be able to support a demand, an event and a periodic contract simultaneously with each aircraft.

The system will apply validation checks to incoming data by reference to flight plan data in relation to time, altitude, direction and position.

The system will be capable of processing ADS reports to display aircraft positions, tracks and altitude. Between ADS reports, aircraft positions will be extrapolated and displayed automatically at specified intervals.

The datalink system should have the capability of supporting 30NM lateral and 30NM longitudinal distance based separation standards.

Air and earth reference data of ADS reports will be provided for controllers if required.

The types of ADS contract are described at 5.3.1 ADS.

4.4.2 Message Handling

ADS messages will be processed by the system in the following order:

1. ADS emergency mode.
2. Demand/event reports.
3. Periodic report.

Within these categories, messages will be handled in the order received.

The following errors will be notified to controllers:

- Message validation error.
- Message sequence error detected with time stamp.
- Time-out of ADS report in response to request.
- Periodic and waypoint event report failure.

4.5 AIDC

4.5.1 General

General descriptions of AIDC applications, requirements, functional capabilities, and message contents are provided in the latest version of the ICD.

The AIDC application exchanges ATC coordination information between ATSUs.

Bilateral agreements between ATSUs are necessary to determine the operational and system requirements for both ATSUs, and should be made before developing the system. These agreements should cover:

- The ICD to be applied – Asia/Pacific or other ICD.
- message set to be used.
- usage of messages (e.g. timing of transmission).

The AIDC application requires that:

- messages are generated and sent in time-ordered sequence.
- messages are delivered in the order in which they are sent.

When an ATSU queues received messages, messages with the highest urgency type will be placed at the beginning of the queue. Messages will be assigned one of the following urgency attributes:

- Normal.
- Urgent.
- Distress.

The time used in the AIDC application will be accurate to within 1 second of UTC.

A timestamp will be generated when the message is dispatched and will consist of the date (YYMMDD) and time (HHMMSS).

Where an AIDC message is linked to a previously sent message, the message will contain reference information, including the ID of the referenced message.

4.5.2 Asia/Pacific Interface Control Document (ICD)

The Asia Pacific ICD for AIDC provides the standardized procedures for inter-facility message exchanges.

(The purpose of the ICD is to ensure that inter-facility message exchanges between ATSU equipped with automated ATS systems in the Asia/Pacific Region are harmonized to a common standard.)

Until ATN becomes available, the engineering details needed to implement the exchange of messages described in Appendix A of the ICD will need to be agreed to bilaterally.

4.5.3 Message Header

Every message will contain an AFTN header. The AFTN IA-5 message header, including the use of the Optional Data Field defined in Annex 10, will be employed for the exchange of data. AFTN priority indicator FF will normally be used for all data exchanges.

A message header consists of the optional data field (ODF), addressing, message/data identification number, reference information, time stamp and cyclic redundancy check (CRC).

4.5.4 ATS Coordination Messages

AIDC provides the means by which data is exchanged between and within ATSUs for the notification of flights approaching FIR boundary, the coordination of boundary crossing conditions and the transfer of ATC services.

AIDC messages are also used to exchange emergency, track definition, and application management information as well as for transfer of surveillance data.

4.5.5 Detailed Information Provided in ICD

The appendices to the ICD describe:

- ATS coordination messages (Appendix A).
- Error codes (Appendix B).
- ATM application naming conventions (Appendix C).
- Implementation Guidance Material – IGM (Appendix D).
- Relationship to ICAO AIDC messages (Appendix E).

4.5.6 Performance Requirements

The performance requirements for the trip time of messages need to be specified and agreed to with neighbouring ATSUs to ensure effective use of AIDC. Recommended performance figures are specified in Appendix D of the ICD.

The methodology for monitoring AIDC performance is provided in Appendix A of the Guidance Material for End-to-end Safety and Performance Monitoring of ATS Datalink Systems in the Asia/Pacific Region.

CHAPTER 5 SPECIFICATION

The development of the specification should, wherever possible, be a team effort, with operational and technical personnel working together to achieve the optimum result. System specifications should be based primarily on operational requirements; the technical specifications should be framed to support those requirements.

In developing a specification for any technical system, it is important to achieve the right level of detail. Too little detail leaves the purchaser at the mercy of potential suppliers, while too much may preclude suppliers from offering very suitable equipment. In general, it is probably appropriate to specify requirements in great detail only where those requirements are essential to the operation, and otherwise to leave the supplier a reasonable amount of freedom. An off-the-shelf system can be expected to be less expensive than one that is custom-designed.

It is also important to get the specification right. Proposals will be priced on the specification, and any changes required later, particularly after the contract is signed, will be costly in terms of price and completion time.

This section on specification covers the system configuration, its interfaces with other systems, its functionality, the operator interface, system capacity, and recording and data analysis.

5.1 SYSTEM CONFIGURATION

The system configuration depends upon the operational environment. In specifying the configuration, a number of issues must be considered:

- Is it to be a stand-alone ADS/CPDLC/AIDC system, is it to be part of an integrated system or is it to be interfaced with a separate ATM system?
- How many sectors are required?
- How many workstations are required per sector? If more than one, why?
- What contingency configuration is required?
- Is complete duplication of the system required?
- What are the requirements for main/standby computers and independent contingency workstations?
- Will there be duplication of communications bearers? If so, which ones?
- Assuming the normal operational configuration is one workstation per sector, how many contingency workstations are required?

5.2 INTERFACES

The System must have a number of interfaces to send and receive data; some of these are essential, others may be useful or just nice to have. This section concentrates on the essential and the useful.

5.2.1 Datalink Service Provider

In the current FANS 1/A environment, ADS and CPDLC messages are passed between aircraft and the System using the ACARS data messaging system. ACARS was developed by the DSPs to pass information between the airline operating centre (AOC) and the aircraft. ADS and CPDLC required an air-ground datalink and, in the absence of the Aeronautical Telecommunication Network (ATN), the ACARS system was used.

Access to the ACARS datalink is available only from the DSPs; ARINC and SITA are the major DSPs; they provide global coverage and complete management of the signal between the ATSU and the aircraft, including selection of most appropriate datalink path (VHF, satellite or HF). There are also some national or regional DSPs, such as AVICOM Japan.

It is essential therefore to specify the appropriate interface port(s) to connect to the chosen DSP. This is typically an RS232 serial port, but the exact requirement should be confirmed with the DSP.

5.2.2 ATN

It is intended that the ADS and CPDLC functions will eventually be carried by the ATN. The purpose of the ATN is to "provide data communication services and application entities in support of the delivery of air traffic services (ATS) to aircraft; the exchange of ATS information between ATS units; and other applications such as aeronautical operational control (AOC) and aeronautical administrative communication (AAC)." [Annex 10, Vol III, 3.3]

It is important, therefore, that any new system should either include provisions for, or have a defined upgrade path to provide, interfacing with the ATN.

ICAO Doc 9705 - Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN) is the appropriate source of interface data for the ATN.

At present, the ATN is under development and trials are being carried out in several ICAO Regions.

5.2.3 AFTN/AMHS

The AFTN is currently the carrier for ground-ground messaging between ATC units and carries AIDC messages in the FANS 1/A environment. The AHMS (Aeronautical Message Handling System) is the ground-ground messaging application of the ATN. The AMHS is also referred to as the ATSMHS (ATS Message Handling System).

AIDC messages will be passed via the AFTN until the ATN is operational. However, AFTN/AMHS gateways will increasingly be used to provide a transition between the AFTN and ATN. These gateways transpose AFTN messages into AMHS format and vice versa.

Any new system should include at least one AFTN/AMHS gateway. AIDC messages generated in AMHS structure can then be transmitted via the AFTN and incoming messages from the AFTN will be transposed to AMHS structure. After the ATN becomes operational and the AFTN is no longer used, the gateway can be removed.

5.2.4 ATS systems

In many cases, interfaces to other ATS systems will be necessary. This may be because an ADS/CPDLC system will use the flight data or other processing capability of another system or because the new system will be directly connected to another system.

5.2.4.1 Flight Data Processing System

Where an ADS/CPDLC system is to rely on an existing system to provide flight data, the interface required will depend on the data to be passed. The ADS/CPDLC system may have no flight data processing capability and merely require flight plan information for identification purposes, or it may have some capability to up-date flight plans received from the other system and return the up-dated information.

In either case, the interface may need to transform data formats between the 2 systems. It is therefore essential that the data formats used by the existing system are detailed in the specification so that they are allowed for in proposals; otherwise, costly contract variations may be required.

5.2.4.2 Radar Data Processing System

Data imported from a separate radar data processing system will take the form of track data or possibly plot data. As with interfaces for flight data, it is most important to detail the radar data formats in the specification.

If ADS data is to be exported to a separate radar data processing system or display system, the formats required by those systems also must be detailed.

5.2.4.3 Direct Connection between Systems

When a full system (with FDPS and perhaps RDPS as well as ADS/CPDLC/AIDC) is to be connected directly to an existing system for full data interchange, details of all the data formats of the existing system should be included in the specification.

5.2.5 Radar Data

If the System is to receive direct radar feeds from existing radars, the output data format of each radar must be detailed.

Most new systems are designed around the ASTERIX surveillance data formats; specifying ASTERIX where possible will allow the greatest flexibility for the future. The ASTERIX Standard was adopted as the ICD for surveillance data exchange for the Asia/Pacific Region in 1998. Information on ASTERIX may be found at:
http://www.eurocontrol.int/asterix/public/subsite_homepage/homepage.html

The "Regional Supplement to the ASTERIX Interface Control Document for the Asia/Pac Region" gives details of location-specific ASTERIX coding.

Inputs from military radars may be non-standard or require additional processing; any available details should be included.

5.2.6 ADS B Data

Where ADS B data is available or anticipated, the system should be capable of accepting and processing such data.

5.2.7 Meteorological Data

Many modern systems make provision for the use of meteorological data for updating predicted waypoint times in near-real time. However, this type of prediction may require very large amounts of data and may not be justified if experience shows that weather variations have very little effect on the routes concerned or where the weather patterns are such that occasional manual input would suffice.

If there is a requirement for regular automatic data input, the available sources of data should be investigated and the appropriate formats should be specified.

5.3 FUNCTIONALITY

This section covers the core applications of the system, ADS, CPDLC and AIDC, and their supporting functions, AFN and ACF.

5.3.1 ADS

ADS is a means of surveillance in which an aircraft reports its current position, intent and other pertinent information via the datalink function to an ATSU. ADS is detailed in ARINC 745-2.

The ADS reporting rate and the types of data to report are determined by ADS contract requests from an ATSU. An aircraft can report to up to four ATSUs simultaneously.

There are three types of ADS contract: the periodic contract, the event contract and the demand (“one-shot”) contract.

5.3.1.1 Periodic Contract

The ATSU sets up a periodic contract with the aircraft to obtain regular position reports; the contract specifies to the aircraft the reporting rate, any optional data groups be added to the basic ADS report, and the frequency at which the optional groups are to be included in the reports.

Only one periodic contract can be established between an ATSU end system and a particular aircraft at any one time. The periodic contract normally remains in effect until the contract is cancelled by the ATSU.

The system must be capable of pre-defining the reporting rate as a system parameter and of allowing the controller to change the rate, on a case by case basis, to meet operational requirements.

The system must also allow the controller to include any of the permissible additional data groups in a periodic contract request.

Some systems have the capability of automatically changing the reporting rate from one area to another; however, this could increase system cost and complexity.

5.3.1.2 Event Contract

An event contract specifies a request for reports whenever a defined ‘event’ occurs. Only one event contract can be established between a ground system and a particular aircraft at any one time; however, the event contract can contain multiple event types. There are four event types.

The **Vertical Rate Change Event** is triggered when the aircraft’s vertical rate is either less than or greater than a parameter defined in the contract.

The **Lateral Deviation Change Event** is triggered when the aircraft’s actual position exceeds a lateral distance parameter from the aircraft’s expected position on the active flight plan in the FMC.

The **Altitude Range Change Event** is triggered when the aircraft’s altitude exceeds the altitude ceiling or floor defined in the contract by the ground system.

Once a vertical rate, lateral deviation or altitude range event trigger has occurred, a recurrence of this event no longer triggers an event report. If required, a new event contract must be initiated each time one of these specific events occurs.

The **Waypoint Change Event** is triggered by a change to the next or the next-plus-one waypoints. Such a change normally occurs due to routine waypoint sequencing. However, it will also be triggered by occurrences such as a change to a non-ATS waypoint entered by the pilot for operational reasons, or execution of a new route affecting the next or next-plus-one waypoints. Unlike the other event contracts, the waypoint change event trigger remains in effect for all waypoint changes.

Once an event contract has been established, it remains in effect until the specific event requests are fulfilled, or it is cancelled by the ground system.

The system must be capable of pre-defining the event trigger parameters and of allowing the controller to change the event parameters as required.

5.3.1.3 Demand Contract

The demand contract is a “one-off” request from the ground system for an ADS report containing specific data as defined in the request. A demand contract can be requested by the ground system at any time. The demand contract request does not affect any existing contracts.

The system must allow the controller to initiate a demand contract, including optional data fields.

5.3.1.4 Emergency Mode

The emergency mode can only be activated by the pilot and is normally cancelled by the pilot. While it is possible for a ground system to cancel the emergency mode status, most ground systems do not have this capability; however, some ground systems allow the controller to modify the “display” of the emergency mode status.

The system must recognise the emergency flag and display the emergency status to the controller.

5.3.2 CPDLC

CPDLC provides a two-way message system between controller and pilot. It comprises an number of pre-defined up-link and down-link messages, some of which are complete in themselves, while others require data (such as time, flight level, etc) to be added. There are also two free-text messages available in each direction, one reserved for emergency use.

To send a message, the controller selects the required message and enters any required data. (Options for selecting messages and entering data are discussed below under Human-Machine Interface.) The system then automatically codes the message in bit-oriented format and presents it for transmission.

On reception of a down-link message, the CPDLC application decodes the message and presents it to the controller.

The current message set is detailed in the FOM, and the system must provide the complete up-link message set and be capable of accepting and decoding the complete down-link message set.

Some message sequences require “closure”:

- A message requiring a response remains open until a referenced response is received.
- A message is closed when either a response is not technically required, or after a referenced response other than STANDBY or REQUEST DEFERRED has been received.

The system must manage message closure protocols in accordance with the requirements of the FOM.

5.3.3 ACF

ADS and CPDLC both operate on bit-oriented data, while ACARS is character-oriented. The ACARS Convergence Function (ACF) converts the bit-oriented data of ADS and CPDLC to the character-oriented data used by ACARS, and vice versa.

If the system is to operate over ACARS, the ACF must be specified as an essential requirement.

(The ACF is not required where the ATN is the carrier.)

5.3.4 AFN

The AFN function provides the transfer of information required to support the initiation of datalink connectivity between an aircraft and an ATSU. The AFN is a character-oriented application.

Because it is essential to ADS and CPDLC operation over ACARS, the AFN function as detailed in ARINC 622-4 must be a requirement of the system specification.

5.3.5 AIDC

The AIDC application supports information exchanges for notification, coordination, and the transfer of communications and control functions between automated ATS systems located at different ATSUs.

The AIDC message set is defined in the ICD. This message set was based on ICAO agreed methods and messages wherever possible; elsewhere, new messages used existing ICAO field definitions to the extent possible.

5.4 OPERATOR INTERFACE

5.4.1 Human Factors

Human factors play a major part in the success or failure of a system to meet its operational objectives. A system that is uncomfortable to use will lead to controller dissatisfaction, which as controllers are an essential part of the overall system, can only degrade the overall system performance.

Displays and keyboards that are poorly designed from a human factors aspect will be inefficient and may cause actual harm to the users. Bad display design can affect the eyes and bad keyboard design may result in occupational overuse syndrome (repetitive strain injury). The human factors implications of the system specification should be very carefully considered, and it may be appropriate to get specialist advice.

5.4.2 Displays

One or more displays are required to handle the ADS, CPDLC and AIDC messages. Many systems incorporate message handling in the situation display.

Modern displays use LCD technology and may be as large as 600 x 600mm, with typical resolution of 2048 x 2048 pixels. Smaller displays may be more appropriate for some uses, particularly if there are 2 displays at a controller position: a second display is often used for flight data handling. However, the arrangement of displays will largely depend on the extent to which the new system is to be integrated with existing systems.

While colour displays offer great advantages in differentiating between different categories of data, the choice of colours for the various categories can be very contentious. It is essential that colour allocation is not arbitrarily decided, but is based upon sound human factors principles. Inappropriate colour choices can contribute to fatigue, confusion and errors. To avoid these problems, a human factors expert should be engaged to advise on the use of colour.

Different symbols should be used for radar tracks, ADS-B tracks, ADS-C tracks and tracks generated from flight plan information. The track symbol should be that of the source of the highest quality information. At the current stage of development of ADS-B systems, radar is generally accepted as the best surveillance data, followed by ADS-B and then by ADS-C. Flight plan tracks are the lowest quality.

The status of the CPDLC connection is important information for the controller and is best displayed in the track label.

5.4.3 Message Handling

Message handling for ADS, CPDLC and AIDC messages is usually achieved by some form of menu access for generating messages and by pop-up windows for replying to incoming messages. Most systems now offer access via the track label.

For CPDLC, there are two elements to generating most messages: selection of the specific message and entry of necessary data. The message selection should be simple: there are about 180 uplink messages available. Some systems present a selection of appropriate messages – for example, by offering only height-related messages if the height field in the track label is selected. ADS contract messages are more simple and infrequently required, so that a simple menu-type operation is normally adequate. AIDC messages can usually be generated automatically form flight plan data.

If a particular message handling method is required, it should be clearly stated in the specification.

The language for all menus and message sets should be English: English is the de facto language for radiotelephony within the Asia-Pacific Region. While it may seem attractive for menus and CPDLC messages to be displayed in a local language, this will inevitably lead to loss of English language proficiency and so will work against the new ICAO language proficiency provisions in Annexes 1, 6, 10 and 11. These provisions require that from March 2008, pilots, aeronautical station (radio) operators and air traffic controllers shall demonstrate the ability to speak and understand the language used for radiotelephony communications to specified levels.

5.4.4 Input Devices

The controller input devices include the text input device and the pointing device.

The text input device is normally a keyboard and there are various types of keyboard (standard, ergonomic, etc). The type should be specified if it is considered important; however, it is worth noting that controllers do not have to input large amounts of text in an ADS/CPDLC system. Touch panels may be offered instead of keyboards.

The mouse is the most common and probably most flexible pointing device; others include the track-ball and the light pen. It is difficult to locate a track-ball and keyboard so that they are well-placed for both left- and right-handed people, and light pens have been poorly received by many controllers.

Wireless connections for the input devices will reduce the clutter on the workstation working surface and allow more freedom of movement for the pointing devices. However, electro-magnetic compatibility with nearby equipment must be carefully considered.

5.5 CONTROLLER TOOLS

Controller tools include such items as:

- Conflict probe
- Temporary maps
- Bearing-distance lines
- Velocity vectors
- Label overlap avoidance

5.5.1 Conflict Probe

Conflict Probe is a tool to determine whether a proposed flight plan will come into conflict with another during a specified period.

The Conflict Probe is normally initiated by the controller for a particular aircraft. The probe compares the proposed trajectory with the current planned trajectories of other aircraft information and displays the position and time of calculated conflicts to the controller. The period covered by the probe is typically fairly long (up to several hours), as the main use of Conflict Probe is when a routing change is proposed under a flexible track regime.

Conflict Probe is a very complex function, requiring considerable computer power, and consequentially can be expected to be expensive.

5.5.2 Temporary Maps

Temporary maps allow controllers to depict on the display areas of interest on a temporary basis. Temporary maps should be simple both to construct – a few straight lines is usually adequate – and to switch on or off on the display.

5.5.3 Bearing-Distance Line

As its name suggests, a bearing-distance line allows a controller to measure the bearing and distance between 2 points on a display. The points might be an aircraft track symbol and a reporting point or 2 aircraft track symbols.

Some systems allow one or both ends of the line to lock on to an aircraft track symbol, so that the bearing and distance information displayed is updated as the aircraft move.

Multiple bearing distance lines, if available, can be useful.

5.5.4 Velocity Vectors

Velocity vectors display a vector from the track symbol showing the calculated position of the track after a specific time. The time is normally preset to a default value (typically 2 minutes); most systems allow the controller to set a different value.

Some systems also allow velocity vectors to be shown for all tracks or for a selected track only.

5.5.5 Label Overlap Avoidance

Label overlap avoidance allows the track labels to be moved to avoid labels overlapping one another. This is done by rotating some labels to new positions relative to the track symbol or by changing the distance of some labels from their symbols. The process is normally automatic, but should allow the controller to set selected labels to a preferred position.

5.6 SYSTEM CAPACITY

The required system capacity is directly related to the number of ADS, CPDLC and AIDC messages, the number of radar tracks, the number of active flight plans, the number of workstations and so on. These, in turn, are directly related to the volume of traffic, particularly the peak traffic volume.

The system capacity is normally expressed as the number of active flight plans that the system can handle at one time; in this context, “active” means that the system is using or processing the flight plan information in some way.

It is clearly important that the system capacity should allow for traffic growth over the projected life of the system, which for modern systems is typically 5 to 7 years between major upgrades or replacement. The anticipated growth should therefore be carefully assessed using the best projections available, and should allow for daily and seasonal traffic peaks.

However, it is also important not to set the capacity requirement too high, as this will almost certainly result in increased cost.

Some growth rates over those periods are shown below to give an indication of future capacity requirements based on current traffic:

Anticipated Annual Growth	Total Growth over		
	5 years	6 years	7 years
5%	28%	34%	41%
7.5%	44%	54%	66%
10%	61%	77%	95%

5.7 RECORDING AND DATA ANALYSIS

The system should record all incoming and outgoing ADS, CPDLC and AIDC messages for use in incident and accident investigations. It is imperative that all recordings are time-stamped. Messages are typically recorded onto a tape cartridge or DVD, and the system should allow change-over of the cartridge or DVD with no interruption to the recording.

Annex 10 Vol II and Annex 11 require communications, including AIDC and CPDLC, to be recorded and the recordings to be retained for at least 30 days for accident/incident investigation purposes. Chapter 3 of the FOM details some specific recording requirements for both safety investigation and performance monitoring.

The recording system should allow replaying of the situation and identification of messages were sent or received by the system.

Provision should also be made for recording data for use by the agencies monitoring RNP, RVSM and datalink performance. These are the Safety Monitoring Agency (SMA), the Regional Monitoring Agency (RMA) and the Central Reporting Agency (CRA) respectively. Generally, the data required by RMAs and SMAs is captured by the FDPS.

To meet CRA requirements, the specification should include a requirement for datalink performance monitoring tools and analysis software. The analysis software should, at the least, be capable of extracting time-stamps, addressees and message types from all incoming and outgoing messages.

The table below summarises the FOM datalink monitoring requirements for ANSPs.

Requirements	**Monitor/Record**
Operational Procedures	Time stamped ATS messages with identification and reference numbers
	Message Assurance
	Anomaly event report
Performance	End-system availability
	Transit times
Safety (i.e. operational, performance and interoperability requirements which are used to mitigate the effect of a failure condition)	Time stamped ATS messages with identification and reference numbers/MAS
	Anomaly event reports
Interoperability	Time stamped ATS messages with identification and reference numbers/MAS

APPENDIX A GLOSSARY

ACARS	Aircraft Communications Addressing and Reporting System
ACAS	Aircraft Collision Avoidance System (ICAO
ADS	Automatic Dependent Surveillance
AEEC	Airline Electronic Engineering Committee
AFN	ATS Facilities Notification
AFTN	Aeronautical Fixed Telecommunication Network
AIDC	ATC Inter-Facility Data Communications
AIP	Aeronautical Information Publication
AMHS	Aeronautical Message Handling System
ANSP	Air Navigation Service Provider
AOC	Airline Operational Communications
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ARINC	Aeronautical Radio Incorporated
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSMHS	ATS Message Handling System
ATSU	ATS unit
AVICOM	AVICOM Japan Co. LTD
CAA	Civil Aviation Authority
CNS	Communications, Navigation, Surveillance
CPDLC	Controller Pilot Data Link Communications
CRA	Central Reporting Agency (for datalink)
CRC	Cyclic Redundancy Check
DL	Downlink message
DSP	Datalink Service Provider
EUROCAE	European Organization for Civil Aviation Equipment
FANS	Future Air Navigation System
FIR	Flight Information Region
FIT	FANS Interoperability Team (IPACG, ISPACG)
	FANS Implementation Team (FIT-BOB, FIT-SEA)
FMC	Flight Management Computer
FMS	Flight Management System
GES	Ground Earth Station (satellite)
GPS	Global Positioning System (USA)
HF	High Frequency (3-30 MHz)
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation

IFATCA	International Federation of Air Traffic Controllers Associations
IFALPA	International Federation of Air Line Pilots' Associations
IPACG	Informal Pacific ATC Coordinating Group
ISPACG	Informal South Pacific ATS Coordinating Group
MAS	Message Assurance (data message)
MCDU	Multipurpose Control Display Unit (ACARS & FMC)
MU	Management Unit (ACARS)
NDA	Next Data Authority
NOTAM	Notice To AirMen
RASMAG	Regional Airspace Safety Monitoring Advisory Group
RMA	Regional Monitoring Agency (for RVSM)
RNP	Required Navigation Performance
RTCA	RTCA Inc.
RVSM	Reduced Vertical Separation Minima
SATCOM	Satellite Communication
SATVOICE	Satellite Voice Communication
SITA	Société Internationale de Télécommunications Aéronautiques
SMA	Safety Monitoring Agency (for RNP)
SR&O	System Requirements and Objectives (FANS-1 document)
TCAS	Traffic Alert and Collision Avoidance System (USA)
TMU	Traffic Management Unit
UL	Uplink message
VHF	Very High Frequency (30-300 MHz)

APPENDIX B REFERENCES

Annex 10, Volume III, Communication Systems		ICAO
Procedures for Air Navigation Services, Air Traffic Management	Doc 4444	ICAO
Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN)	Doc 9750	ICAO
Basic Air Navigation Plan – Asia and Pacific Regions	Doc 9673	ICAO
Manual on Airspace Planning Methodology for the Determination of Separation Minima	Doc 9689	ICAO
Manual of Air Traffic Services Data Link Applications	Doc 9694	ICAO
Safety Management Manual	Doc 9859	ICAO
Asia/Pacific Regional Plan for the new CNS/ATM Systems		ICAO Asia Pacific Office
Regional Supplement to the ASTERIX Interface Control Document (ICD) for the Asia/Pac Region		ICAO Asia Pacific Office
Asia/Pacific Regional Interface Control Document (ICD) for ATS Inter-facility Data Communications (AIDC), version 2		ICAO Asia Pacific Office
Guidance Material for End-to-End Safety and Performance Monitoring of ATS Datalink Systems in the Asia Pacific Region		ICAO Asia Pacific Office
FANS 1/A Operations Manual		
Interoperability Requirements for ATS Applications using ARINC 622 Data Communications	DO-258A / ED-100A	RTCA and EUROCAE
Air-Ground Character-Oriented Protocol Specification	618-5	ARINC
Data Link Ground Systems Standard and Interface Specification (DGSS/IS)	620-5	ARINC
ATS Data Link Applications Over ACARS Air-Ground Network	622-4	ARINC
Aircraft Communications Addressing Reporting System (ACARS)	724B-5	ARINC
Air Traffic Services Systems Requirements & Objectives (ATS SR&O)		Boeing

APPENDIX C PERFORMANCE CRITERIA

Criteria	Definition	Values
Performance	End-to-end round trip time for uplinks. (from sending of the uplink until reception of the MAS)	Round trip time of 2 minutes, 95% of messages. Round trip time of 6 minutes, 99% of messages.
	End-to-end one way time for downlinks. (comparison of message time stamp and receipt time)	One way time of 1 minute, 95% of messages. One way time of 3 minutes, 99% of messages
	Uplink messages only: Undelivered messages will be determined by: • Message assurance failure is received. After trying both VHF and SATCOM. Depending on reason code received, the message might, in fact, have reached the aircraft. • No message assurance or flight crew response is received by ATSU after 900 seconds	Less than 1% of all attempted messages undelivered
Availability	The ability of the network data link service to perform a required function under given conditions at a given time: The maximum allowed time of continuous unavailability or downtime should be declared (MTTR)*	99.9% TBD
Reliability	The ability of a data link application/system to perform a required function under given conditions for a given time interval: it can be expressed in MTBF (Mean Time Between Failure) *	TBD
Integrity	The probability of an undetected failure, event or occurrence within a given time interval.	10^{-6}/hour

∗ Availability = MTBF x 100/(MTBF+MTTR)

Note: RTCA SC189/EUROCAE WG 53 defines the performance requirements for specific operational environments.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

Caribbean/South American Air Traffic Flow Management Concept of Operation

(CAR/SAM ATFM CONOPS)

Version	1.2
Date	June 2007

FOREWORD

The *Caribbean/South American ATFM Concept of Operations* (CAR/SAM ATFM CONOPS) is published by the ATM/CNS Subgroup of the Caribbean/South American Regional Planning and Implementation Group (GREPECAS). It describes an air traffic flow management operational concept to be applied in both regions.

The GREPECAS and its contributory bodies will issue revised editions of the Document as required to reflect ongoing implementation activities.

Copies of the *CAR/SAM ATFM Concept of Operations* can be obtained by contacting:

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The present edition (Version 1.1) includes all revisions and modifications until April 2007. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table, according to the procedure established in page 3.

The publication of amendments and corrigenda is regularly announced through correspondence with States, and the ICAO web site, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1	20/06/07	20/06/007	JF

CORRIGENDA			
No.	Date applicable	Date entered	Entered by

AMENDMENTS TO THE DOCUMENT

1. The CAR/SAM ATFM CONOPS is a regional document that includes aeronautical, scientific, and technological advances related to ATFM. It also includes the operational experiences gained in the CAR/SAM Regions, as well as in other ICAO Regions, that may affect ATFM concepts and procedures.

2. Due to its unique and regional focus, the CAR/SAM ATFM CONOPS is also a dynamic document and is in continuous progress and permeable in order to accept every modification originated by the ATM/CNS subgroup. This will allow for constant improvement based on experience gained from aeronautical disciplines and activities, enable its harmonious implementation in the CAR/SAM Regions, and ensure air operations efficiency and maintain agreed levels of safety.

In order to keep this ATFM CONOPS updated and make the required changes and/or modifications, the following amendment procedures have been established.

1. The ATFM CONOPS consists of a series of loose-leaf pages organized in sections and parts describing the concepts and procedures applicable to ATFM operations in the CAR/SAM Regions.

2. The framework of the sections and parts, as well as the page numbering have been developed so as to provide flexibility, facilitating the review or the addition of new texts. Each Section is independent and includes an introduction giving its purpose and status.

3. Pages bear the date of publication, as applicable. Replacement pages are issued as necessary and any portions of the pages that have been revised are identified by a vertical line in the margin. Additional material will be incorporated in the existing Sections or will be the subject of new Sections, as required.

4. Changes to text are identified by a vertical line in the margin in the following manner:

Italics	*for new or revised text;*
Italics	*for editorial modification which does not alter the substance or meaning of the text; and*
Strikethrough	~~for deleted text.~~

5. The absence of change bars, when data or page numbers have changed, will signify re-issue of the section concerned or re-arrangement of text (e.g. following an insertion or deletion with no other changes).

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GLOSARIO DE ACRÓNIMOS/ACRONYMS GLOSSARY

ACC	Centro de control de área
	Area control center
	Aeronautical fixed service
AFTN	Red de telecomunicaciones fijas aeronáuticas
	Aeronautical fixed telecommunication network
AIP	Publicación de Información aeronáutica
	Aeronautical Information Publication
AIS	Servicio de información aeronáutica
	Aeronautical information service
ANP	Plan navegación aérea
	Air navigation plan
ANS	Servicios de navegación aérea
	Air navigation services
ANSP	Proveedor de servicios de navegación aérea
	Air navigation service provider
AO	Operador de aeronave
	Aircraft operator
APP	Oficina de control de aproximación
	Approach control office
ATC	Control de tránsito aéreo
	Air traffic control
ATFM	Gestión de la afluencia del tránsito aéreo
	Air traffic flow management
ATM	Gestión del tránsito aéreo
	Air traffic management
ATS	Servicios de tránsito aéreo
	Air traffic services
CAA	Administración de aviación civil
	Civil aviation authority
CAR/SAM	Regiones Caribe y Sudamérica
	Caribbean and South American Regions
CATFM	Dependencia de Gestión de la afluencia del tránsito centralizada
	Centralized air traffic flow management unit
CBA	Análisis de costo/beneficios
	Cost/benefit analysis
CNS/ATM	Comunicaciones, navegación y vigilancia/gestión del tránsito aéreo
	Communications, navigation, and surveillance/air traffic management
FDPS	Sistema de procesamiento de datos de vuelo
	Flight data processing system
FIR	Región de información de vuelo
	Flight information region
FMU	Dependencia de organización de la afluencia
	Flow management unit
FMP	Puestos de gestión de afluencia
	Flow management position

FPL	Plan de vuelo Flight plan
GREPECAS	Grupo regional de planificación y ejecución CAR/SAM CAR/SAM regional planning and implementation group
MET	Servicios meteorológicos para la navegación aérea Meteorological services for air navigation
OACI/ICAO	Organización de aviación civil internacional International civil aviation organization
PANS ATM	Procedimientos para los servicios de navegación aérea –Gestión de tránsito aéreo Procedures for Air Navigation Services –Air traffic management
PIRG	Grupo regional de planificación y ejecución Planning and implementation regional group
TBD	A ser determinado To be determined
TMA	Area de control terminal Terminal management area
TWR	Torre de control Tower
WWW	Red mundial World Wide Web

Explanation of terms and expressions

The writing and explanation of some terms and particular expressions used in this document are defined for a better understanding

Homogeneous ATM area. A homogeneous ATM area is an airspace with a common ATM interest, based on similar characteristics of traffic density, complexity, air navigation system infrastructure requirements or other specified considerations wherein a common detailed plan will foster the implementation of interoperable ATM systems.

Routing area. A routing area encompasses one or more major traffic flows, defined for the purpose of developing a detailed plan for the implementation of ATM systems and procedures.

Centralized ATFM. A centralized unit responsible for the provision of air traffic flow management within a specific area.

Capacity (for ATFM purposes). The maximum number of aircraft that can be accommodated in a given time period by the system or one of its components (throughput).

ATM Community. All the organizations, bodies or entities which might participate, collaborate and cooperate in the planning, development, use, regulation, operation and maintenance of the ATM System.

Demand. The number of aircraft requesting to use the ATM system in a given time period.

Efficiency. The ratio of the cost of ideal flight to the cost of procedurally constrained flight.

Air Traffic Flow Management (ATFM). A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

Air Traffic Management. Service which comprises airspace management, air traffic flow management and air traffic services.

Flight Management Position/Unit – FMP/FMU). A position or working unit established in an appropriate air traffic control unit to ensure the necessary interphase between the local ATFM and a centralized ATFM units related to air traffic flow management – ATFM.

Main Traffic Flows. It is a concentration of significant volumes of air traffic on the same or proximate flight trajectories.

Air Traffic Management System. A system which provides ATM through the integration in cooperation with human beings, information, technology, facilities and services, with the support of communications, navigation and surveillance on board and spatial based.

Air Traffic Volume. The number of aircraft within a defined airspace or aircraft movement in an aerodrome, within a specific time frame.

Executive summary

GREPECAS considered that early ATFM implementation shall ensure optimum air traffic flow towards specific areas or through them during periods in which the demand exceeds or is foreseen to exceed available capacity of the ATC system. Therefore, an ATFM system should reduce aircraft delays both in flight and ground and avoid system overloading.

In this connection, GREPECAS approved the operational concept described herein, which reflects the expected order of events which might occur and should assist and guide the planners in the design and gradual development of ATFM system, in order to provide safety and effectiveness, and ensure an optimum air traffic flow towards certain areas or through them during periods in which the demand exceeds or is foreseen to exceed the available capacity of the ATC system.

The main actors involved in air traffic flow management *are* the organizations, bodies or entities which might participate, collaborate and cooperate in the planning, development, use, regulation, operation and maintenance of the ATFM System.

From the analysis of the statistics it may be noted that during the period 1994-2004, the passengers regular traffic (in PKP) of airlines in the Latin American and Caribbean Region grew at an average annual rate of 3.3% (in comparison to the 5.1% annual rate of global growth, foreseeing that air traffic growth continues to gradually improve at mid term, at the same time that the economical activity.

The total of operations of the main airports of the CAR Region in the period 2002 to 2005 reflected a positive trend of 1.92%. However, in the same period the trend in the SAM Region was negative –0.56% being the global trend positive 0.66% for both regions.

Also, several airspaces with common interests have been identified *with regard to* air traffic management, based on similar characteristics of traffic density, complexity and air navigation system infrastructure requirements within which a common plan shall foster the implementation of the ATM Global Operational Concept. A description of such homogeneous and routing areas is attached *to the* CAR/SAM ATFM CONOPS.

As established in ICAO documents, air traffic flow management should be implemented within a region or within other defined areas as a centralised ATFM organization, with the support of flow management units (FMU) established in each ACC within the region or area of application.

In view of the above, this document describes the main objectives of the Centralized ATFM Facility which include: assist ATC in making the maximum use of its airspace and capacity; issue flow management initiatives, as required ,in order to maintain a safe, orderly and expeditious flow of air traffic; ensure that air traffic volume is compatible with declared capacities; develop a description of the principles and functions of flow management units; and establish the requirements for equipping flow management units and Centralized ATFM Facilities.

In the current operational concept, GREPECAS establishes a simple implementation strategy through the development in phases in order to ensure maximum utilisation of available capacity and permit all parties concerned to obtain sufficient experience. The implementation would be initiated with the application of basic ATFM procedures in airports and in an evolutionary manner to reach more complex phases, without the immediate need for a regional ATFM centre, since its implementation would demand further studies to define operational concepts, systems requirements and institutional aspects for its implementation.

Finally, GREPECAS deemed pertinent to establish exceptions for the application of ATFM measures for aircraft performing ambulance flights, humanitarian flights, search and rescue operations and State aircraft in international flights, leaving at the discretion of the States/Territories and International Organizations the measures to be adopted on this matter for domestic flights. It also set out that for a partial or total interruption of flow management and/or support services the corresponding contingency will also be available.

1. History

1.1 ICAO CNS/ATM Systems received support from the Tenth Air Navigation Conference held in 1991 at ICAO Headquarters in Montreal, Canada. The same year, the CAR/SAM Regional Planning and Implementation Group (GREPECAS) started to work towards a regional application of this new air navigation services concept.

1.2 Further, at the Eleventh Air Navigation Conference (AN-Conf/11, Montreal September 2003), States supported and approved the new ICAO ATM Global Operational Concept, which encourages the implementation of a services management system which enables an operationally continuous regional airspace through the application of a series of ATM functions.

1.3 As per the guidance principles established by ICAO Council with regard to the facilitation of the inter-regional harmonization, the regional plans for CNS/ATM systems implementation in the regions should be prepared in accordance to the general profiles defined in the Global Air Navigation Plan for CNS/ATM Systems. After a careful analysis of the guidance principles of this Global Plan, GREPECAS adopted them and incorporated characteristics inherent to the CAR/SAM Regions, using as a basis the definitions of Homogeneous Areas and Main Traffic Flows. Homogeneous areas are those airspace portions with ATM requirements and similar complexity degrees, while main air traffic flows are airspaces where a significant amount of air traffic exists.

1.4 From the analysis carried out by ICAO/UNDP Project RLA/98/003, it may be inferred that while in general terms in the CAR/SAM Regions environment, currently no traffic congestions are registered requiring a complex flow management, they have been identified in some airports and airspace sectors, mainly in special periods and specific hours, where some congestions are already produced, which should be avoided.

1.5 In view of the above, GREPECAS considered that the early implementation of the ATFM shall ensure an optimum air traffic flow towards some areas or through them, during periods in which the demand exceeds or is foreseen to exceed the available capacity of the ATC system. Therefore, an ATFM system should reduce aircraft delays both in flight and ground and avoid system overloading. The ATFM system shall assist the ATC to comply with its objectives and achieve a more effective utilisation of the airspace and airports available capacity. ATFM should also ensure that air operations safety is not compromised in case unacceptable levels of air traffic congestion occur and at the same time ensure that air traffic is effectively administered without applying unnecessary restrictions to flow.

2. Purpose of the document

2.1 The CAR/SAM ATFM CONOPS document is a high level description of service to be provided in the CAR/SAM Regions during a specific time horizon. It explains the current situation as well as the future situation which will be reached through a series of specific stages.

2.2 The operational concept described herein reflects the expected order of events and should assist and guide the planners in the design and gradual development of the ATFM system. The concept is designed to promote safety, efficiency, and an optimum flow of traffic in areas where demands exceed, or is forecast to exceed, the available capacity of the ATM system.

3. Actors involved in ATFM

3.1 The ATFM community includes organizations, bodies or entities which could participate, collaborate and cooperate in the planning, development, utilisation, regulation, operation and maintenance of ATFM system. Among them, the following may be emphasized:

3.2 ***Aerodrome Community***. Includes aerodromes, aerodromes authorities and other parties involved in the provision and operation of the physical infrastructure needed to support the take-off, landing and ground handling of aircraft.

3.3 ***Airspace Providers***. Refers in general terms to Contracting States in their owner capacity with legal authority to permit or deny access to their airspace sovereignty. The expression may also be applied to organizations of the State to which the responsibility has been assigned to establish standards and guidelines for the airspace use.

3.4 ***Airspace users***. Refers mainly to airlines and pilots.

3.5 ***ATM service providers.*** Constituted by all the organizations and personnel (i.e. controllers, engineers, technicians) implied in the provision of ATFM services to airspace users.

3.6 ***Military aviation.*** Refers to the personnel and material of military organizations as wardens and their vital role in States' security.

3.7 ***International Civil Aviation Organization (ICAO)***. Considered as the only international organization responsible for efficiently coordinating the implementation activities of global ATM which lead to a real, continuous global ATM.

4. Trends and traffic forecasts in the main airports of the CAR/SAM Regions

4.1 During the period 1994-2004, the Latin American and Caribbean Region's airlines passengers' regular traffic (in PKP) grew at an annual average of 3.3% (in comparison to the global annual average growth rate of 5.1%). Until year 2000 privatisation of national carriers fusions and inter-regional alliances, together with a wide rationalization of fleets and routes, counted among the measures that enabled airlines of the regions to capture a greater portion of traffic of United States – Latin America and Caribbean, one of the aviation markets with greater growth rate. After high traffic growth rates in 1997 and 1998 (9.5% and 7.8% respectively), the passengers traffic decreased in 1999 in a 0.3% but it was recovered in 2000 with a growth rate of 4.4%, decreasing again in 2001 in 5.1%. The traffic decreased in 1.6% in 2002 before recovering in 2003 (3.8%) and 2004 (8.4%). In some CAR/SAM areas the traffic growth in 2005 registered scopes of up to 13%.

4.2 Aircraft movement in the main airports in the period 2002-2005 would indicate that, in the CAR Region the total operations reflect a positive trend of 1.92% observing that in some States particularly, positive trends are reflected that vary from 2.42% to 6.41%. In the SAM Region, the total of operations reflected a negative trend of -0.56% between years 2002 to 2005 observing that some States particularly reflect positive trends which vary from 0.85% to 4.79%.

4.3 Making a balance of the previous information, it is observed that during years 2002 to 2005 the global trend in the CAR/SAM Regions is reflected in a positive 0.66%. It is foreseen that the traffic growth continues to gradually improve at mid term at the same time than economical activity.

5. Main traffic flows

5.1 The CAR/SAM air navigation plan has identified several airspaces with common interests as regards air traffic management, based on similar characteristics of traffic density, complexity and air navigation system infrastructure requirements within which a common plan shall foster the implementation of the ATM Global Concept. Within these routing areas the main traffic flows have also been identified following the same or close flight trajectories between pairs of cities.

5.2 These routing areas and the respective traffic flows are described in the Table shown as **Appendix A** to this document.

6. Identification of areas and/or routes where traffic congestion is produced

6.1 Currently, saturation periods have been identified in several airports and traffic flows *in* some portions of the CAR/SAM FIRs. In view of this, it is necessary that CAR/SAM States, Territories, and International Organizations maintain and disseminate to all interested parties *a list of* the saturation periods of their respective airports, terminal areas and traffic flows.

7. Objectives, principles and functions of a Centralized ATFM Facility

Objective of the Centralized ATFM Facility

7.1 As established in the PANS ATM (Doc 4444), air traffic flow management should be implemented within a region, *or other defined area*, as a *C*entralized ATFM Facility with the support of flow management positions (FMP) established in each ACC within the region or area of application.

7.2 The objective of the Centralized ATFM Facility is to enhance efficiency and safety of air traffic operations by demand and capacity balancing and traffic synchronization. This may be accomplished by the use of flow management initiatives to maintain a safe, orderly and expeditious air traffic circulation while ensuring that the traffic volume is compatible with the declared capacities.

7.3 Consequently, States, Territories, and International Organizations may define whether a Flow Management Unit, and the associated Flow Management Positions, should be established in the interim phase before the implementation of the Centralized ATFM Facility can be accomplished.

Principles in which ATFM will be based

7.4 Regional ATFM structure should be developed according to agreed upon guidelines as stated herein and in such a manner that each State/Territory and International Organization of the CAR/SAM Regions has access to a Centralized ATFM Facility.

7.5 The implementation of the Centralized ATFM Facility should be based on the following principles:

a) Be at the disposal of all States/Territories and International Organizations in the region under their responsibility, taking into consideration the requirements of ATFM community members.

b) Use a common, comprehensive, and permanently updated database.

c) Take appropriate measures well in advance to accomplish demand and capacity balancing.

d) Maintain close and continuous coordination with FMUs and/or FMPs, aircraft and airport operators, and other pertinent Centralized ATFM Facilities.

e) Take measures *to* ensure that restrictions and delays are equitably balanced among the airspace users.

f) Apply quality management to the services provided.

g) Use the collaborative decision making (CDM) process as the basis for developing and implementing ATFM measures.

h) Favor, to the maximum possible, the use of the existing capacity without compromising safety.

i) Contribute *to* the achievement of the global plan initiatives (GPIs).

j) Provide the flexibility necessary to enable operators to change their arrival or departure schedules, even with short notice.

Functions of a Centralized ATFM Facility

7.6 To provide ATFM service, the Centralized ATFM Facility should*:*

a) Establish and maintain a *regional* database that includes:
- the air navigation infrastructure, ATS units and registered aerodromes;
- pertinent ATC sector and airport capacity;
- forecast flight data, etc.

b) Establish a method for displaying:
- a chart of forecast air traffic demand;
- a comparison *of demand and* available capacity *for pre-determined areas;* and
- the time-frame of *forecast* air traffic overloads.

c) Make the appropriate coordination to attempt to increase available capacity, when necessary.

d) When demand will exceed available capacity, coordinate, communicate, and apply ATFM measures in a timely manner.

e) Carry out a follow-up on the result of measures adopted.

f) Coordinate ATFM measures with the other Centralized ATFM Facilities, when so required.

8. Equipment requirements for FMU/FMP and Centralized ATFM Facility

8.1 The implementation of ATFM in the CAR/SAM Regions requires identifying and determining the minimum equipment requirements and communication links for implementing a Centralized ATFM Facility, FMU, and/or FMP.

Note: A detailed description of these requirements is shown in **Appendix B** to this document.

9. Human resource planning and training requirements for FMU/FMP and Centralized ATFM Facility

9.1 Establishment of a Centralized ATFM Facility, FMU, or FMP requires careful human resource planning and training. ATFM training shall be designed to include segments regarding techniques to balance demand and capacity, traffic synchronization, benefits of optimizing traffic flows and creating operational efficiency, techniques for managing change in the operational environment, and the process for ensuring high levels of service to the customers.

10. Operational procedures

10.1 The operational procedures *for* the Centralized ATFM Facility, FMUs and FMPs should be developed in separate documents. After consultation with all applicable parties, changes, if necessary. shall be agreed upon and published as amendments to operational procedures.

10.2 The purpose of these documents shall be to:

- establish the functions and responsibilities of personnel working in the Centralized ATFM Facility, FMUs and FMPs in regard to implementing flow management service.
- describe the procedures to be used between the Centralized ATFM Facility, FMUs, and FMPs.
- describe the air traffic flow management initiatives and messages that may be applied

10.3 ATFM initiatives should be designed to address specific daily traffic flows, flight series, or specific flights. To this end, traffic management planning, strategy development, and day-to-day monitoring, should be conducted. With regard to the above, ATFM activities should be developed in three phases: strategic - up to 48 hours before the day of the operation; pre-tactical - during 48 hours prior to the operation day; and, tactical - during the day of the operation. During all three ATFM phases, responsible facilities should maintain a close liaison with system stakeholders to ensure efficient and equitable service.

11. ATFM Implementation Strategy

11.1 The operational concept establishes a simple implementation strategy. This strategy should be developed in phases, so as to ensure maximum utilisation of the available capacity and enable all concerned parties to obtain sufficient experience.

11.2 The experience acquired in other Regions and by some States in the CAR/SAM Regions permits States/Territories and International Organizations to apply basic ATFM procedures in airports, without the immediate need for a Centralized ATFM Facility. Such a facility will demand extensive studies to define operational concepts, requirements of systems and institutional aspects for ATFM implementation in the CAR/SAM Regions.

Airports

11.3 Normally the adoption of ATFM strategic measures at airports located in airspaces of low traffic density, avoids congestion and saturation of such airspace. Another aspect to be considered is that the adoption of ATFM strategic measures at airports are simpler to apply, keeping in mind that they only demand a data collection of flight intentions (RPL, Official Airline Guide - OAG, flight lists etc) and reduce use of automation and existing infrastructure tools. In this stage, the airport slot allocation to operators should also consider non-regular flights.

11.4 The implementation process of ATFM in the CAR/SAM Regions should start with the establishment of a common methodology of calculating airport capacity which would enable identification of airports where periods exist in which demand is higher than capacity. With that identification, measures could be adopted with a view to optimise the utilisation of the existing capacity.

11.5 ATFM strategic measures at airports may be limited to the use of Airport Slots with the objective of achieving the balance between the demand of regular flights and airport capacity. The application of slots would ensure a smooth hourly distribution of these flights at airports.

11.6 The necessary capacity for other airspace users (non-regular flights) should also be kept in mind when developing airport slot allocation procedures.

11.7 The evolution of ATFM measures in airports should evolve towards the inclusion of non-regular flights in balancing procedures between demand and capacity. The adoption of ATFM tactical measures in airports would be still of low complexity. However, it would demand an increase in the data collection program for non-regular flights in order to include these FPLs. Also, in addition to the use of automation tools efficient communications means between with aircraft operators which perform non-regular flights must be established.

11.8 It is expected that ATFM strategic measures at airports will be sufficient to solve specific problems at airports where there is a significant demand of regular flights. ATFM tactical measures would be applied mainly to airports in which a significant amount of non-regular flights are carried out.

Airspace

11.9 From the experience acquired in demand and airport capacity management, States/Territories and International Organizations should consider analysis of airspace capacity, especially in areas where ATFM measures at airports are not sufficient to solve congestion and airspace saturation problems. The ATFM strategic measures should avoid congestion and airspace saturation. The adoption of these ATFM measures would be of low complexity since it would only include their influence in the establishment of airports slots. However, it would demand the use of more sophisticated automation and infrastructure tools, in order to identify congestion or saturation in control sectors.

11.10 It is expected that strategic ATFM measures in the airspace are sufficient to prevent overload of control sectors, mainly in those airspaces in which there is a significant excess demand.

11.11 If demand and capacity balancing cannot be accomplished with the application of ATFM airspace strategic measures, States/Territories and International Organizations should move to more complex solutions. This involves ATFM tactical measures related to airspace, including dynamic procedures that are applied to flights scheduled in the near-term. The adoption of airspace tactical measures would be increasingly complex since it would include the application of slots, based on continuous analysis of the demand and capacity. This analysis would require the use of additional automation and infrastructure tools to those applied in in the previous phase, which permit the assignment of slots, addressed to avoid overloads of airspace sectors and airports.

11.12 It is expected that airspace tactical ATFM be implemented only in States/Territories and International Organizations where there is a clear operational requirement, keeping in mind that the complexity of the application of tactical measures in airspace implies a significant investment in automated systems, data bases, telecommunications system and human resources training.

11.13 States/Territories and International Organizations who decide to implement airspace tactical ATFM measures should develop standards, procedures and operational manuals applicable to ATFM service.

Centralized ATFM Facility implementation strategy in the CAR/SAM Regions

11.14 GREPECAS/13 was of the opinion that two CAR and SAM scenarios should be taken into account, but that they could be modified insofar as the operational concept development and the implementation plans progress. The strategy is to develop a harmonized planning of a CAR and SAM interregional ATFM system.

11.15 In order to maximise its efficiency, it was considered that the Centralized ATFM Facility should have the responsibility for providing service to the maximum extension of airspace possible, provided that this is homogeneous. In accordance with ATFM planning in the CAR and SAM Regions, it will have at least two Centralized ATFM Facilities one for each region.

11.16 It was also considered necessary that the procedures during all the implementation process be developed in a harmonious manner among the ATFM Facilities to avoid risking operational safety. This entails establishing a regional and interregional strategy to facilitate and harmonize all the implementation process. The ATFM Task Force will accomplish these planning and harmonization objectives. For implementation, two scenarios will be established depending on the individual operational needs and features of the CAR and SAM Region. The activation of two ATFM Implementation Groups was considered, one for each Region.

11.17 It was considered that operational implementation should be carried out in phases, according to ICAO Doc 9854 – Global Air Traffic Management Operational Concept, in order to permit a progressive implementation and acquire necessary expertise for an adequate implementation

11.18 In order to harmonize the National Plans with the Regional CAR/SAM ATFM Regional Plan, it is highly recommended that the States, Territories and International Organizations take the following required measures: make a closer follow-up of the regional development of the ATFM, prepare anATFM implementation program, asses the impact that ATFM will have in the national ATM system, and establish pertinent coordinations to accomplish a regionally harmonized implementation.

12 Special flights exempt from application of ATFM measures

12.1 Aircraft that file flight plans as air ambulance flights, humanitarian flights, search and rescue operations, and State aircraft would be exempt from the application of ATFM measures. States would continue to have jurisdiction on these aircraft when they file as domestic flights.

13 Contingency plan

13.1 In case of a partial or total interruption of the flow management service and/or support services, ATFM and FMUs/FMPs will have corresponding contingency plans prepared in accordance with GREPECAS guidelines. These contingency plans will help ensure the safe and orderly movement of air traffic -- although not necessarily efficient -- and the plans will be incorporated into the operational procedures documents associated with the Centralized ATFM Facilities and FMUs/FMPs.

APPENDIX A

Table

Routing Areas and Main Traffic Flows Identified in the CAR/SAM Regions

-1- Routing Area (AR)	-2- Traffic flows	-3- FIRs involved	-4- Type of area	-5- Remarks
Caribbean/South American Regions (CAR/SAM)				
AR 1	Buenos Aires-Santiago de Chile	Ezeiza, Mendoza, Santiago	Low density Continental	SAM intra-regional traffic flow
	Buenos Aires-Sao Paulo/Río de Janeiro	Ezeiza, Montevideo, Curitiba, Brasilia	Low density Continental	SAM intra regional traffic flow
	Santiago de Chile-Sao Paulo/Rio de Janeiro	Santiago, Mendoza, Córdoba, Resistencia, Asunción, Curitiba, Brasilia	Low density Continental	SAM intra regional traffic flow
	Sao Paulo/Rio de Janeiro-Europe	Brasilia, Recife	Continental / Low density Oceanic	SAM/AFI/EUR inter regional traffic flow
AR 2	Sao Paulo/Río de Janeiro-Miami	Brasilia, Manaus, Maiquetía, Curacao, Kingston, Santo Domingo, Port au Prince, Habana, Miami	Continental / Low density Oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow
	Sao Paulo/Río de Janeiro-New York	Brasilia, Belem, Paramaribo, Georgetown, Piarco, Rochambeau, San Juan (New York)	Continental / Low density Oceanic	CAR/SAM/NAM/NAT inter- and intra-regional traffic flow
AR 3	Sao Paulo/Río de Janeiro- Lima	Brasilia, Curitiba, La Paz, Lima	Low density Continental	SAM intra-regional traffic flow
	Sao Paulo/Río de Janeiro-Los Angeles	Brasilia, Porto Velho, Bogotá, Barranquilla, Panamá, Central América, Mérida, México, Mazatlán (Los Angeles)	Low density Continental	CAR/SAM/NAM inter- and intra-regional traffic flow
AR 4	Santiago - Lima - Miami	Santiago, Antofagasta, Lima, Guayaquil, Bogotá, Barranquilla, Panamá, Kingston, Habana, Miami.	Continental / Low density Oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow

-1- **Routing Area (AR)**	-2- **Traffic flows**	-3- **FIRs involved**	-4- **Type of area**	-5- **Remarks**
	Buenos Aires - New York	Ezeiza, Resistencia, Asunción, La Paz, Porto Velho, Manaus, Maiquetía, Curacao, Santo Domingo, Miami (New York)	Continental / Low density Oceanic	CAR/SAM/NAM/ NAT NAM inter- and intra-regional traffic flow
	Buenos Aires - Miami	Ezeza, Resistencia, Córdoba, La Paz, Porto Velho, Bogotá, Barranquilla, Kingston, Habana, Miami	Continental / Low density Oceanic	CAR/SAM/NAM NAM inter- and intra-regional traffic flow
AR 5	North of South America - Europe	Guayaquil, Bogotá, Maiquetía, Piarco (NAT-EUR)	Continental / high density Oceanic	SAM/NAT/EUR inter-regional traffic flow
AR 6	Santiago - Lima - Los Angeles	Santiago, Antofagasta Lima, Guayaquil, Central Amérca, México	Low density oceanic	CAR/SAM /NAM intra- and inter-regional traffic flow
AR 7	South America – South Africa	Ezeiza, Montevideo, Brasilia, Johanesburgo (AFI)	Low density oceanic	SAM/AFI inter-regional traffic flow
	Santiago de Chile - Isla de Pascua - Papeete (PAC)	Santiago, Pascua, Tahiti	Low density oceanic	SAM/PAC inter-regional traffic flow
GM-1	Mexico, Toluca, Guadalajara, Monterrey, Mazatlán, La Paz, Acapulco, Puerto Vallarta, Huatulco, Cancún Gulf of Mexico— North America	Mexico, Houston, Miami; Albuquerque; Los Angeles	Continental/oceanic high density	CAR/NAM inter-regional major traffic flow
	Cancún, Guatemala, El Salvador, Nicaragua, Honduras, Costa Rica – Miami	Mexico, Central America, Havana, Miami	Continental/oceanic high density	CAR/NAM interregional traffic flow
GM-2	Mexico, Cancun, La Havana, Nassau — Europe	Mexico, Havana, Miami -NAT-EUR	Continental/oceanic high density Major traffic flow	CAR/NAM/NAT/ EUR inter-regional traffic flow
GM-3	Costa Rica, Panama, Honduras Kingston, Haiti, Santo Domingo San Juan, The Caribbean — Europe	Central America, Panama, Kingston, Port-au-Prince, Curacao, Santo Domingo, San Juan – EUR	Oceanic high density	CAR/ NAT/EUR intra and interregional major traffic flow

-1- Routing Area (AR)	-2- Traffic flows	-3- FIRs involved	-4- Type of area	-5- Remarks
	North America – East Caribbean	New York, Miami, Havana, San Juan, Santo Domingo Piarco	Oceanic high density	West Atlantic Route System CAR/NAM inter-regional traffic flow

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APPENDIX B

General Considerations for the implementation process of a Centralized ATFM

The implementation of the Centralized ATFM should consider the following requirements:

a) Access to the operational status of the air navigation infrastructure.

b) Access to aeronautical information and cartography.

c) Access to meteorological information.

d) Database of:

- aerodromes;
- airport capacity;
- ATC capacity
- Air traffic demand
- Airspace structure
- Radio navigation aids
- Aircraft performance; and
- Utilization of airports and control sectors.

e) Access to flight planning data (FPL, RPL, etc.).

f) Flight plans processing.

g) Access to surveillance data (SSR, ADS, etc.)

h) Automated resources:

- Processing and data visualization system for flow management, having, among other thing, the following sub-systems:
  - Flight data processing
  - Airspace and airports structure data;
  - Situation analysis (capacity and demand);
  - Presentation of air traffic situation;
  - Monitoring of the operational status of the infrastructure;
  - Support to collaborative decision making (ATC slots, alternate routes, etc.).
  - Database maintenance.

i) Communication to coordinate with:

- Other centralized ATFMs
- Operators (airlines, general aviation, State, etc.);
- Airport management;
- FMUs and/or FMPs and/or ATS units;
- Aeronautical meteorological units;
- AIS units.

j) Human resources

- qualified personnel;
- support personnel;
- recurrent training.

k) Use of adequate tools for statistics

l) Infrastructure

- buildings
- equipment
- electrical power
- air conditioning
- supplies
- software

m) Implementation of FMUs and/or FMPs, as required.

n) Redundancy of critical systems.

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Interim Guideline for ATFM Communication

Version 1.0

October 2006

FOREWORD

Centralized traffic management facilities are best able to communicate their national system's ability to accept traffic from adjacent international air traffic service (ATS) providers. As coordination and collaboration efforts intensify between the countries, effective communications are essential. A key element in removing language barriers is establishing common terms and phrases. Terminology and phraseology differences in air traffic flow management (ATFM) could be a potential source of confusion during communications among the Japan Civil Aviation Bureau (JCAB) Air Traffic Management Center (ATMC) and the Federal Aviation Administration (FAA) David J. Hurley Air Traffic Control System Command Center (ATCSCC).

IPACG/21 discussions resulted in a recommendation to develop the common terms of reference for ATFM communications. IPACG/22 supported the formation of a Task Force to address this issue. The operation of the Task Force was outlined at IPACG/23. The ATCSCC and ATMC established a process to examine the ATFM common terminology and phraseology at IPACG/24. This document was submitted by the Task Force at IPACG/25. The bilateral effort herein should be combined with an ICAO effort to standardize ATFM terms in the future.

The terminology will be an essential element in developing definitive, clear, and concise communication between international ATFM units. Likewise, the phraseology will be a technical pattern of communication to exchange standardized and harmonized messages between international ATFM units. These terminology and phraseology are not intended to be a requirement for ATFM communications, but may be used as a guideline for the exchange of ATFM messages.

This guideline is largely based on the "Phraseology for the Exchange of ATFM Messages Handbook" dated February 2003, by the Multi-Agency Air Traffic Services Procedures Coordination Group (MAPCOG) ATFM Task Force, which is a joint effort between EUROCONTROL, NAV CANADA and the FAA.

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1. General

2. ATFM Message Components

3. ATFM Message Types

4. Abbreviations

Appendix: Table of Abbreviations

1. General

1.1 The primary goal of these guidelines is to develop terminology and phraseology for the exchange of ATFM messages between units providing ATFM services. The terminology and phraseology contained herein are intended to both reflect the current use of plain language and provide a basis for standardization and harmonization.

1.2 Although there are various plain language words and phrases in use today by ATFM service providers, these words and phrases can be organized into a modular and structured method of delivery to ensure communication harmonization and reduce the incidence of misunderstanding between units providing ATFM service.

1.3 These guidelines include the concept of modular and structured ATFM messages and defines an ATFM message's components as *who, what, where, when* and *why*. These five components are described as follows:

1). Who: The ATFM service unit being contacted followed by the ATFM service unit that is initiating the contact.
2). What: The ATFM objective to be achieved.
3). Where: The location of the ATFM objective to be achieved.
4). When: The time and/or duration of the ATFM objective to be achieved.
5). Why: The reason for the ATFM objective.

1.4 There should be no module regarding "how" the ATFM restrictions should be achieved by the counterpart ATFM service provider. It is the counterpart's responsibility how they fulfill the requested ATFM restrictions within their airspace. However, the center being asked for the ATFM restrictions may collaborate with the originating center on the type and method of ATFM measure application.

1.5 Below are the examples of possible ATFM messages:

- ATCSCC, this is ATMC…We need 100 miles interval regardless of altitude on R220, R580 and all the PACOTS tracks for traffic landing at Narita airport estimated FIR boundary from 0100 UTC until 0500 UTC due to severe weather.
- ATMC, this is ATCSCC…Information maybe developed into ATFM… Los Angeles has started flow control for all aircraft landing at Los Angeles airport due to earthquake. They are requesting ground stops for arrivals until further notice.

2. ATFM Message Components

2.1 The use of a modular and structured ATFM message provides for consistent ATFM message design and delivery. Each of the ATFM message's five components can contain plain language elements that when combined provide a complete ATFM message. The harmonization achieved lies in the delivery of an ATFM message that has all of the required components in a structured format while making allowances for different plain language elements. This is of particular benefit for ATFM service providers that use different ATFM terminology or for ATFM service providers that do not use English for their intra-ATFM coordination.

As the modular and structured ATFM message may contain several different elements of plain language, this section will examine each of the five components and detail some of the possible plain language words and phrases that are in use today.

2.2 **WHO**: The *who* component identifies the ATFM service unit being contacted followed by the ATFM service unit that is initiating the contact. Examples of the who component:

- ATMC, this is ATCSCC…
- ATCSCC, this is ATMC…

2.3 **WHAT**: The *what* component identifies the ATFM objective to be achieved. Objectives include but are not limited to:

I/WE NEED…

- (X) MILES/MINUTES INTERVAL AT THE SAME ALTITUDE…
- (X) MILES/MINUTES INTERVAL REGARDLESS OF ALTITUDE…
- A RATE OF (X) AIRCRAFT PER HOUR…
- (X) MILES-IN-TRAIL AT (specified altitude(s))…
- (X) MINUTES-IN-TRAIL AT (specified altitude(s))…
- TO BLOCK (specified altitude(s))
- TO LIMIT THE ACCEPTABLE ALTITUDE TO (specified altitude(s))
- TO SUSPEND THE FIR ENTRY…

2.4 **WHERE**: The *where* component represents the location of the ATFM objective to be achieved. It is often preceded by modifying clause, indicating what aircraft or traffic the restriction will apply to. The modifying clause and the location combination are used to construct there where component.

Examples of there where clause:

- …OVER NIPPI…
- …NARITA AIRPORT…
- …ANCHORAGE APPROACH…
- …ON A337…
- …WESTBOUND ON PACOTS TRACK C…
- …EAST FLOW ON A590…
- …INBOUND ON G344…
- …ON PACOTS TRACK 2 LANDING AT SAN FRANCISCO AIRPORT…
- …ON PACOTS TRACK E BELOW FLIGHT LEVEL (X)…
- …ABOVE FLIGHT LEVEL (X)…
- …INBOUND TO TOKYO ACC…
- …INBOUND TO OCEANIC SECTOR 5…
- ... (compass direction) OF (a significant point/airway/location)…

Examples of the modifying clause:

- …FOR TURBOJET TRAFFIC…
- …FOR ALL AIRCRAFT…
- …FOR TRAFFIC GREATER THAN (X) KNOTS…
- …FOR HEAVY AIRCRAFT…
- …FOR TRAFFIC LANDING…
- …FOR AIRCRAFT DEPARTING…
- …FOR TRAFFIC OVERFLYING…
- …FOR AIRCRAFT PASSING…

2.5 **WHEN**: The *when* component represents the time and/or duration of the ATFM objective to be achieved:

- …FROM 0300 UTC UNTIL 0600 UTC…
- …FROM NOW UNTIL 0600 UTC…
- …FROM 2300 UTC UNTIL FURTHER NOTICE…
- …UNTIL FURTHER NOTICE…
- …FOR THE NEXT (X) HOURS…

2.6 **WHY**: The *why* component represents the reason for the ATFM objective:

DUE TO/FOR…

- RUNWAY CLOSURE
- (SEVERE) WEATHER
- COMMUNICATION SYSTEM OUTAGE
- RADAR FAILURE
- (significant event)
- (natural disturbance such as FIRE or VOLCANIC ASH)
- STATE ACTIVITY
- MILITARY ACTIVITY
- EQUIPMENT OUTAGE
- EMERGENCY
- ADJACENT ATFM MEASURES

3. ATFM Message Types

3.1 **Information to be shared prior to invoking the ATFM restrictions**: The information-sharing should be facilitated not only during the actual flow control but also (and more importantly) well prior to invoking the ATFM restrictions when the possibility of flow control arises. The following phrases will make clear the distinction between the ATFM messages and the information provided for situation awareness:

- INFORMATION MAY BE DEVELOPED INTO ATFM
- CAPACITY RELATED INFORMATION

3.2 Examples of messages sent prior to invoking ATFM restrictions follow:

- ATCSCC, this is ATMC…**Information may be developed into ATFM**… Narita airport has closed one of the runways and started snow removal.
- ATCSCC, this is ATMC…**Capacity related information**…Narita airport has entered the storm zone of the typhoon.

3.3 **ATFM Initiative Message**: ATFM initiatives communicate air traffic restrictions from one nation to another. They follow the five component structure described earlier:

1). Who: The ATFM service unit being contacted followed by the ATFM service unit that is initiating the contact.
2). What: The ATFM objective to be achieved.
3). Where: The location of the ATFM objective to be achieved.
4). When: The time and/or duration of the ATFM objective to be achieved.
5). Why: The reason for the ATFM objective.

3.4 Examples of ATFM initiatives follow:

- ATMC, this is ATCSCC…**I need a 30 minute interval at the same altitude** *for all aircraft landing at Chicago airport* from 0800 UTC until further notice due to state activities.
- ATCSCC, this is ATMC…**We need to block FL350 and below** *for aircraft overflying Japanese domestic airspace* for the next 12 hours due to emergency.

3.5 **Coordination of aircraft exempted from ATFM initiatives**: The following phrases will be used for the coordination of aircraft which are deemed necessary to exempt from the ATFM restrictions:

- REQUEST EXEMPTION FROM ATFM
- COORDINATION OF ATFM EXEMPTION

3.6 The following types of aircraft may be exempted from the flow control restrictions:

- Aircraft in a state of emergency
- Aircraft engaged in search and rescue missions
- Aircraft operating for humanitarian reasons
- Aircraft carrying the head of state or distinguished visitors of state
- Aircraft carrying a patient who needs urgent treatment

3.7 Examples of messages requesting ATFM exemption follow:

- ATMC, this is ATCSCC…**Request exemption from ATFM**…UAL123 is carrying a patient who needs urgent treatment.
  UAL123…Exemption is approved.
- ATCSCC, this is ATMC…**Coordination of ATFM exemption**… JA501A is operating for search and rescue missions.

3.8 **Information for the next coordination**: If it is possible and appropriate, the expected time of next coordination will be forwarded with the ATFM messages:

- I WILL CALL YOU AT 0400 UTC FOR FURTHER COORDINATION
- WE WILL CALL YOU AGAIN IN 30 MINUTES

3.9 An example of a message with information for the next coordination follows:

- ATMC, this is ATCSCC…I need a 30 minute interval regardless of altitude for all aircraft on PACOTS track 8 from 1000 UTC until further notice due to military activity. I will call you again in 60 minutes.

3.10 **Amendment**: The amendment of an ATFM message should be structured as the initial message and include similar elements but with additional modifiers. These modifiers may include:

- CHANGE
- AMEND
- REDUCE
- INCREASE
- DECREASE

3.11 Amendment messages should also identify which message is being amended, as several restrictions could be in place at one time. Examples of ATFM amendment messages follow:

- ATCSCC, this is ATMC…We have **changed** the restriction on traffic flying PACOTS tracks C, E and F for Narita airport. We now need 20 minutes intervals at the same altitude on PACOTS tracks C, E and F for traffic landing at Narita airport from now until 0900 UTC.
- ATMC, this is ATCSCC…We have **increased** the inbound rate from 5 aircraft per hour to 10 aircraft per hour for traffic beyond Oakland FIR until further notice.

3.12 **Cancellation**: The cancellation of an ATFM message should be structured as the initial message and include similar elements but contain a canceling word or phrase. It is normally not necessary to state the *why* or reason for the cancellation. A canceling word or phrase may include:

- CANCEL
- RESUME
- RESUME NORMAL
- RELEASE

3.13 Cancellation messages should also identify which message is being cancelled, as several restrictions could be in place at one time. An example of an ATFM cancellation message follows:

- ATCSCC, this is ATMC…We have **canceled** the restriction on traffic beyond the Fukuoka FIR at this time. **Resume normal** traffic flow.

4. Abbreviations

4.1 The abbreviations used by the ATCSCC and ATMC that are not defined in the ICAO Doc. 8400 (PANS-ABC), are shown in the **Appendix**. The shaded abbreviations are considered to be the common terms between the two centers.

4.2 The non-common abbreviations are deemed inappropriate for the inter-facility ATFM communication between ATCSCC and ATMC.

Table of Abbreviations

The abbreviations listed here are those used by ATCSCC and ATMC respectively that are not defined in the ICAO Doc. 8400 (PANS-ABC). The shaded abbreviations are considered to be the common terms between the two centers. The asterisk shows verbatim difference in the original collocation but the abbreviation still indicates the common object.

	ATCSCC	ATMC
AAR	Airport Acceptance Rate	
ACID	Aircraft Identification	
ADL	Aggregate Demand List	
ADR	Airport Departure Rate	
ADZY	Advisory	
AIM	Aeronautical Information Manual	
ALTRV	Altitude Reservation	Altitude Reservation
ANP	Air Navigation Plan	
AOA	Office of the Administrator	
AOC	Airline Operations Center	
AP	Air Patrol	
APREQ	Approval Request	Approval Request
APVL	Approval	Approval
ARINC	Aeronautical Radio Incorporated	
ARO	Airport Reservation Office	
ARTCC	Air Route Traffic Control Center	Air Route Traffic Control Center
ARU	Airspace Reservation Unit (Canada)	
ASM		Airspace Management
AT	Air Traffic	
ATCSCC	Air Traffic Control System Command Center	Air Traffic Control System Command Center
ATMC	Air Traffic Management Center	Air Traffic Management Center
ATMetC		Air Traffic Meteorological Center
ATO	Air Traffic Operations Program	
AUTODIN	Automatic Digital Network	
CARF	Central Altitude Reservation Function	
CCFP	Collaborative Collective Forecast Product	
CCWSU	Command Center Weather Service Unit	
CDM	Collaborative Decision Making	Collaborative Decision Making
CDR	Coded Departure Route(s)	Conditional Route
CDR	Continuous Data Recording	
CDT	Controlled Departure Time	
CFR	Code of Federal Regulations (formerly FAR)	
CIWS	Corridor Integrated Weather System	
COMSEC	Communications Security System	

	ATCSCC	ATMC
CR	Collaborative Routing	
CT	Select Flights Ground Delay Program	
CTA	Controlled Time of Arrival	
CTAS-TMA	Center TRACON Automation System Traffic Management Advisor	
CVRS	Computerized Voice Reservation System	
CWA	Central Weather Advisory	
CWSU	Center Weather Service Unit	
DARC	Direct Access Radar Channel	
DCCWU	ATCSCC Weather Unit	
DOTS	Dynamic Ocean Track System	Dynamic Ocean Track System
DP	Departure Procedure	
DSP	Departure Sequencing Program	
EDCT	Expected Departure Clearance Time	Expected Departure Clearance Time
EFAS	Enroute Flight Advisory Service	
EFTO	Encrypt For Transmission Only	
EOF	Emergency Operations Facility	
EOR	Emergency Operations Room	
EPS	Engineered Performance Standards	
ESCAT	Emergency Security Control of Air Traffic	
ETE	Estimated Time Enroute	Estimated Time Enroute
ETMS	Enhanced Traffic Management System	
EUCARF	European Central Altitude Reservation Facility	
FA	General Ground Delay Program	
FAA	Federal Aviation Administration	Federal Aviation Administration
FADT	Fuel Advisory Delay Time	
FCA	Flow Constrained Area	
FDMS		Flight Data Management System
FDPS		Flight Data Processing Section
FEA	Flow Evaluation Area	
FP	Flight Plan	
FPL	Full Performance Level	
GA	General Aviation	
GAAP	General Aviation Airport Program	
GDP	Ground Delay Program	
GS	Ground Stop	
HARS	High Altitude Route System	
HDTA	High Density Traffic Airport	
IFCN	Interfacility Communication Network	
IFPFP	Individual Flight Plan From this Point	Individual Flight Plan From this Point
IFSS	International Flight Service Station	
INATS	Interruption of Air Traffic Service	

	ATCSCC	ATMC
JCAB	Japan Civil Aviation Bureau	Japan Civil Aviation Bureau
LAA	Local Airport Advisory	
LADP	Local Airport Deicing Plan	
LOA	Letter of Agreement	Letter of Agreement
MAP	Monitor Alert Parameter	
MARSA	Military Assumes Responsibility for Separation of Aircraft	Military Assumes Responsibility for Separation of Aircraft
MEL	Minimum Equipment List	
MINIT	Minutes in Trail	
MIT	Miles in Trail	
MOS	Military Operations Specialist	
MTSAT	Multi-functional Transport Satellite	Multi-functional Transport Satellite
MVFR	Marginal Visual Flight Rules	
NADIN	National Airspace Data Interchange Network	
NAS	National Airspace System	
NAVAID*	Navigational Aid	Navigation Aid
NFDC	National Flight Data Center	
NMCC	National Maintenance Coordination Center	
NOAA	National Oceanic and Atmospheric Administration	
NOM	National Operations Manager	
NOPAC	North Pacific	North Pacific
NOS	National Oceanographic Service	
NRP	National Route Program	
NTMO	National Traffic Management Officer	
NWS	National Weather Service	
OAG	Official Airline Guide	
ODP		Oceanic Air Traffic Control Data Processing System
OPSNET	Operations Network	
OTG		Oceanic Track Generator
OTR		Oceanic Transition Route
PACMARF*	Pacific Military Altitude Reservation Facility	Pacific Military Altitude Reservation Function
PACOTS	Pacific Organized Track System	Pacific Organized Track System
PMTC	Pacific Missile Test Center	
PO	Plan of Operation	
Pref Route	Preferential Route	
PT	Planning Team	
RA	Route Advisory	
RAA	Remote Airport Advisory	
ROT	Runway Occupancy Time	
SAA	Special Activity Airspace	
SOP	Standard Operating Procedure	

	ATCSCC	ATMC
STMP	Special Traffic Management Program	
SUA	Special Use Airspace	
SVRW	Severe Weather	
SWAP	Severe Weather Avoidance Program	
TEC	Tower-Enroute Control	
TELCON	Telephone Conference	
TFM	Traffic Flow Management	
TIS	Traffic Information System	
TMC	Traffic Management Coordinator	Traffic Management Coordinator
TMCIC	Traffic Management Coordinator in Charge	
TMI	Traffic Management Initiative	
TMU	Traffic Management Unit	Traffic Management Unit
TSTM	Thunderstorm	
WSO	Weather Service Office	

UNMANNED AIRCRAFT SYSTEMS STUDY GROUP (UASSG)

Terms of Reference

In light of rapid technological advances, to assist the Secretariat in coordinating a framework for regulatory development as well as in guiding the Standards and Recommended Practices (SARPs) development process within ICAO, for civil unmanned aircraft systems (UAS), and to support a safe, secure and efficient integration of UAS into non-segregated airspace and aerodromes.

Work Programme

1) Assist the Secretariat in coordinating all ICAO UAS related work, with the aim of ensuring global interoperability and harmonization.

2) Develop a UAS regulatory concept and associated guidance material.

3) Contribute to the development of technical specifications by other bodies (e.g., terms, concepts), as requested.

4) Identify communication requirements for UAS.

— END —

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ASIA/PACIFIC REGIONAL INTERFACE CONTROL DOCUMENT (ICD)
FOR
ATS INTERFACILITY DATA COMMUNICATIONS (AIDC)

Version 3.0 - TBD 2007

Issued by the ICAO Asia/Pacific Regional Office, Bangkok

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Chapter 0 EXECUTIVE SUMMARY

0.1 The Asia/Pacific Regional Interface Control Document (ICD) for ATS Interfacility Data Communications (AIDC) is based on the work undertaken by the North Atlantic Systems Planning Group (NAT SPG) to standardise the interfacility message exchanges (ground/ground data link) needed to support oceanic automation in the North Atlantic Region. The NAT SPG agreed that the ground/ground data interchange should be in accordance with the procedures specified in a common ICD but that the common ICD should identify and detail any regional differences considered necessary.

0.2 The purpose of the ICD is to ensure that data interchange between units equipped with automated ATS systems used for air traffic management (ATM) in the ASIA/PAC Region is harmonised to a common base standard, and that the evolutionary development is coordinated and implemented centrally through the APANPIRG. Therefore, the ICD for the ASIA/PAC Region was developed to address any regional differences but, at the same time, preserve the common base standard set out in the Automatic Dependent Surveillance (ADS) Panel Guidance Material.

0.3 As in the North Atlantic, the ASIA/PAC Region has a great need for a communications and data interchange infrastructure that will significantly reduce the need for verbal coordination between Oceanic Area Control Centres and/or Area Control Centres. ATS Interfacility Data Communications (AIDC) standards, as defined in this document, provide the means by which data interchange between ATS units providing air traffic service in, and adjacent to, the ASIA/PAC Region is harmonised during the notification, coordination, and transfer of control phases of operations.

0.4 The message sets and procedures described in the ICD have been designed for use with the existing Aeronautical Fixed Telecommunications Network (AFTN) and the future Aeronautical Telecommunication Network (ATN). In the interest of global standardisation, ICAO agreed methods and messages were used wherever possible. Where ICAO methods and messages do not meet requirements, new messages were identified using existing ICAO field definitions to the extent possible. Specifically, the ICD defines the following:

(a) Basic communications and support required to coordinate implementation of AIDC throughout the ASIA/PAC Region;

(b) Common boundary agreements between all the area/oceanic control centres concerned;

(c) Implementation guidance material; and

(d) Relationship to the ICAO OPLINKP (formerly the ADS Panel) AIDC message set.

0.5 The ICD also describes a configuration management process which will ensure stability in the design and implementation of the messages described herein. As agreed, this process is applicable and adopted by Asia Pacific Provider States along with the ICD guidance material.

Chapter 1 FOREWORD

1.1 HISTORICAL

1.1.1 In 1971, States in the North Atlantic (NAT) Region initiated action to begin the automation of flight data exchanges between Oceanic Area Control Centres (OACs) using On-Line Data-Interchange (OLDI) techniques. These techniques were not standard nor indeed even compatible, and it was agreed that to get full benefits from the application of OLDI, regional standardisation must be achieved.

1.1.1.1 OLDI was defined as system to system interchange of data with controller notification and presentation when necessary. It was not seen as a means where by controllers could effectively send and receive electronic mail.

1.1.2 At its twenty-fifth meeting (Paris, September 1988), the North Atlantic Systems Planning Group (NAT SPG) established a Task Force to develop a future ATS system concept for the whole of the NAT Region (NAT SPG/25, Conclusion 25/11 refers).

1.1.2.1 Today there are two types of OLDI in use, one known as European OLDI and the other known as NAT OLDI. The message sets differ to some degree with the European OLDI being simpler and oriented toward minimal controller interaction. The NAT OLDI message set includes messages which require manual intervention.

1.1.3 At its twenty-seventh meeting (Paris, June 1991), the NAT SPG noted that the draft ICD was sufficiently mature to be used for planning purposes and therefore agreed that States should endeavour to replace agreements that existed at the time with the common ICD by the end of 1991. Subsequent work within the NAT SPG upgraded the ICD to better match automation and communications transition requirements.

1.1.4 On the basis of the above, the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG), at its fifth meeting in 1994, undertook the task of developing the inter-facility message exchanges needed to support automation in the regions.

1.1.5 The ICAO OPLINK Panel then adopted the AIDC message set and included it as guidance material.

1.1.6 At the thirteenth meeting of APANPIRG (Bangkok, September 2002) decision 13/9 was made to reconvene the AIDC Task Force to undertake the reviewing and updating of the ASIA/PAC AIDC Interface Control Document (ICD).

1.1.7 The AIDC Review Task Force met in Brisbane on the 27th and 28th of March 2003. Discussions within the Task Force revealed inconsistencies between existing AIDC ICDs containing the same version number. The Task Force decided to baseline a document based on the original printed ICAO document.

1.1.8 As a result of this meeting the ASIA/PAC Regional ICD for AIDC was updated to include:

- Additional clarification of certain message types;
- Improved consistency of the terminology used in the document;
- Incorporation of recent changes proposed changes to PANS-ATM Doc. 4444 and Doc. 9694, regarding additional optional sub-fields in ICAO Field 14; and

- Proposed additional message types, namely the Application Status Monitor (ASM), the FANS Application Notification (FAN) and the FANS Completion Notification (FCN).

1.1.9 Version 2.0 of the Asia/Pacific Regional ICD for AIDC was adopted by APANPIRG/14 in August 2003 under the Conclusion 14/3.

1.1.10 At the seventeenth meeting of APANPIRG (August 2006) Decision 17/13 was taken to reconvene the AIDC Task Force to complete the outstanding task of defining the format of the FAN message and addressing other outstanding issues identified in the ASIA/PAC AIDC Interface Control Document (ICD) Version 2.0.

1.1.11 The AIDC Task Force met in Bangkok 6-9 February, 2007.

1.1.12 As a result of this meeting, in addition to editorial changes, the ASIA/PAC Regional ICD for AIDC was updated to include:

a) specific error messages in Appendix B, Table B-1 associated with V2.0 functionality.

b) clarification of some formats to avoid the possibility of differing interpretations.

c) the format of the FANS message.

d) modification of the format of the FCN message to permit greater flexibility in its application.

e) the format of the ADS message.

f) the format and use of the TRU message.

1.1.13 Version 3.0 of the Asia/Pacific Regional ICD for AIDC was adopted by APANPIRG/18 in September 2007 under the Conclusion ***TBD.***

Chapter 2 THE DOCUMENT

2.1 INTRODUCTION

2.1.1 The ASIA/PAC Interface Control Document (ICD) for ATS Interfacility Data Communications is divided into the following Parts:

2.2 PART I - PURPOSE, POLICY AND UNITS OF MEASUREMENT

2.2.1 This part provides an overall philosophical view of the ICD, general information concerning the units that are used and information on data that is applicable to all ATSUs (Air Traffic Services Units).

2.3 PART II - COMMUNICATIONS AND SUPPORT MECHANISMS

2.3.1 This part describes the technical and other requirements needed to support AIDC. It also indicates that a longer term strategy for the transition to the ATN needs to be developed.

2.4 APPENDICES

2.4.1 Appendices include, inter alia, implementation guidelines which are relevant for software engineers, and a cross-reference to the ICAO OPLINKP AIDC message set, descriptions of messages used to exchange ATS data between automated ATS Systems, templates for typical bilateral letters of agreement when implementing AIDC, a list of error messages, and a Glossary of Terms.

2.5 LIST OF ACRONYMS

ABI	Advance Boundary Information (AIDC message)
ACARS	Aircraft Communication Addressing and Reporting System
ACC	Area Control Centre
ACI	Area of Common Interest
ACP	Acceptance (AIDC message)
ADS	Surveillance ADS-C (AIDC message)
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AFN	ATS Facilities Notification
AFTN	Aeronautical Fixed Telecommunications Network
AIDC	ATS Interfacility ASIA/PAC Data Communications
AOC	Airline Operational Control; or ––Assumption of Control (AIDC message)
AMHS	ATS Message Handling System
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ARINC	Aeronautical Radio Inc.
ARTCC	Air Route Traffic Control Center
ASIA/PAC	Asia/Pacific
ASM	Application Status Monitor (AIDC message)
ATC	Air Traffic Control
ATSC	Air Traffic Service Centre
ATM	Air Traffic Management
ATMOC	Air Traffic Management Operations Centre
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSU	Air Traffic Service Unit
C-ATSU	Controlling ATSU
CDN	Coordination (AIDC message)

CHG	ICAO Modification Message
CPDLC	Controller Pilot Data Link Communications
CPL	Current Flight Plan (AIDC message)
CRC	Cyclic Redundancy Check
D-ATSU	Downstream ATSU
DIA	Coordination Dialogue
EMG	Emergency (AIDC message)
EST	Coordination Estimate (AIDC message)
ETX	End of Text
FAN	FANS Application Message (AIDC message)
FANS (also FANS-1/A)	Future Air Navigation System
FCN	FANS Completion Notification (AIDC message)
FCO	Facilities Notification Contact
FI	Flight Identifier
FIR	Flight Information Region
FMC	Flight Management Computer
FMD	Flight Management Computer (Selected)
FMH	Facilities Notification Message Header
FML	Flight Management Computer (Left)
FMR	Flight Management Computer (Right)
FOM	FANS Operations Manual
FPL	Filed Flight Plan
FN_CAD	Contact Advisory
FPO	Facilities Notification Current Position
IA-5	International Alphabet 5
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IGM	Implementation Guidance Material
IMI	Imbedded Message Identifier
LAM	Logical Acknowledgement Message (AIDC message)
LOA	Letter of Agreement
LRM	Logical Rejection Message (AIDC message)
MAC	Coordination Cancellation (AIDC message)
MIS	Miscellaneous (AIDC message)
MTI	Message Type Identifier
NAT	North Atlantic
NDA	Next Data Authority (CPDLC message); or Next Data Authority (Next unit that will communicate with the aircraft using CPDLC)
OAC	Oceanic Area Control Centre
OCS	Oceanic Control System
ODF	Optional Data Field
OLDI	On-Line Data-Interchange
OPLINKP	Operational Data Link Panel
OSI	Open System Inter-connection
PAC	Preactivation (AIDC message)
PANS-ATM	Procedures for Air Navigation Services - Air Traffic Management
REJ	Rejection (AIDC message)
R-ATSU	Receiving ATSU
RNP	Required Navigation Performance
SARPs	Standards and Recommended Practices
SITA	Societe Internationale de Telecommunications Aeronautiques
SMI	Standard Message Identifier

SOH	Start of Header
STX	Start of Text
TCP	Transfer of Control Point
TDM	Track Definition Message (AIDC message)
TEI	Text Element Identifier
TOC	Transfer of Control (AIDC message)
TRU	Track Update (AIDC message)
UTC	Universal Coordinated Time
VSP	Variable System Parameter

PART I - PURPOSE, POLICY AND UNITS OF MEASUREMENT

1. PURPOSE

1.1 The purpose of the document is to ensure that data interchange between ATSUs providing air traffic services in, and adjacent to, the ASIA/PAC Region is harmonised to a common standard and to ensure that evolutionary development is encouraged and coordinated centrally. It also provides a description of the message types and methods of communication.

1.2 In the context of this document, the definition of AIDC is as follows:

The AIDC application supports information exchanges between ATC application processes within automated ATS systems located at different ATSUs. This application supports the Notification, Coordination, and the Transfer of Communications and Control functions between these ATSUs.

1.3 In the interest of global standardisation, ICAO agreed methods and messages are used wherever possible. Where ICAO methods and messages do not meet requirements, new messages were identified using existing ICAO field definitions to the extent possible.

2. SCOPE

2.1 This document specifies the facilities and messages to be used within the ASIA/PAC region for the exchange of notification, coordination, transfer and related data between automated ATS systems.

2.2 The messages defined in this document are used during the various stages of the flight. Though outside the scope of the AIDC application, the Emergency, Flight Planning and Supplementary Message Categories as defined in ICAO Doc 4444 Appendix 3 will continue to be used to perform functions not provided by the AIDC application.

2.3 In particular, the Flight Planning function is required and will be required in the future to support operations within the ASIA/PAC Region. The ICAO messages FPL (Filed Flight Plan), CHG (Modification), DLA (Delay), DEP (Departure), ARR (Arrival), CNL (Cancel) and RQP (Request Flight Plan) will be used to support this function.

3. POLICY

3.1 Document amendment

3.1.1 Parts I and II of this ICD are under configuration control and are administered by the ICAO ASIA/PAC Regional Office in conjunction with APANPIRG. Changes to Parts I and II of the document shall only be made as a result of agreement by APANPIRG. Requested changes to the Appendices shall be relayed to the ICAO Regional Office in Bangkok, who will circulate requested proposed changes to all States in the Regions for comment and, subject to unanimous agreement, the Regional Office will amend such document accordingly.

3.2 System philosophy

3.2.1 The application of AIDC in the ASIA/PAC Region shall be based on a step-by-step data distribution scheme comprising three phases: Notification, Coordination and Transfer of Control.

3.2.1.1 The capability to revert to manual coordination shall be retained.

3.2.2 In support of all the operational phases, application management messages are required to support application level dialogue between automated ATS systems.

3.2.3 Flight plans shall continue to be filed in accordance with existing procedures.

3.2.4 A functional address, which refers to a function within an OAC/ACC (e.g. an ATC watch supervisor), may be substituted in certain messages for the aircraft identification found in Field 7. Where such an address is used, it is preceded by an oblique stroke (/) to differentiate it from an aircraft identification.

4. UNITS OF MEASUREMENT

4.1 Introduction

4.1.1 In general the AIDC ICD messages support different units of measurement. Bilateral agreements should determine the units to be transmitted.

4.2 Time and date

4.2.1 All times shall be expressed in UTC as four digits, with midnight expressed as 0000. Dates, when used, shall be in the form of YYMMDD.

4.3 Geographic position information

4.3.1 Geographic position information shall be in accordance with the provisions contained in the *Procedures for Air Navigation Services Air Traffic Management (PANS-ATM, Doc 4444)*.

4.4 Level and speed information

4.4.1 Level and speed information shall be specified in accordance with ICAO PANS-ATM Doc 4444 with the following exceptions applying only to Field 14 or the Track Data field in a TRU message.

Note. When including more than one of the optional formats described below in the same AIDC message, the order that the data is incorporated into Field 14 is the order that it is described below. For example, if an AIDC message was to include a block level and an assigned Mach Number, the block level information would precede the Mach Number information.

4.4.1.1 <u>Block level information</u>

4.4.1.1.1 In certain circumstances, a vertical range of levels may be transmitted. Where a vertical range of levels is used, it shall be specified as a lower level followed by the upper level.

Example 1 MINNY/2125F320F340 The aircraft is operating in a block of levels between F320 and F340 (inclusive).

4.4.1.1.2 When transmitting a level restriction, only a single level may be included within the restriction.

Example 2 ELMER/0244F310F350F290A The aircraft is cleared to operate in a block of levels between F310 and F350 and will cross ELMER at or above F290.

4.4.1.1.3 The coordination of a vertical range of levels by AIDC should only be made following bilateral agreement.

4.4.1.2 <u>Mach Number Technique information</u>

4.4.1.2.1 The boundary estimate may contain additional clearance information describing a Mach Number that has been assigned to an aircraft. If transmitted, the Mach Number information shall always follow directly after the level information and be separated from the level information by a forward slash delimiter (/). This information shall contain:

- a single character providing advice as to whether an aircraft will be maintaining the notified Mach Number or less (L), the notified Mach Number or greater (G), or exactly the notified Mach Number (E); and
- four characters defining the notified Mach Number, expressed as the letter M followed by 3 numerics.

Example1 BUGGS/0349F350F370/GM085 The aircraft is operating in a block of levels between F350 and F370 (inclusive) maintaining M0.85 or greater.

Example 2 PLUTO/0215F310/EM076 The aircraft is maintaining M0.76.

4.4.1.2.2 The absence of speed information in the boundary estimate data of an AIDC message indicates that the previously assigned speed has been cancelled.

Example 3 SPEDY/1237F310F330B/LM083 The aircraft is cleared to F310 and will cross SPEDY at or below F330, maintaining M0.83 or less;

subsequently followed by:

Example 4 SPEDY/1238F310 The aircraft will no longer be on descent at SPEDY, and has resumed normal speed (and one minute later than previously coordinated).

4.4.1.2.3 The format described for the notification and coordination of Mach Number in this section applies to Field 14 – boundary estimate data – only. It may be transmitted in any AIDC message containing Field 14.

4.4.1.2.4 The coordination of Mach Numbers by AIDC should only be made following bilateral agreement.

4.5 Offset and weather deviation information

4.5.1 The boundary estimate may contain additional clearance information describing an offset or weather deviation that has been issued to an aircraft. If transmitted, the offset and weather deviation information shall always be the last information in the group and shall be separated from preceding information by a forward slash delimiter (/). This information shall contain:

- a single character providing advice as to whether the clearance is an offset (O) or a weather deviation (W); and
- One to three characters indicating an off track distance associated with this clearance (leading zeros shall not be used); and
- a direction, indicating left (L), right (R) or either side of track (E).

Example 1 GOOFY/2330F310/GM084/O30R The aircraft is offsetting 30NM right of track, maintaining M0.84 or greater.

Example 2 DAFFY/0215F310F350/W25E The aircraft is operating in a block of levels between F310 and F350 (inclusive) deviating up to 25NM either side of track.

Example 3 DAFFY/0215F310F350/W5E The aircraft is operating in a block of levels between F310 and F350 (inclusive) deviating up to 5NM either side of track.

Example 4 DAFFY/0215F310F350/W100E The aircraft is operating in a block of levels between F310 and F350 (inclusive) deviating up to 100NM either side of track.

4.5.2 The absence of offset or weather deviation data in the boundary estimate data of an AIDC message indicates that any previously notified or coordinated off track clearance no longer applies.

Example 5 MICKY/1519F330/W15R The aircraft is deviating up to 15NM right of track

subsequently followed by:

Example 6 MICKY/1520F330 The aircraft is back on track (and one minute later than previously coordinated).

4.5.3 The off-track clearance format described in this section applies only to Field 14 – boundary estimate data – or the Track Data field in a TRU message. It may be transmitted in a TRU message or any AIDC message containing Field 14.

4.5.4 When an aircraft is offsetting or deviating, the coordination point in the boundary estimate data shall be the coordination point based on the nominal route rather than any calculated boundary point based on the offset route.

4.5.5 When including Offset information in an AIDC message, the direction "E" (either side of track) shall not be used.

4.5.6 Valid "off track" distance values are integers between 1 and 250, with no leading zeros. The off track distance is measured in nautical miles (NM).

4.5.-7 The coordination of offsets and weather deviations by AIDC should only be made following bilateral agreement.

5. RESTRICTION FORMATS

5.1 Level and speed restrictions

5.1.1 Use of restrictions is not mandatory. If they are used the following convention shall be used.

5.1.2 Route, speed and level information contained in the Route field (ICAO ATS Field 15) represents the current cleared profile. Where a clearance requires a speed/level change subsequent to a route point, then the ICAO convention of route point followed by an oblique stroke and the new speed/level will be used (Ex. 1). Where a clearance requires a speed/level change to be completed by a route point, then the items will be reversed (Ex. 2).

5.1.3 A combination of these two conventions will describe a clearance with a defined starting and completion point (Ex. 3).

Example 1 60N010W/M084F350

Example 2 M084F350/62N020W

Example 3 60N010W/M084F350/62N020W

5.2 **Time restrictions**

5.2.1 There are three types of time restrictions, describing when an aircraft should arrive at a fix:

a) AT;

b) AT OR BEFORE; or

c) AT OR LATER.

5.2.2 A suffix will be added to the four digit time to denote the restriction type, as follows:

a) AT: 'A', e.g. 1230A;

b) AT OR BEFORE: 'B', e.g., 1230B; or

c) AT OR LATER: 'L', e.g., 1230L.

5.2.3 The restriction itself will begin with a slash, i.e., '/', e.g., /1230B, and will appear after the fix with which it is associated. For example,

49N050W/1230L

signifies that the aircraft should arrive at 49 N 50 W at or later than 1230 pm.

5.2.4 A time restriction may be used in conjunction with speed/level restrictions as follows:

60N010W/M084F350/1230L
M084F350/62N020W/1230A
60N010W/M084F350/62N020W/1230B

5.2.5 Time restrictions may only appear in the Route field (Field 15).

5.2.6 The use of time restrictions shall be bilaterally agreed between ATS providers.

PART II - COMMUNICATIONS AND SUPPORT MECHANISMS

1. INTRODUCTION

1.1 Coordination communications are divided into two areas; one addresses the need for voice communications between ATSUs whereas the other addresses the need for data communications. It is anticipated that the continuing implementation of automated data communications between ATSUs will result in a reduction in the utilisation of voice communications.

2. MESSAGE HEADERS, TIMERS AND ATSU INDICATORS

2.1 Message Headers

2.1.0 **General.** AFTN IA-5 Message Header, including the use of the Optional Data Field defined in Annex 10, Volume II and herein, will be employed for the exchange of all ATS data in the region. The AFTN priority indicator FF shall normally be used for all data exchanges.

2.1.1 **Optional Data Field**. The optional data field provides a flexible way to convey information on an end-to-end basis, undisturbed by the communication processes along the path. Since the information is optional it is necessary to specify a unique number and ending for each defined use. Option 1 has already been allocated for additional addressing use, and will be found in ICAO Annex 10, Volume II in due course. Option numbers 2 and 3 have been defined for computer applications to convey message/data unit identification and message/data unit reference information, respectively, and are adopted in this ICD. Other options can be defined and added as the need arises. The proposed encoding would have no impact on AFTN switching centers as they ignore this part of the origin line.

2.1.2 **Addressing**. The Source and Destination addresses of the AFTN header convey the direction and logical identity of the application processes exchanging AIDC information (data). The application process must be aware of the AFTN addresses that are used for this function. The first four characters form the location, while the next three characters specify an office/agency or a processor at the given location. The eighth character of the address indicates the end system application and details of the naming assignment are contained in Appendix C. This approach allows up to 26 multiple applications to be co-hosted in the same processor, each having its own unique address. This implementation will make the addressing consistent with Open System Inter-connection (OSI) parameters and simplify the transition to the ATN.

2.1.3 **Message/Data Identification Number**. The message/data identification number is a six (6) digit number, taken from a single application pool of available numbers. The identification of the sending and receiving units would use the normal 8-character addresses of the AFTN header.

2.1.3.1 The message/data identification number is encoded and conveyed in the AFTN message header Optional Data Field (ODF), option 2. The AFTN implementation provides functionality consistent with the OSI primitive/parameter structure.

2.1.3.2 A message/data identification number will be assigned to each message/data unit requiring confirmation of receipt by the initiating processor. This number will be assigned on an application process basis in such a way as to guarantee a unique identification number for a period of time as specified in paragraph 2.1.6. For messages/data not requiring confirmation the message/data identification parameter shall not be used.

2.1.4 **Reference Information**. The message/data reference information is a way of linking a message/data unit to a previously sent message. This function is encoded and conveyed in the AFTN ODF, option 3. This implementation would make the linking information consistent with the abstract OSI protocol primitive/parameter structure. The reference information consists of the message/data identification number of the previously sent message/data unit being referenced. As the previous message being referenced could have been originated by either processor the location indicator of the message source shall be used as a prefix to the reference number.

2.1.5 **Time Stamp**. The time stamp is expressed as 12 digits in year, month, day, hours, minutes, and seconds (YYMMDDHHMMSS). The high precision (seconds) of the time stamp will support computation of transmission delays. This data item is conveyed as option 4 of the ODF.

2.1.6 **Cyclic Redundancy Check (CRC)**. The CRC is a four digit hexadecimal number that is used to ensure end-to-end message integrity. The CRC employed is the CRC-CCITT. The CRC is computed over the message text, from the beginning left parenthesis to the closing right parenthesis, inclusive. Non printable characters such as line feeds and carriage returns shall be excluded from the CRC calculation. This data item is conveyed as option 5 of the ODF.

2.2 **Timers**

2.2.1 In order to guarantee the uniqueness of the message/data identification number, and yet allow for the efficient reuse of the numbers in the pool, two timers are required for each message/data unit requiring confirmation: accountability and reuse.

2.2.2 **Accountability Timer**. The accountability timer determines the maximum period of time for the responding application to confirm receipt of a given message/data unit. The default value for this timer nominally shall be three minutes. If there is no valid response from the responding application the initiating processor shall retransmit the message/data unit (and reset the timer), or initiate local recovery procedures. When local procedures allow retransmission a maximum value, such as three, must be determined before local recovery procedures are initiated. The accountability timer shall be cancelled by the receipt of any message with the appropriate message/data reference identifier, which will typically be a LAM or LRM. Retransmissions use the same message/data identification number as the original message/data unit.

2.2.3 **Reuse Timer**. The reuse timer function employs two timers that determine the minimum period of time during which a message/data identification number is guaranteed to be unique. Reuse timer A shall be set for exchanges not involving dialogues between processors. The range for reuse timer A shall be from 1 to 30 minutes, in one minute increments. The default value for reuse timer A shall be 5 minutes, or as agreed for communicating applications by the concerned administrations. Reuse timer B shall be set for exchanges where a dialogue is involved in the exchange. The range for reuse timer B shall be 2 to 90 minutes, in one minute increments. The default value for reuse timer B shall be 10 minutes, or as agreed for communicating applications by the concerned administrations. A given message/data identification number can be reused when an ACP, AOC, or REJ response message is received or the reuse timer has expired.

2.2.4 **System Failure Timer Procedures**. In the event of system failure the accountability and reuse timers will be reset and resume timing upon completion of system recovery.

2.2.5 **Example**. The following examples depict two ASIA/PAC Core Messages encoded in accordance with the previous procedures. The second message is a reference to the first message. SOH, STX, message ending and ETX characters are omitted for clarity, as are the alignment functions.

FF NFFFZOZO
122145 KZOAZOZO 2.000033-4.940412214523-5.A34B-
(CPL-UAL714-IS-B747/H-S/C-KLAX-05S179W/2220F370-M082F370(route data)-YSSY-0)

Explanation: Sending an initial coordination message (number 000033 from Oakland (KZOAZOZO) to Nadi (NFFFZOZO) at time 940412 214523.

FF KZOAZOZO
122147 NFFFZOZO 2.000044-3.KZOA000033-4.940412214703-5.DE6A-
(ACP-UAL714-KLAX-YSSY)

Explanation: Fiji (NFFFZOZO) accepts the proposed coordination condition received from Oakland (KZOAZOZO) by sending message number 000044 from NFFFZOZO to KZOAZOZO at 940412214703. The message refers to message 000033 sent earlier by KZOAZOZO

2.3 ATSU Location Indicators

2.3.1 ICAO location indicators must be used by automated ATSUs in AIDC messages.

3. ENGINEERING CONSIDERATIONS

3.1 Future Communications

3.1.1 The future data communications infrastructure should be compatible with the ICAO ATN.

3.1.2 Until the ATN becomes available, the engineering details needed to implement the exchange of messages contained in Appendix A will need to be agreed to bilaterally and identified in Appendix D.

3.2 ATN Transition Support

3.2.1 The AFTN will provide the underlying communications network and services within the ASIA/PAC region in the near-term. Communication services provided by the ground element of the ATN will be eventually employed by the AIDC application.

3.2.2 The APANPIRG ATN—Implementation Coordination Group (ICG) is currently considering the continued use of AFTN format for AIDC application in the Asia/Pacific region. When the ATS Message Handling System (AMHS) has been implemented, the exchanges of AFTN messages on ATN can be accomplished using the AFTN/AMHS gateway function of the AMHS application. This mechanism can be used to exchange the AFTN AIDC messages providing that the connection has been tested to meet the recommended performance criteria in Appendix D.

3.2.3 The ASIA/PAC region will comply with ATN SARPs. A summary of these SARPs specifically relevant to ASIA/PAC operations, including addressing conventions and encoding rules, will be included within the document.

3.3 Performance Criteria

3.3.1 If AIDC messages are not transmitted and received in a timely manner between automation systems, aircraft can potentially cross boundaries without coordination or transfer of control responsibility taking place. The benefits of AIDC are also severely reduced if link speeds and transit times are inadequate.

3.3.2 In order to effectively use the AIDC application for the interchange of ATC coordination data, performance requirements need to be specified. These specified performance requirements need to be agreed to by neighbouring states implementing AIDC. Recommended performance figures are specified in Appendix D.

3.4 Recording of AIDC data

3.4.1 The contents and time stamps of all AIDC messages shall be recorded in both end systems in accordance with the current requirements for ATS messages.

3.4.2 Facilities shall be available for the retrieval and display of the recorded data.

APPENDIX A - ATS COORDINATION MESSAGES

1. INTRODUCTION

1.1 The following sections describe those messages used by ASIA/PAC ATS systems for On-Line Data Interchange. These core messages are a selection from the AIDC message set developed by the ICAO – OPLINK Panel. Unless otherwise indicated in this document, message fields will conform to ICAO field definitions (PANS-ATM Doc 4444), and are referred to by field number. All ATS data shall be enclosed between parentheses. Only one ATS message shall be included within a transmission. An overview of all ASIA/PAC core messages and their composition can be found in Table A-2.

1.2 Coordination and the further route of flight

1.2.1 Field 15 shall include subfields 15a, 15b and 15c. It shall describe the cleared route, beginning with the last significant point preceding the coordination point. It will contain all known cleared route information. As a minimum, it shall contain the first significant point in the adjacent ATSU's airspace. If the cleared route of flight is not known completely to destination, the truncation indicator shall appear after the last known significant route point. For example:

1. M083F340 SALAG B333 PUGEL/M083F360 T
2. M083F300 DCT FICKY B200 TATAS T

Note 1: In accordance with PANS-ATM Doc 4444 the truncation indicator shall only follow a significant point or significant point/Cruising Speed and Cruising level in Field 15 and shall not follow an ATS route designator.

Note 2. ATSUs should be aware of the risks associated with simply deleting an unknown waypoint or route without using correct truncation procedures. Deletion of a waypoint or route will result in erroneous route information being transmitted to downstream ATSUs.

1.3 Field 3 Requirements

1.3.1 All messages shall use field 3a only.

1.3.2 Fields 3b and 3c are not used since, for AIDC, these reference numbers are included in the ODF, option 3. See Part 2, paragraph 2.1.4.

1.4 Field 7 Requirements

1.4.1 Where Field 7 is required to be present in a message, Field 7a (Aircraft Identification) shall be mandatory. Fields 7b (SSR Mode) and 7c (SSR Code) are optional but shall always be present where the information is available and applicable.

2. MESSAGE GROUP

2.0 The core messages shown in Table A-1 below are to be supported by all ASIA/PAC ATS Providers using automated data interchange.

2.0.1 Optional messages may be supported by ATS providers. Such messages will be detailed in bi-lateral agreements.

Table A-1. ASIA/PAC AIDC Messages

Core	Opt	Message Class	Message
X		Notification	ABI (Advance Boundary Information)
X		Coordination	CPL (Current Flight Plan)
X			EST (Coordination Estimate)
X			MAC (Coordination Cancellation)
	X		PAC (Preactivation)
X			CDN (Coordination)
X			ACP (Acceptance)
X			REJ (Rejection)
	X		TRU (Track Update)
X		Transfer of Control	TOC (Transfer of Control)
X			AOC (Assumption of Control)
X		General Information	EMG (Emergency)
X			MIS (Miscellaneous)
	X		TDM (Track Definition Message)
X		Application Management	LAM (Logical Acknowledgement
X			LRM (Logical Rejection Message)
	X		ASM (Application Status Monitor)
	X		FAN (FANS Application Message)
	X		FCN (FANS Completion Notification)
	X	Surveillance Data Transfer	ADS (Surveillance ADS-C)

2.1 Notification messages

2.1.1 ABI (ADVANCE BOUNDARY INFORMATION)

2.1.1.1 *Purpose*

Used to give advance information on flights and shall be transmitted at a bilaterally agreed time or position (Variable System Parameter) before the common boundary. Changes to a previously transmitted ABI shall be communicated by means of another ABI. Changes to the cleared route of flight will result in the retransmission of an ABI.

2.1.1.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
14	Boundary estimate data
16	Destination aerodrome
22	Amendment

Field 22 shall contain as a minimum the following fields:

9	Number, type of aircraft and wake turbulence category
15	Route (see Appendix A, paragraph 1.2.1)

Field 22 may also optionally include any or all of the following fields:

8	Flight rules
10	Equipment
18	Other information. Note that this field shall contain information as received by the sending centre or a subset thereof as agreed between the parties

Subject to bilateral agreement, the following field may also be included in Field 22:

Text	Amended Destination

2.1.1.3 Amended Destination is a free text field that may be used in the ABI message to notify an amended destination aerodrome. The field consists of an identifier (“DEST”) followed by a delimiter “/” character, followed by the name or the location of the new destination. When used, the Amended destination field is the last field within Field 22.

2.1.1.4 *Example(s)*

(i) (ABI-THA179-EGLL-15N0090E/0700F330
-VTBD-8/IS-9/B747/H-10/S/C-15/14N093W 13N097W YAY T-18/0)

(ii) (ABI-QFA43-YSSY-ESKEL/0300F330-NZAA-8/IS-9/B744/H-10/SIDHJRW/CD-15/SY L521 ESKEL TANEN WN-DEST/NZWN)

The second example shows an ABI following a diversion from the original destination (NZAA) to a new destination (NZWN).

2.1.2 More information concerning the usage of the Amended Destination field is contained in Appendix D – *Implementation Guidance Material*.

2.2 **Coordination messages**

2.2.1 CPL (CURRENT FLIGHT PLAN)

2.2.1.1 *Purpose*

Used to initiate initial coordination dialogue between automated ATS systems for a specific flight.

2.2.1.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
8	Flight rules
9	Aircraft type
10	Navigation equipment
13	Departure aerodrome
14	Boundary estimate data
15	Route (see Appendix A, paragraph 1.2.1)
16	Destination aerodrome
18	Other information

2.2.1.3 *Example*

(CPL-QFA811-IS-B767/H-S/C-WSSS-20N070E/1417F350-
M080F350 30N060E 40N090E YAY T-EGLL-0)

2.2.2 EST (COORDINATION ESTIMATE)

2.2.2.1 *Purpose*

Used to inform the receiving centre of the crossing conditions for a flight and to indicate that the conditions are in compliance with agreements between the two parties. An ACP message shall be transmitted to complete the coordination process. The only valid response to an EST is an ACP.

2.2.2.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
14	Boundary estimate data
16	Destination aerodrome

2.2.2.3 *Example*

(EST-QFA811/A2277-WSSS-20N070E/1417F350-YAYT)

2.2.3 PAC (PREACTIVATION)

2.2.3.1 *Purpose*

Used to inform the receiving centre of the crossing conditions for a flight which has not yet departed and to indicate that the conditions are in compliance with agreements between the two parties. Normally it is only used when the departure point is close to the FIR boundary and preflight coordination is required.

Note: On receipt of a PAC message an ACP message is required to be transmitted to complete the coordination process. The only valid response to a PAC is an ACP.

2.2.3.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
14	Boundary estimate data
16	Destination aerodrome
22	Amendment (optional field)

Field 22 may optionally include any or all of the following fields:

8	Flight rules
9	Number, type of aircraft and wake turbulence category
10	Equipment
15	Route (see Appendix A, paragraph 1.2.1)
18	Other information. Note that this field shall contain information as received by the sending centre or a subset thereof as agreed between the parties

2.2.3.3 *Example*

(PAC-QFA811/A2277-WSSS-20N070E/1417F350-YAYT-10/S/C)

2.2.4 MAC (COORDINATION CANCELLATION)

2.2.4.1 *Purpose*

Used specifically to indicate to a receiving centre that all notification and/or coordination received for a flight is no longer relevant to that centre. This message is not to be considered as a CNL message.

2.2.4.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
16	Destination aerodrome
22	Amendment (optional field)

Field 22 may only contain the following fields:

14	Boundary Estimate Data
18	Other Information

Field 14 may be transmitted containing the boundary estimate data previously transmitted. It may be used if required, to correctly identify the flight concerned by the MAC, when appropriate. If a MAC is transmitted as a result of a diversion to a new destination (i.e. such that the receiving ATSU is no longer affected by the flight), Field 16 – Destination aerodrome – should contain the destination contained in the original Notification and/or coordination messages.

2.2.4.3 *Examples*

(i) (MAC-SIA286-NZAA-WSSS)
(ii) (MAC-THA989-VTBD-YMML-18/RMK/DIVERTED TO YPDN)
(iii) (MAC-FJI910-YSSY-NFFN-14/DUBEV/2330F370)

2.2.5 CDN (COORDINATION)

2.2.5.1 *Purpose*

Used to propose changes to the coordination conditions agreed to in a previously transmitted CPL, EST, PAC or CDN message. Only one CDN dialogue can be active per flight at any given time between the same two ATSU's (refer App D paragraph 3.2.5). The initial coordination dialogue is always terminated by an ACP message; otherwise a unit receiving a CDN can indicate that the coordination conditions should be left as previously agreed by transmitting an REJ message. CDN dialogues should be closed prior to the Transfer of Control occurring.

ATSUs should ensure that appropriate procedures are defined in bilateral Letters of Agreement for dealing with CDN messages containing a number of revisions (e.g. a revised estimate and level). There may be occasions when the receiving ATSU can accept one of the amendments but not the other.

2.2.5.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
16	Destination aerodrome
22	Amendment

Under normal circumstances, Field 22 may only contain fields 14, 15 and 18. Subject to bilateral agreement, the following fields may also be included in Field 22:

10	Equipment
Text	Amended Destination

2.2.5.3 Amended Destination is a free text field that may be used in the CDN message to propose the coordination of a new destination aerodrome. The field consists of an identifier ("DEST") followed by a "/" character, followed by the name or the location of the new destination. When used, the Amended Destination field is the last field within Field 22.

2.2.5.4 *Examples*

(i) (CDN-NWA36-NFFN-RJTT-14/20N150E/0446F370)
(ii) (CDN-QFA1-YSSY-WSSS-10/SDGHIJRYZ/SD)
(iii) (CDN-KAL823-RJAA-NZCH-15/LTO G591 AA-DEST/NZAA)
(iv) (CDN-MAPLE1-PKMJ-ZZZZ-14/MARTI/2200F310-15/MARTI 02N168E-DEST/0150N16745E)

2.2.5.5 The last two examples demonstrate a CDN proposing a new route to an amended destination. In example (iii), there was no change to Field 14 – Boundary estimate data. Example (iv) shows a change of route with a corresponding change to Field 14. The “DEST/” included in Example (iv) refers to the proposed destination, rather than the original “ZZZZ” destination. Refer to Appendix D for the methodology in proposing a diversion to a new destination.

2.2.6 ACP (ACCEPTANCE)

2.2.6.1 *Purpose*

Used to confirm that the contents of a received CPL, CDN, EST or PAC message are accepted. ACP messages may be generated automatically or manually.

2.2.6.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
16	Destination aerodrome

2.2.6.3 *Example*

(ACP-ACA860-NZAA-KSFO)

2.2.7 REJ (REJECTION)

2.2.7.1 *Purpose*

Used to reject a clearance proposed by a CDN to a previously coordinated flight and terminate the coordination dialogue. The clearance remains as was previously agreed.

2.2.7.2 *Message Format*

ATS Field	Description
3	Message Type
7	Aircraft Identification
13	Departure Aerodrome
16	Destination Aerodrome

2.2.7.3 *Example*

(REJ-AAL780-KSFO-RJAA)

2.2.8 TRU (TRACK UPDATE)

2.2.8.1 *Purpose*

Used to permit the coordination of amendments to previously agreed coordination conditions where prior coordination of these changes is not required. Because there is no operational response to the TRU message, use of this message must be in strict accordance with bilateral agreements between the ATSUs concerned.

2.2.8.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft Identification
13	Departure Aerodrome
16	Destination Aerodrome
Text	Track Data

2.2.8.3 Track data is a free text field used in the TRU message to permit the transfer of updated clearance information from one ATSU to another. This field contains a number of elements which are described below. Each element consists of an "identifier" and a value which are separated by a "/" character.

2.2.8.4 All of the elements within the Track data field are optional, and multiple elements may be included, separated by a single <space> character. Track data will contain at least one element. When multiple elements are to be transmitted in a single TRU message, the order of the elements within the Track data field is the order in which they are listed below. Unused elements are not included in the Track data field.

2.2.8.5 Heading (HDG)

This optional element is preceded by the identifier 'HDG' and contains the magnetic heading that has been assigned to the aircraft, expressed as a three digit number between 001 and 360.

Example

(i) HDG/080

2.2.8.6 Cleared Flight Level (CFL)

This optional element is preceded by the identifier 'CFL' and contains the amended level that the aircraft has been assigned. Block levels in accordance with Part I paragraph 4.4.1.1 are also supported.

Examples

(i) CFL/F330
(ii) CFL/F310F330

2.2.8.7 Speed (SPD)

This optional element is preceded by the identifier 'SPD' and contains details of the speed (Mach Number or Indicated airspeed) that the aircraft has been assigned.

- Mach numbers are expressed as "M" followed by 3 numerics giving the true Mach Number to the nearest .01 Mach.

- Indicated airspeeds are expressed as "I" followed by 4 numerics giving the Indicated Airspeed in knots.

2.2.8.7.1 To cancel an assigned speed that had been previously coordinated, the SPD identifier is followed by a "/" character, followed by zero (0)

Examples

(i) SPD/M084
(ii) SPD/I0250
(iii) SPD/0

2.2.8.8 Direct to (DCT)

This optional element is preceded by the identifier 'DCT' and contains the position that the aircraft has been cleared directly to.

Examples

(i) DCT/MICKY
(ii) DCT/30S160E

2.2.8.9 Off Track deviation (OTD)

This optional element is preceded by the identifier 'OTD' and contains the details of any off track clearance that has been issued to the aircraft. The format of the off track deviation is as described in Part I paragraph 4.5, i.e.

- a single character providing advice as to whether the clearance is an offset (O) or a weather deviation (W); and
- an off track distance associated with this clearance;
- a direction, indicating left (L) or right (R) or, in the case of weather deviation, either side of track (E); and
- when including Offset information in an AIDC message, the direction "E" (either side of track) shall not be used

2.2.8.9.1 To cancel a previously coordinated off track deviation, the OTD identifier is followed by a "/" character, followed by zero (0).

Examples

(i) OTD/W20R
(ii) OTD/O30L
(iii) OTD/0

2.2.8.10 Depending on automation, the receiving ATSU may automatically update their flight plan data, or simply display the message to the responsible controller.

2.2.8.11 *Examples*

(i) (TRU-UAL73-NTAA-KLAX-CFL/F280 OTD/W20R)
(ii) (TRU-QFA43-YSSY-NZAA-HDG/115 CFL/F270)

2.3 **Transfer of control messages**

2.3.1 <u>TOC (TRANSFER OF CONTROL)</u>

2.3.1.1 *Purpose*

Used to offer the receiving centre executive control of a flight.

2.3.1.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification~~,~~
13	Departure aerodrome
16	Destination aerodrome

2.3.1.3 *Example*

(i) (TOC-TAP451/A2217-YMML-NZCH)

2.3.2 <u>AOC (ASSUMPTION OF CONTROL)</u>

2.3.2.1 *Purpose*

Sent in response to a TOC to indicate acceptance of executive control of a flight.

2.3.2.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
16	Destination aerodrome

2.3.2.3 *Example*

(i) (AOC-TAP451/A2217-NFFF-PHNL)

2.4 **General information messages**

2.4.1 <u>EMG (EMERGENCY)</u>

2.4.1.1 *Purpose*

Used at the discretion of ATSUs when it is considered that the contents require immediate attention. Normally the information would be presented directly to the controller responsible for the flight or to the controller expecting to receive responsibility for the flight. When the message does not refer to a specific flight, a functional address shall be used and the information presented to the appropriate ATS position. Where such an address is used it is preceded by an oblique stroke (/) to differentiate it from an aircraft identification. The following are some examples of circumstances which could justify the use of an EMG message.

a) Reports of emergency calls or emergency locator transmission reports.

b) Messages concerning hi-jack or bomb warnings.

c) Messages concerning serious illness or disturbance among passengers.

d) Sudden alteration in flight profile due to technical or navigational failure.

e) Communications failure

2.4.1.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification or functional address
18	Other information

2.4.1.3 *Examples*

(i) (EMG-UAL123-RMK/Free Text)
(ii) (EMG-/ASUP-RMK/Free Text)

2.4.2 MIS (MISCELLANEOUS)

2.4.2.1 *Purpose*

Used to transmit operational information which cannot be formatted to comply with any other message type and for plain language statements. Normally the information would be presented directly to the controller responsible for the flight or to the controller expecting to receive responsibility for the flight. When the message does not refer to a specific flight, a functional address shall be used and the information presented to the appropriate ATS position. Where such an address is used it is preceded by an oblique stroke (/) to differentiate it from an aircraft identification.

2.4.2.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification or functional address
18	Other information

2.4.2.3 *Examples*

(i) (MIS-NWA456-RMK/Free Text)
(ii) (MIS-/ASUP-RMK/Free Text)

2.4.3 TDM (TRACK DEFINITION MESSAGE)

2.4.3.1 *Purpose*

Used to distribute track information to affected Area Control Centres (ACCs) and Airline Operational Control Centres (AOCs) for flight planning. The message contains track definition and activity time periods.

2.4.3.2 *Message Format*

1. Message Identifier. The message begins with a "(TDM " and ends with ")". Fields within the message are separated by a space (i.e. " ").

2. Track Name. The track name consists of two fields. The first field is always TRK. The second field is the track identifier. The track identifier consists of 1 to 4 alphanumeric characters.

3. General Information. Contains:

(A) Date and time the track was generated and message number for that particular track in YYMMDDHHMMNN format where NN represents the message number. The initial TDM date/time message number group will look like: 941006134501. Message numbers 02 to 99 indicate TDM amendments or revisions. Note that zero padding may be required to provide the correct number of digits.

(B) Track status - Blank field for initial message or "AMDT" for amendment.

4. Activity Time Interval. This field consists of two date/time pairs, separated by a blank character, in the following format: YYMMDDHHMM YYMMDDHHMM

The first date/time pair represents the track activation, while the second is the track termination date/time.

Example: 9410070300 9410071500.

This example represents an activation date/time of October 7, 1994, at 0300 UTC and a termination date/time of October 7, 1994 at 1500 UTC.

5. Track Waypoints. This field contains the set of waypoints defining the track from the ingress fix to the egress fix. Waypoints are represented as latitude/longitude or named en route points. Waypoints are separated from each other by a blank space. Note that zero padding may be required. For example:

60N150W 60N160W, or NORML NUMMI, or FINGS 5405N13430W, etc.

6. Optional Fields

(A) Level: This optional field will not be used in the Pacific operations since levels are published in separate documents, eg. Pacific Ocean Supplements. However, the field will be retained for possible future use. If used in the future, track levels lists may be specified for the east and westbound directions of flight and a track levels list would contain the complete list of levels available on the track for the specified direction of flight. The levels would apply to all waypoints in the track waypoint list.

(B) Connecting routes (RTS): The RTS field is an optional field not normally used by automated ATS systems. When used, it is located after the waypoint list (before the remarks field) and begins with the keyword "RTS/" at the beginning of a line. Each line of the RTS field contains a single connecting route (to the ingress fix or from the egress fix).

7. Remarks. The Remarks subfield is a free text field that can contain additional comments. If there are no remarks a zero (0) is inserted as the only text. The remarks subfield begins with "RMK/".

2.4.3.3 *Examples*

2.4.3.3.1 The following TDM describes a route connecting Honolulu and Japan and would look similar to:

(TDM TRK A 940413124001
9404131900 9404140800
LILIA 27N170W 29N180E 31N170E 32N160E MASON
RTS/ PHNL KEOLA2 LILIA
MASON OTR15 SMOLT OTR16 SUNNS OTR20 LIBRA RJAA RMK/0)

2.4.3.3.2 The following TDM Revision describes a revision to the TDM shown in 2.4.3.3.1.

(TDM TRK A 940413131502 AMDT
9404131900 9404140800
LILIA 27N170W 29N180E 30N170E 32N160E MASON
RTS/ PHNL KEOLA2 LILIA
MASON OTR15 SMOLT OTR16 SUNNS OTR20 LIBRA RJAA RMK/0)

2.4.3.3.3 In the example given in 2.4.3.3.2 above, the message number (as delineated by the last two digits of the message generation date/time group) indicates it as the second ("2") message for the track. This is followed by "AMDT" to signify the previous message has been amended.

2.5 Application Management Messages

2.5.1 LAM (LOGICAL ACKNOWLEDGEMENT MESSAGE)

2.5.1.1 *Purpose*

Sent for each message (except for another LAM or LRM) that has been received, processed, found free of errors and, where relevant, is available for presentation to a control position. Non-receipt of an LAM may require local action. The message identifier and reference identifier are found in the message header, which is defined in Part II.

2.5.1.2 *Message Format*

ATS Field	Description
3	Message type

2.5.1.3 *Example*

(LAM)

2.5.2 LRM (LOGICAL REJECTION MESSAGE)

2.5.2.1 *Purpose*

Used to reject a message which contains invalid information. The message identifier and reference identifier are found in the message header, which is defined in Part II of this document. The LRM will identify the first field found that contains invalid information, if this field information is available.

2.5.2.2 *Message Format*

ATS Field	Description
3	Message type
18	Other Information

2.5.2.3 Field 18 will only use the RMK/ sub-field. It will comprise an error code, supporting text and the field number in which the error occurred (where applicable).

2.5.2.4 The following format is used in the RMK/ sub-field of the LRM to report errors:

<error code>/<field number>/<invalid text>

2.5.2.5 The <error code> shall contain the appropriate error code number from Appendix B, Table B-1. The error code is described using up to three numeric characters without leading zeros. When multiple errors are detected in an AIDC message, only a single LRM should be generated in response. This LRM would usually contain the error code of the first error detected.

2.5.2.6 The <field number> will contain the field number corresponding to the error code extracted from Table B-1. Where multiple field numbers are assigned to an error code only the first field number containing the error will be sent. Where no field number is referenced in Table B-1 the field number sub-field will be empty. The field number can be described using up to six alphanumeric characters.

Note. Some ATSUs may not support non-numeric field numbers (e.g. "HEADER"). Whilst this is acceptable in order to preserve backwards compatibility with existing systems, the preferred implementation is for any non-numeric field numbers from Table B-1 to be supported within the LRM.

2.5.2.7 The <invalid text> field will contain the error text corresponding to the error code extracted from Table B-1 (not including any of 'explanatory text' that may have been included in Table B-1). If the specific error can be identified, it may optionally be appended to the Table B-1 error text. The invalid text field can contain up to 256 characters.

Note. Some ATSUs may not include the error text from Table B-1 in the <invalid text> field of transmitted LRMs. Whilst this is acceptable in order to preserve backwards compatibility with existing systems, the preferred option is for the LRM <invalid text> field to at least contain the error text from Table B-1.

2.5.2.8 The following shows a number of LRM examples. Where more than one LRM format is shown, the format of the first one is the <u>preferred</u> option.

2.5.2.9 *Examples*

(i) (LRM-RMK/1/HEADER/INVALID SENDING UNIT)
<u>OR</u>
(LRM-RMK/1/ /INVALID SENDING UNIT)
(See Note following paragraph 2.5.2.6).

(ii) (LRM-RMK/17/16/INVALID AERODROME DESIGNATOR)
<u>OR</u>
(LRM-RMK/17/16/)
(See Note following paragraph 2.5.2.7).

(iii) (LRM-RMK/57//INVALID MESSAGE LENGTH)

(iv) (LRM-RMK/27/15/ INVALID LAT/LON 130S165E)
(The actual error “130S165E” may be optionally appended to the error text from Table B-1, see paragraph 2.5.2.7).

2.5.3 ASM (APPLICATION STATUS MONITOR)

2.5.3.1 *Purpose*

Sent to an adjacent centre to confirm that the adjacent centre’s ATC application system is online. It is transmitted when no other application messages have been received within an adaptable time.

The periodic interval between transmissions of this message should be determined based on the needs of the operational environment. Typical values may be between 5 and 30 minutes.

2.5.3.2 *Message Format*

ATS Field	Description
3	Message Type

2.5.3.3 *Example*

(ASM)

2.5.4 FAN (FANS APPLICATION MESSAGE)

2.5.4.1 *Purpose*

Transmitted by one ATSU (*generally* the controlling ATSU) to another ATSU (*generally* the receiving ATSU) to provide the required information necessary to establish CPDLC and/or ADS-C connections with a FANS equipped aircraft.

2.5.4.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
16	Destination aerodrome
Text	Application data as described below

2.5.4.2.1 Receipt or transmission of a FAN message does not change the Coordination state of the flight.

2.5.4.3 *Application data field*

Application data is a free text field used in the FAN message to permit the transfer of FANS logon information from one ATSU to another. This field contains a number of elements which are described below. Each element consists of an “identifier” and a value which are separated by a “/” character. The abbreviation used for the identifier corresponds to the associated ICAO abbreviation (where one exists); otherwise the three character MTI (Message Type Identifier) contained in the logon is used (refer to ARINC 622 for a listing of various MTIs).

2.5.4.3.1 The order of the elements within the FAN message is the order that they are listed below, with consecutive elements being separated by a single <space> character. Although some elements within the Application data field may be "optional", they should be included if the corresponding data is available (i.e. if the ATSU transmitting the FAN message has received this information either from a logon or a FAN message). This is for the benefit of downstream ATSUs that may use the information within these optional elements. If data is not available for an optional element, that element is not to be included in the FAN message.

2.5.4.3.2 Additional information concerning the elements described below is contained in Appendix D.

2.5.4.4 *Standard message identifier (SMI)*

This mandatory element is preceded by the identifier 'SMI', and contains information relating to the address to which uplink messages are routed to in the avionics. The value of the SMI sent in the FAN message is the downlink SMI as it was received in either the most recently received logon or FAN message.

- Allowable values for the SMI are listed in ARINC 620. Examples of SMIs include "FML", "FMR", "FMD", "FM3" and "AFD".

Example
SMI/FMD

2.5.4.5 *Aircraft identification*

This mandatory element is preceded by the identifier 'FMH', and contains the aircraft identification as it was received in either the most recently received logon or FAN message.

Example
FMH/MAS123

2.5.4.6 *Aircraft registration*

This mandatory element is preceded by the identifier 'REG', and contains the registration details of the aircraft – including the hyphen if applicable - as it was received in either the most recently received logon or FAN message.

Examples

(i) REG/N12345
(ii) REG/9V-ABC

2.5.4.7 *Aircraft Address (ICAO 24 bit code)*

This optional element is preceded by the identifier 'CODE', and contains the six character hexadecimal translation of the 24 bit aircraft address as it was received in either the most recently received logon or FAN message.

Example

CODE/ABC123

2.5.4.8 *Aircraft position information*

This optional element is preceded by the identifier 'FPO', and contains the position of the aircraft as determined by the ATSU at the time of transmission of the FAN message, if this information is available. The position of the aircraft is expressed as a latitude/longitude in either dd[NS]ddd[EW] or ddmm[NS]dddmm[EW] format.

Examples

(i) FPO/23S150E
(ii) FPO/0823N11025E

2.5.4.9 *ATS Application and Version Number*

There will usually be multiple elements associated with the ATS Application and Version number (i.e. CPDLC and ADS-C). Occurrences of this element are preceded by the identifier 'FCO', which describes the ATS data link application(s) available in the avionics, as they were received in a logon or a previously received FAN message. The FAN message must include at least one ATS data link application - a separate identifier is used for each available application. These elements may be transmitted in any order.

2.5.4.9.1 The value associated with the FCO identifier consists of three letters to describe the application name immediately followed by (i.e. with no intervening spaces) two numeric characters to represent the associated version number. Possible values for the 3 letters are "ATC" (for CPDLC) or "ADS" (for ADS-C), and the possible range of version numbers is 01 to 99.

Examples

(i) FCO/ATC01 FCO/ADS01
(ii) FCO/ADS01

2.5.4.9.2 The second example illustrates a FAN message with the ADS-C application only. This may be either because the aircraft is not CPDLC equipped, or because the FAN is being used with an adjacent ATSU to enable monitoring using ADS-C by that ATSU when the aircraft is only entering the ACI.

2.5.4.10 *Examples*

(i) (FAN-QFA43-YSSY-NZAA-SMI/AFD FMH/QFA43 REG/VH-OJA FPO/34S158E FCO/ATC01 FCO/ADS01)

(ii) (FAN-ANZ123-NZAA-KLAX-SMI/FML FMH/ANZ123 REG/ZK-NJP FCO/ADS01)

(iii) (FAN-SIA221-WSSS-YSSY-SMI/FMD FMH/SIA221 REG/9M-MRP CODE/A254B3 FPO/1214S11223E FCO/ATC01 FCO/ADS01)

2.5.4.11 ATSUs should ensure that at least two of the ACID, REG, or CODE fields are used to ensure that the logon information contained in the FAN message is associated with the correct flight data record.

Note 1. If the FAN message contains information for the purpose of the next unit establishing a CPDLC connection, it should not be sent until after an appropriate CPDLC Next Data Authority message (NDA) has been transmitted to the aircraft, allowing a reasonable time for delivery of the NDA message.

Note 2. Where an aircraft enters an adjacent ATSU's ACI but does not actually enter the ATSU's airspace and a FAN message is sent to the adjacent ATSU to enable monitoring using ADS-C then the FCO identifier for the CPDLC application should not be included.

2.5.5 FCN (FANS COMPLETION NOTIFICATION)

2.5.5.1 *Purpose*

The FCN may be transmitted by either the transferring or receiving ATSU to provide information concerning the CPDLC Connection status of the aircraft. It is transmitted by the transferring ATSU when their CPDLC Connection with the aircraft is terminated, providing notification to the receiving ATSU that they are the CPDLC Current Data Authority. It may also be transmitted by the receiving ATSU to provide notification of the establishment of a CPDLC Connection or the failure of a CPDLC Connection request.

2.5.5.1.1 Receipt or transmission of an FCN message does not change the Coordination state of the flight.

2.5.5.1.2 An FCN transmitted by the receiving ATSU may also (optionally) include contact/monitor frequency information to be issued to the aircraft by the transferring ATSU.

2.5.5.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft identification
13	Departure aerodrome
16	Destination aerodrome
Text	Communication Status as described below

2.5.5.3 *Communication Status field*

Communication Status is a free text field used in the FCN message to permit the transfer of CPDLC Connection status and (optionally) frequency information from one ATSU to another. This field may contain a number of elements which are described below. Each element consists of an “identifier” and a value which are separated by a “/” character. Separate elements are separated by a single <space> character.

2.5.5.4 *CPDLC Connection Status identifier (CPD)*

2.5.5.4.1 This mandatory element is preceded by the identifier “CPD”, and contains a single integer value which is used to provide information concerning an aircraft’s CPDLC Connection status. The value to be included in the CPDLC Connection Status field is determined from the following table.

CPDLC Connection Status		**Meaning**
FCN sent by transferring ATSU	**FCN sent by receiving ATSU**	
0		The CPDLC Connection with the aircraft has been terminated
	0	No CPDLC Connection could be established with the aircraft
	1	The CPDLC Connection Request failed due to the receiving ATSU not being the nominated CPDLC Next Data Authority
	2	A CPDLC Connection has been established with the aircraft

2.5.5.6 *Frequency identifier (FREQ)*

2.5.5.6.1 This optional element is preceded by the identifier “FREQ”, and may be included in an FCN message transmitted by the receiving ATSU to advise of any changes to a previously notified (or a default) frequency. The FREQ/ identifier provides advice to the transferring ATSU of the voice frequency to be transmitted to the aircraft in the CPDLC Contact/Monitor instruction. If no frequency information is to be transmitted this element should not be included in the FCN message.

2.5.5.6.3 When transmitted in the FCN message, the frequency variable does not contain units, spaces or leading zeroes. It may be up to 7 characters in length, containing integers or a decimal point selected from the frequency range below.

	Range	**Units**
HF	2850 to 28000	kHz
VHF	117.975 to 137.000	MHz
UHF	225.000 to 399.975	MHz

2.5.5.7 *Examples*

2.5.5.7.1 FCN transmitted by receiving ATSU:

(i) (FCN-SIA221-YSSY-WSSS-CPD/0)
The CPDLC Connection request for SIA221 failed

(ii) (FCN-ANZ15-KLAX-NZAA-CPD/2 FREQ/13261)
The CPDLC Connection request for ANZ15 was successful. Contact/Monitor voice frequency is 13261

2.5.5.7.2 FCN transmitted by transferring ATSU:

(i) (FCN-QFA43-YSSY-NZAA-CPD/0)
The CPDLC Connection with QFA43 has been terminated

2.6 Surveillance Data Transfer Service Messages

2.6.1 ADS (SURVEILLANCE ADS-C)

2.6.1.1 *Purpose*

Used to transfer information contained in an ADS-C report from one ATSU to another.

2.6.1.2 *Message Format*

ATS Field	Description
3	Message type
7	Aircraft Identification
13	Departure Aerodrome
16	Destination Aerodrome
Text	ADS-C Data

2.6.1.3 *ADS-C data field*

ADS-C data is a free text field used in the ADS message to permit the transfer of information contained in an ADS-C report from one ATSU to another. The data field consists of an identifier (“ADS”) followed by a delimiter “/” character, followed by a text string containing specific text extracted from the encoded ACARS ADS-C report received from the aircraft.

2.6.1.3.1 The data field may also be used to indicate that no further ADS messages will be sent to the receiving ATSU for the flight. To indicate this state the ADS identifier is followed by a delimiter “/” character, followed by a “0” (zero). The trigger would be by bilateral agreement (e.g. an ADS-C report has been received that places the aircraft outside the ACI and the predicted route group indicates that the aircraft will not re-enter the ACI).

2.6.1.3.2 The specific text to be included in the AIDC ADS message is described in Appendix D – *Implementation Guidance Material.*

2.6.1.4 *Examples*

(i) (ADS-ANZ90-RJAA-NZAA-ADS/.ZK-OKC030007FF946B6F6DC8FC044
B9D0DFC013B80DA88FC0A64F9E4438B4AC8FC000E34D0EDC0001014
0F3E86)

(ii) (ADS-ANZ90-RJAA-NZAA-ADS/0)

Table A-2. ASIA/PAC Core Messages

CORE	OPT	MESSAGE	MESSAGE ACRONYM	ICAO FIELDS											NON-ICAO FIELD
				3	7	8	9	10	13	14	15	16	18	22	
X		Advance Boundary Information	ABI	X	X				X	X		X		X 8, 9, 10, 15, 18, Text	
X		Current Flight Plan	CPL	X	X	X	X	X	X	X	X	X	X		
X		Coordination Estimate	EST	X	X				X	X		X			
X		Coordination Cancellation	MAC	X	X				X			X		X 14,18	
	X	PreActivation	PAC	X	X				X	X		X		X 8,9,10,15,18	
X		Coordination	CDN	X	X				X			X		X 10,14,15,18, Text	
X		Acceptance	ACP	X	X				X			X			
X		Rejection	REJ	X	X				X			X			
	X	Track Update	TRU	X	X				X			X			X
X		Transfer of Control	TOC	X	X				X			X			
X		Assumption of Control	AOC	X	X				X			X			

CORE	OPT	MESSAGE	MESSAGE ACRONYM	ICAO FIELDS											NON-ICAO FIELD
				3	7	8	9	10	13	14	15	16	18	22	
X		Emergency	EMG	X	X								X		
X		Miscellaneous	MIS	X	X								X		
	X	Track Definition Message	TDM	X											X
X		Logical Acknowledgment Message	LAM	X											
X		Logical Rejection Message	LRM	X									X		
	X	Application Status Monitor	ASM	X											
	X	FANS Application Message	FAN	X	X				X			X			X
	X	FANS Completion Notification	FCN	X	X				X			X			X
	X	Surveillance ADS-C	ADS	X	X				X			X			X

APPENDIX B - ERROR CODES

1. INTRODUCTION

1.1 A set of error codes has been developed for those messages contained in the ASIA/PAC AIDC message set. A list of the codes, associated field number and error text is contained in the table below. This information is for the inclusion in any Logical Rejection Message transmitted in response to the reception of an AIDC message containing an error.

Table B-1. Error Codes

Error Code	Field Number	Error Text
1	HEADER	INVALID SENDING UNIT (e.g., AFTN Address)
2	HEADER	INVALID RECEIVING UNIT (e.g., AFTN Address)
3	HEADER	INVALID TIME STAMP
4	HEADER	INVALID MESSAGE ID
5	HEADER	INVALID REFERENCE ID
6	7	INVALID ACID
7	7	DUPLICATE ACID
8	7	UNKNOWN FUNCTIONAL ADDRESS
9	7	INVALID SSR MODE
10	7	INVALID SSR CODE
11	8	INVALID FLIGHT RULES
12	8	INVALID FLIGHT TYPE
13	9	INVALID AIRCRAFT MODEL
14	9	INVALID WAKE TURBULENCE CATEGORY
15	10	INVALID CNS EQUIPMENT DESIGNATOR
16	10	INVALID SSR EQUIPMENT DESIGNATOR
17	13, 16, 17	INVALID AERODROME DESIGNATOR
18	13	INVALID DEPARTURE AERODROME
19	16	INVALID DESTINATION AERODROME
20	17	INVALID ARRIVAL AERODROME
21	13, 16, 17	EXPECTED TIME DESIGNATOR NOT FOUND
22	13, 16. 17	TIME DESIGNATOR PRESENT WHEN NOT EXPECTED
23	13, 14, 16, 17	INVALID TIME DESIGNATOR
24	13, 14, 16, 17	MISSING TIME DESIGNATOR
25	14	INVALID BOUNDARY POINT DESIGNATOR
26	14, 15	INVALID ENROUTE POINT
27	14, 15	INVALID LAT/LON DESIGNATOR

Error Code	Field Number	Error Text
28	14, 15	INVALID NAVAID FIX
29	14, 15	INVALID LEVEL DESIGNATOR
30	14, 15	MISSING LEVEL DESIGNATOR
31	14	INVALID SUPPLEMENTARY CROSSING DATA
32	14	INVALID SUPPLEMENTARY CROSSING LEVEL
33	14	MISSING SUPPLEMENTARY CROSSING LEVEL
34	14	INVALID CROSSING CONDITION
35	14	MISSING CROSSING CONDITION
36	15	INVALID SPEED/LEVEL DESIGNATOR
37	15	MISSING SPEED/LEVEL DESIGNATOR
38	15	INVALID SPEED DESIGNATOR
39	15	MISSING SPEED DESIGNATOR
40	15	INVALID ROUTE ELEMENT DESIGNATOR
41	15	INVALID ATS ROUTE/SIGNIFICANT POINT DESIGNATOR
42	15	INVALID ATS ROUTE DESIGNATOR
43	15	INVALID SIGNIFICANT POINT DESIGNATOR
44	15	FLIGHT RULES INDICATOR DOES NOT FOLLOW SIGNIFICANT POINT
45	15	ADDITIONAL DATA FOLLOWS TRUNCATION INDICATOR
46	15	INCORRECT CRUISE CLIMB FORMAT
47	15	CONFLICTING DIRECTION
48	18	INVALID OTHER INFORMATION ELEMENT
49	19	INVALID SUPPLEMENTARY INFORMATION ELEMENT
50	22	INVALID AMENDMENT FIELD DATA
51		MISSING FIELD nn (See Note 2)
52		MORE THAN ONE FIELD MISSING
53		MESSAGE LOGICALLY TOO LONG
54		SYNTAX ERROR IN FIELD nn (See Note 2)
55		INVALID MESSAGE LENGTH
56		TDM ERROR
57		INVALID MESSAGE
58		MISSING PARENTHESIS
59		MESSAGE NOT APPLICABLE TO zzzz OAC
60	3	INVALID MESSAGE MNEMONIC (i.e., 3 LETTER IDENTIFIER)

Error Code	Field Number	Error Text
61	HEADER	INVALID CRC
62		UNDEFINED ERROR
63		MSG SEQUENCE ERROR: ABI IGNORED
64		MSG SEQUENCE ERROR: INITIAL COORDINATION NOT PERFORMED
65		MSG SEQUENCE ERROR: EXPECTING MSG xxx; RECEIVED MSG yyy (See Note 2)
66	14	INVALID BLOCK LEVEL
67	14	INVALID OFF-TRACK CLEARANCE TYPE
68	14	INVALID OFF-TRACK DIRECTION
69	14	INVALID OFF-TRACK DISTANCE
70	14	INVALID MACH NUMBER QUALIFIER
71	14	INVALID MACH NUMBER
72	ADF (See Note 3)	INVALID IDENTIFIER
73	ADF (See Note 3)	INVALID SMI
74	ADF (See Note 3)	INVALID ACID IN FMH/ IDENTIFIER
75	ADF (See Note 3)	INVALID REGISTRATION IN REG/ IDENTIFIER
76	ADF (See Note 3)	INVALID AIRCRAFT ADDRESS IN CODE/ IDENTIFIER
77	ADF (See Note 3)	INVALID LOCATION IN FPO/ IDENTIFIER
78	ADF (See Note 3)	INVALID DATA LINK APPLICATION IN FCO/ IDENTIFIER
79	ADF (See Note 3)	INVALID OR UNSUPPORTED CPDLC VERSION NUMBER
80	ADF (See Note 3)	INVALID OR UNSUPPORTED ADS-C VERSION NUMBER
81	ADF (See Note 3)	INVALID IDENTIFIER IN FAN MESSAGE
82	CSF (See Note 4)	INVALID CPDLC CONNECTION STATUS
83	CSF (See Note 4)	INVALID FREQUENCY IN FREQ/ IDENTIFIER
84	ADF (See Note 5)	INVALID IDENTIFIER IN ADS MESSAGE
85	ADF (See Note 5)	INVALID DATA IN ADS MESSAGE **Note.** This error message refers to the encoded ADS-C data (e.g. if it contains non-hexadecimal characters), rather than whether the contents of the decoded ADS-C report itself are valid.
86	TDF (See Note 6)	INVALID IDENTIFIER IN TRU MESSAGE
87	TDF (See Note 6)	INVALID HEADING IN HDG/ IDENTIFIER
88	TDF (See Note 6)	INVALID POSITION IN DCT/ IDENTIFIER
89	TDF (See Note 6)	INVALID OFF TRACK DEVIATION IN OTD/ IDENTIFIER
90	TDF (See Note 6)	INVALID FLIGHT LEVEL IN CFL/ IDENTIFIER
91	TDF (See Note 6)	INVALID SPEED IN SPD/ IDENTIFIER
92-256		RESERVED FOR FUTURE USE

Note 1. It is not intended that any amplifying text contained in parenthesis (i.e. "(e.g., AFTN Address)") within the error text column be transmitted in any LRM.

Note 2. The intention is that in error codes 51, 54, 59 and 65 that lower case text (e.g. "nn", or "xxx") is replaced by the applicable value when this information is available.

Note 3. In the FAN message, the "ADF" field number refers to the Application data field

Note 4. In the FCN message, the "CSF" field number refers to the Communication Status field

Note 5. In the ADS message, the "ADF" field number refers to the ADS-C data field

Note 6. In the TRU message, the "TDF" field number refers to the Track data field

APPENDIX C - ATM APPLICATION NAMING CONVENTIONS

1. Eight character AFTN addresses will be used by the ASIA/PAC AIDC application to identify automated ATS end-systems. The first four characters identify the ATS unit location, while the last four characters identify an organization, end-system, or application process at the given location.

2. The table below describes a proposed naming convention, developed by the ATN Panel, for identifying ATM end-systems and applications. The last (eighth) character of the end-system's or application's AFTN address should be selected in accordance with the table.

8th character	**ATM ground system application process**
A	Air space management
B	Unassigned
C	Unassigned
D	Dynamic track generation
E	Unassigned
F	Flight data processing (processor routes to appropriate control sector based on internal configuration information.)
G	Reserved for State use
H	Reserved for State use
I	Reserved for State use
J	Reserved for State use
K	Reserved for State use
L	Reserved for State use
M	OPMET data bank
N	AIS data bank
O	Oceanic data processing
P	Unassigned
Q	Unassigned
R	Radar data processing (processor routes to appropriate control sector based on internal configuration information.)
S	System management
T	Air traffic flow management
U	Unassigned
V	Unassigned
W	Unassigned
X	Default value
Y	Service function
Z	Unassigned

APPENDIX D - IMPLEMENTATION GUIDANCE MATERIAL

1. INTRODUCTION

1.1 The AIDC Message set described in Appendix A of the ASIA/PAC Regional Interface Control Document (ICD) for ATS Interfacility Data Communications supports six ATS-related functions:

1. Notification;
2. Coordination;
3. Transfer of Control;
4. General (Text) Information Interchange;
5. Surveillance Data Transfer; and
6. Application Management.

1.2 This appendix contains Implementation Guidance Material (IGM) of an explanatory nature. Information on how the message set as a whole is intended to be used is provided, with particular emphasis on the first three functions. The objective is to provide useful information and guidance to software engineers responsible for implementing the ASIA/PAC AIDC Message set within an automated ATS system.

1.3 Although outside the scope of the ICD, Flight Planning messages play an important role within the region, and will continue to do so in the future.

2. PRELIMINARIES

2.1 Assumptions

2.1.1 The following assumptions have been made:

a) The IGM applies only to those portions of a flight operating within the ASIA/PAC Regions;

b) The material described below applies only to data transfers between two automated ATS systems. Though most of it also applies to the general case of Notification and Coordination between more than two automated ATS systems, certain multi-ATSU Coordination problems have not yet been solved;

c) It must be possible to revert to manual intervention of the Notification, Coordination, and Transfer of Control processes at any time;

d) Exceptional conditions, such as loss of communications between two ATSUs, are not addressed and are subject to local procedures; and

e) An ATSU's Area of Common Interest (ACI) is defined as the airspace for which the ATSU is responsible, i.e., an FIR, and surrounding border regions just outside the FIR. These surrounding border regions are usually determined by the required separation minima.

2.2 AFTN Message Header

2.2.1 Every message transmitted shall contain an AFTN header, as specified in Part II of the ASIA/PAC ICD. This header shall contain the optional AFTN data fields described in Part II of the ASIA/PAC ICD.

2.2.2 Message identifier numbers (AFTN optional data field 2) shall be sequential. Receipt of an out of sequence message shall result in a warning being issued.

2.2.3 A check for duplicate message identifier numbers shall be made. In general, since 1,000,000 numbers are available, no duplicates should be present.

2.2.4 Message identifier numbers shall begin at 0, proceed through 999,999, and then rollover to 0. The same sequence shall be repeated when necessary.

2.2.5 Each unique ATSU-to-ATSU interface shall select message identifier numbers from its own pool of numbers. Each pool shall encompass the entire possible range, i.e., include all numbers from 0 to 999,999.

2.3 **Response Messages**

2.3.1 **Application Response**

2.3.1.1 Every ASIA/PAC AIDC message received by an ATSU, except a LAM or LRM, shall be responded to with a LAM or LRM. While no LAM is generated for a valid LRM, an ATSU may choose to respond to an invalid LRM with an LRM. Such a response is termed an Application Response, and is generated automatically by the automation system. A LAM shall be transmitted when the receiving automation system found the received message to be syntactically correct and the message data was accepted for further processing or presentation. Otherwise, an LRM message shall be transmitted.

2.3.1.2 The timeout value T_{alarm} associated with an application response shall be 180 seconds, corresponding to the nominal value associated with the accountability timer described in Part II, Section 2.2.2.

2.3.1.3 Failure to receive an expected application response (i.e. a LAM or LRM) within T_r seconds ($\leq T_{alarm}$) shall result in a re-transmission (up to a maximum number N_r) of the original message, using the same information contained in optional data fields 2 and 3 found in the original message header. The timeout timer T_r shall be reset upon re-transmission. Failure to receive an application response within T_{alarm} seconds from the original transmission of the message shall result in a warning being issued.

2.3.1.4 The transmission of a LAM or LRM shall be triggered by the ATC application process, not the communications process. This is because an application response indicates that the received message was examined by the ATC application process(s), not just the communications functions. Note the distinction between an ATC application process, which implements a critical ATC function such as Coordination or Transfer of Control, and a communications process, which is responsible for the reliable delivery of data, but not data interpretation. This approach conforms to the OSI Reference Model.

2.3.1.5 Receipt of an LRM shall cause the receiving ATSU to take a corrective action before re-transmitting the message. This action may be automatic, as in a CRC error being indicated, or manual, as in an incorrect route element format. Once this action has been taken, the message shall be re-transmitted with a new message identifier number.

2.3.2. **Operational Response**

2.3.2.1 Several ASIA/PAC AIDC messages require a response, in addition to the normal application response, by another AIDC message. Such a response is termed an Operational Response. Table D-1 below indicates the required response to a received message. ASIA/PAC AIDC messages not listed in Table D-1 have no operational response.

Table D-1. Required Operational Response

Received Message	Required Operational Response
CPL	ACP or CDN
EST	ACP
PAC	ACP
CDN	ACP, CDN, or REJ
TOC	AOC

Note. An REJ is not available in an Initial Coordination Dialogue initiated by a CPL, EST or PAC. An REJ is only available in a CDN dialogue.

2.3.2.2 Failure to receive a response within an adapted operational response timeout period T_{op} shall result in a warning being issued.

2.3.2.3 The value of T_{op} is dependent on whether manual processing is required to generate the operational response. In general, T_{op} should be less than 600 seconds when a manual action is required to trigger the operational response.

2.3.2.4 An operational response shall employ the AFTN header optional data field 3 to reference the original message being responded to. A coordination dialogue, which is initiated by one message and contains a sequence of message exchanges, until terminated by an ACP or REJ shall always reference the original message which triggered the dialogue. For example, one ATSU may initiate a coordination dialogue by transmitting a CPL message to an adjacent ATSU. A sequence of CDN messages may ensue, terminated by an ACP message. The CDN and ACP messages would all reference the original CPL message. After completion of the initial coordination dialogue in the preceeding example one ATSU may initiate another coordination dialogue by transmitting a CDN message. A sequence of CDN messages may ensue, terminated by an ACP message, Messages in this new coordination dialogue would reference the first CDN message in the dialogue.

2.4 Application Management

2.4.1 The ASM message is used to confirm that the ATC application on the other end is on-line. This message is sent by ATSU A to (adjacent) ATSU B if, after a mutually agreed time, no communication has been received from ATSU B. ATSU B responds, if the ATC application is active and functioning, by sending a LAM to ATSU A. If ATSU A does not receive a response LAM from ATSU B within a specified time, local contingency procedures should be executed. This message would normally be sent automatically, but may be sent manually for testing purposes.

2.4.2 The FAN message may be used to transfer a data link aircraft’s logon information from one ATSU to another. Implementation of this message removes the need to utilise the five step “Address Forwarding” process (initiated by the FN_CAD) that was developed for the initial implementation of FANS. The message contains all the information that is required to establish ADS-C and/or CPDLC connections with the aircraft. In the event that only an ADS-C connection will be required, the transferring ATSU should include ADS-C information only. If a FAN message is transmitted containing ADS-C information only, there should be no expectation of receiving an FCN (see below) response. If a FAN message is received containing ADS-C Application information only, there should be no attempt to establish a CPDLC connection.

2.4.3 Normally, one FAN message would be sent for each data link transfer per flight. However, when a FCN is received with a communication status field value of (1) indicating the receiving ATSU is not the Next Data Authority, the transferring ATSU should send another NDA message to the aircraft and another FAN message to the receiving ATSU to indicate that the NDA has been sent (refer Figure D-4). While the second FAN may not be required for address forwarding purposes it does provide the receiving ATSU with a positive indication that another NDA has been sent to the aircraft.

2.4.4 ATSUs implementing the FAN message should consider retaining existing Address Forwarding functionality to be used as a contingency for data link transfers in the event of failure of the ground-ground link.

2.4.5 Similarly to Address Forwarding, the FAN message should be sent at a time parameter prior to the boundary with the next ATSU. This parameter should be in accordance with guidance outlined in the FANS Operations Manual (FOM). Functionality for the transmission of a FAN message manually by the ATS officer should also be implemented.

2.4.6 Information concerning the identity of the aircraft (i.e. aircraft identification, aircraft address and registration) contained in the Application data field must not be extracted from the flight plan – it must be information that was contained in either the most recently received logon or FAN message.

Note. This requirement only applies to the aircraft identification within the Application data field of the FAN message. The aircraft identification (i.e. ATS Field 7) at the beginning of the FAN message is the identification of the aircraft from the ATS flight plan.

2.4.6.1 When extracting the identity of the aircraft from the logon, the information required is the aircraft identification within the CRC protected portion of the logon – not the flight identifier (FI) that is contained in Line 4 of the ACARS logon message. In the example below, the aircraft identification is **QFA924**, rather than the QF0924 contained in Line 4 of the ACARS message.

QU BNECAYA
.QXSXMXS 010019
AFD
FI QF0924/AN VH-EBA
DT QXT POR1 010019 J59A
- AFN/FMH**QFA924**,.VH-EBA,,001902/FPOS33373E150484,
0/FCOADS,01/FCOATC,01292B

2.4.7 Under certain circumstances (e.g. FMC failure) it is possible for the SMI of an aircraft to change in flight, which will require a new logon from the aircraft to permit data link services to continue. To ensure that the next ATSU has up to date information, the SMI transmitted in any FAN message should be the SMI from the most recently received logon or FAN message.

2.4.8 A hyphen within the registration that was contained in either the logon or any previously received FAN message must also be included in the REG element of any transmitted FAN message. Without this hyphen, data link messages transmitted by the ATSU may not be delivered to the aircraft.

Note. ATSUs implementing the FAN message must be aware of the possible existence of this hyphen within the registration, and that it does not signify a "new field" as is the case with other AIDC messages.

2.4.8.1 Any "padding" in the registration in the logon (e.g. preceding periods < . >s) must <u>not</u> be included in the FAN message. In the sample ACARS message above, the registration to be included in the FAN message would be "VH-EBA", not ".VH-EBA".

2.4.9 Some ATSUs may utilise the aircraft position which is an optional field that may be contained in the logon. If the aircraft position information element is to be included in any transmitted FAN message, there is little purpose in simply relaying the aircraft position from the original logon – the calculated position of the aircraft should be used instead.

2.4.10 The FCN message, where used, provides advice to the transferring ATSU that the receiving ATSU has established an (inactive) CPDLC connection with an aircraft. The transmission of an FCN message is triggered by an event such as the termination of a CPDLC Connection by the transferring ATSU, or the establishment of (or failure to establish) a CPDLC Connection by the receiving ATSU. FCN messages should only be transmitted when a CPDLC transfer is being effected – i.e. not for transfers involving aircraft that are only ADS-C equipped.

2.4.11 *Multiple FCN messages*

2.4.11.1 The general philosophy for use of the FCN is that only a single FCN message is transmitted by each ATSU for each flight. Under normal conditions, changes in CPDLC status after transmission of an FCN should not result in the transmission of another FCN (an exception to this is when a Connection request fails due to the receiving unit not being the nominated next data authority – see Table below).

Table D-2. FCN Transmission

ATSU transmitting FCN	When an FCN should be sent
Transferring ATSU	On receipt of a Disconnect Request terminating the CPDLC Connection
Receiving ATSU	On receipt of a Connection Confirm, establishing a CPDLC Connection
Receiving ATSU	On receipt of CPDLC downlink #64 [*icaofacilitydesignation*], **Note.** This provides advice to the transferring ATSU to uplink an appropriate Next Data Authority message to the aircraft. And subsequently: On establishment of a CPDLC Connection
Receiving ATSU	Following initial failure of a CPDLC Connection request or a time parameter prior to the FIR boundary, if no CPDLC Connection has yet been established, whichever occurs later

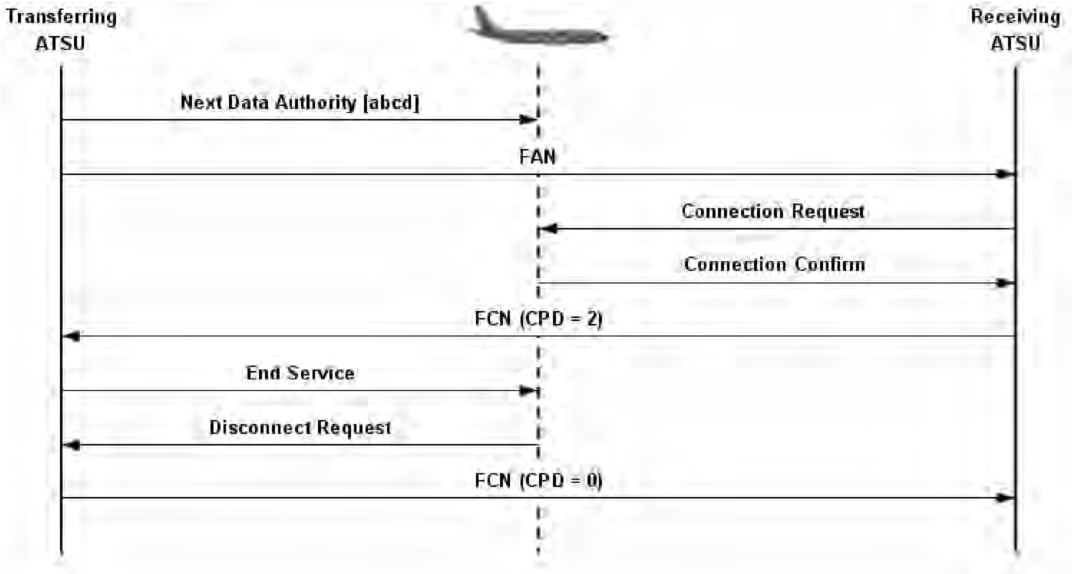
2.4.11.2 Procedures following a change to CPDLC Connectivity following the transmission of an FCN message should be described in local procedures (e.g. voice coordination), rather than by transmission of another FCN message.

2.4.12 Procedures for the notification of changes to the voice frequency after the transmission of an FCN message should be described in local procedures rather than via the transmission of another FCN message.

2.4.13 **Sample flight threads involving FAN and FCN messages**

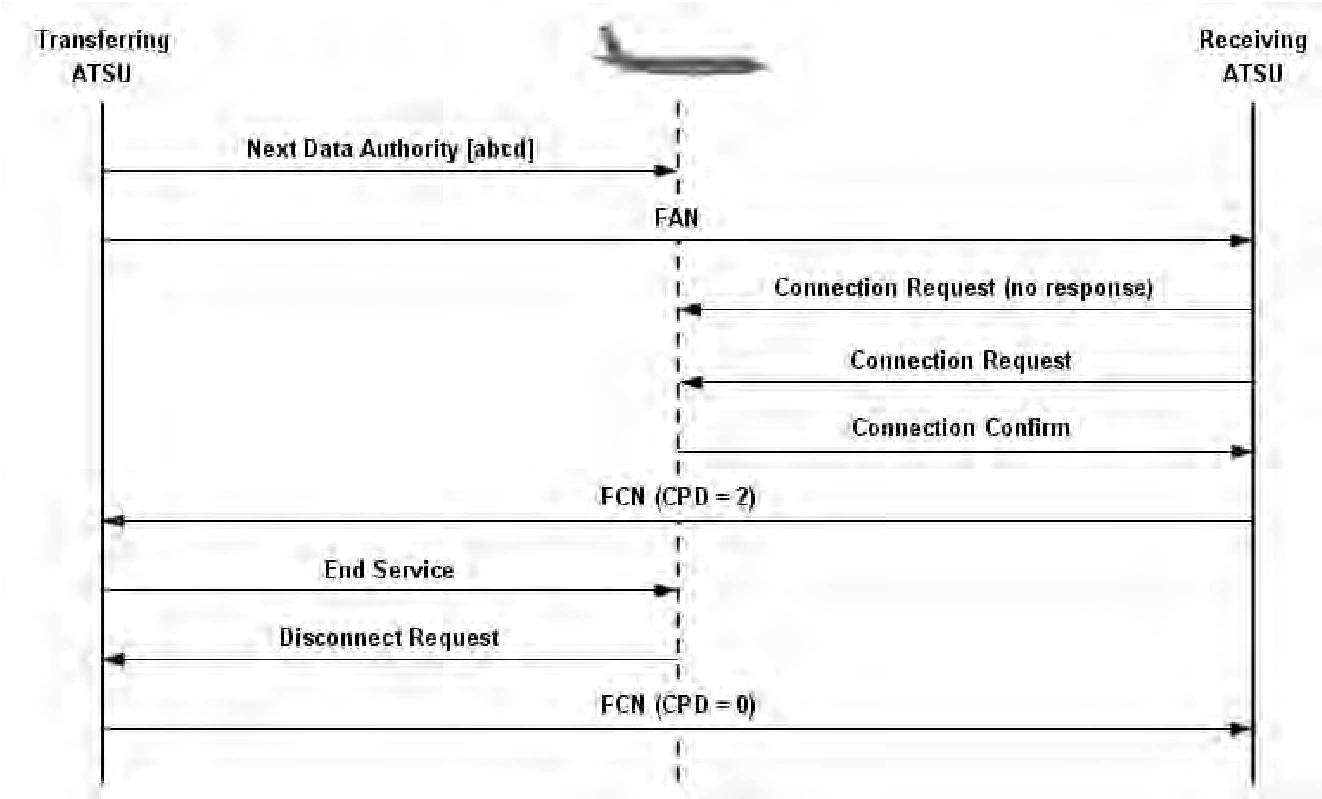
2.4.13.1 The following diagrams show typical flight threads involving the FAN and FCN messages. Relevant uplink and downlink messages between the aircraft and the ATSU are also shown.

Figure D-1. Routine data link Transfer using FAN and FCN messaging



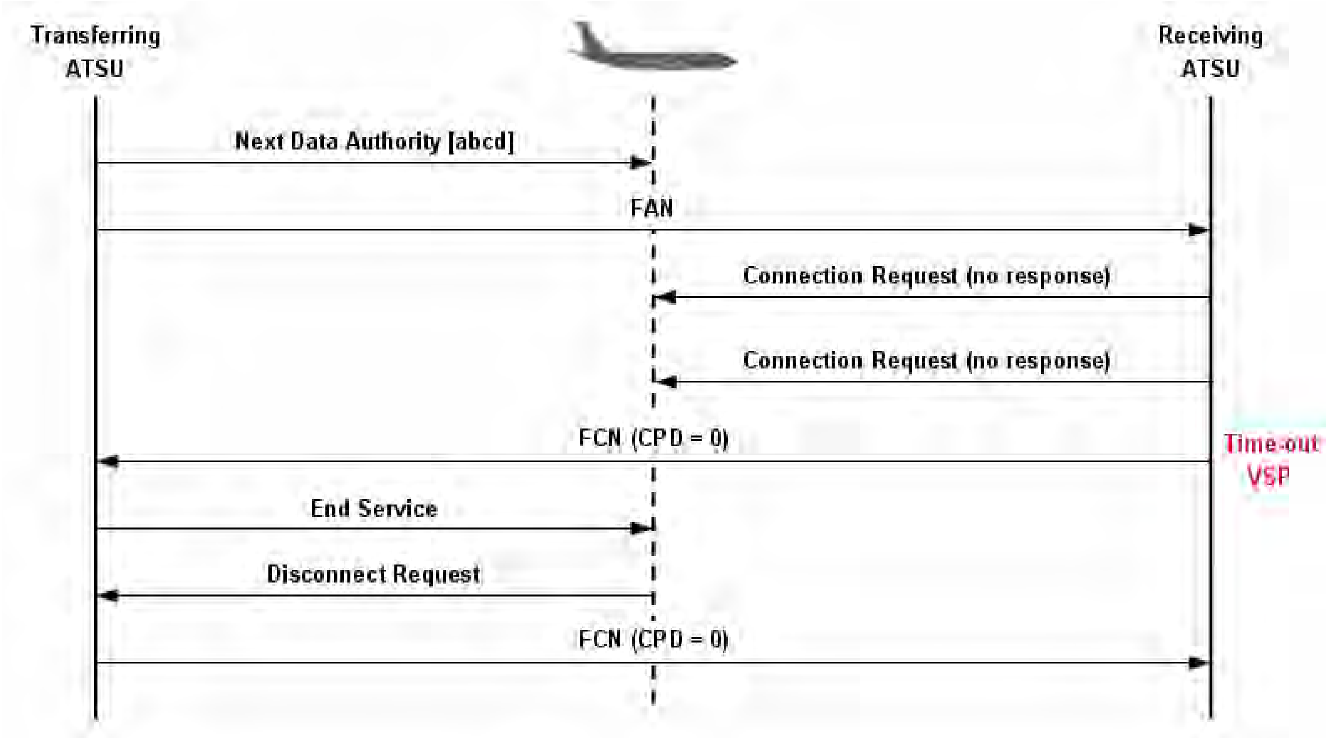
2.4.13.2 Figure D-1 shows a routine data link transfer from one ATSU to the next. The first step in the transfer process is the uplinking of a CPDLC Next Data Authority message to the aircraft advising the avionics of the next centre that will be communicating with the aircraft via CPDLC. A FAN message is then sent to the next ATSU to provide them with the aircraft's logon information. The receiving ATSU then successfully establishes a CPDLC connection with the aircraft and transmits a 'successful' FCN (CPD = 2) back to the transferring ATSU. On termination of the CPDLC Connection, the transferring ATSU transmits an FCN (CPD=0) to the receiving ATSU.

Figure D-2. CPDLC Transfer using FAN and FCN messaging – initial Connection Request failed



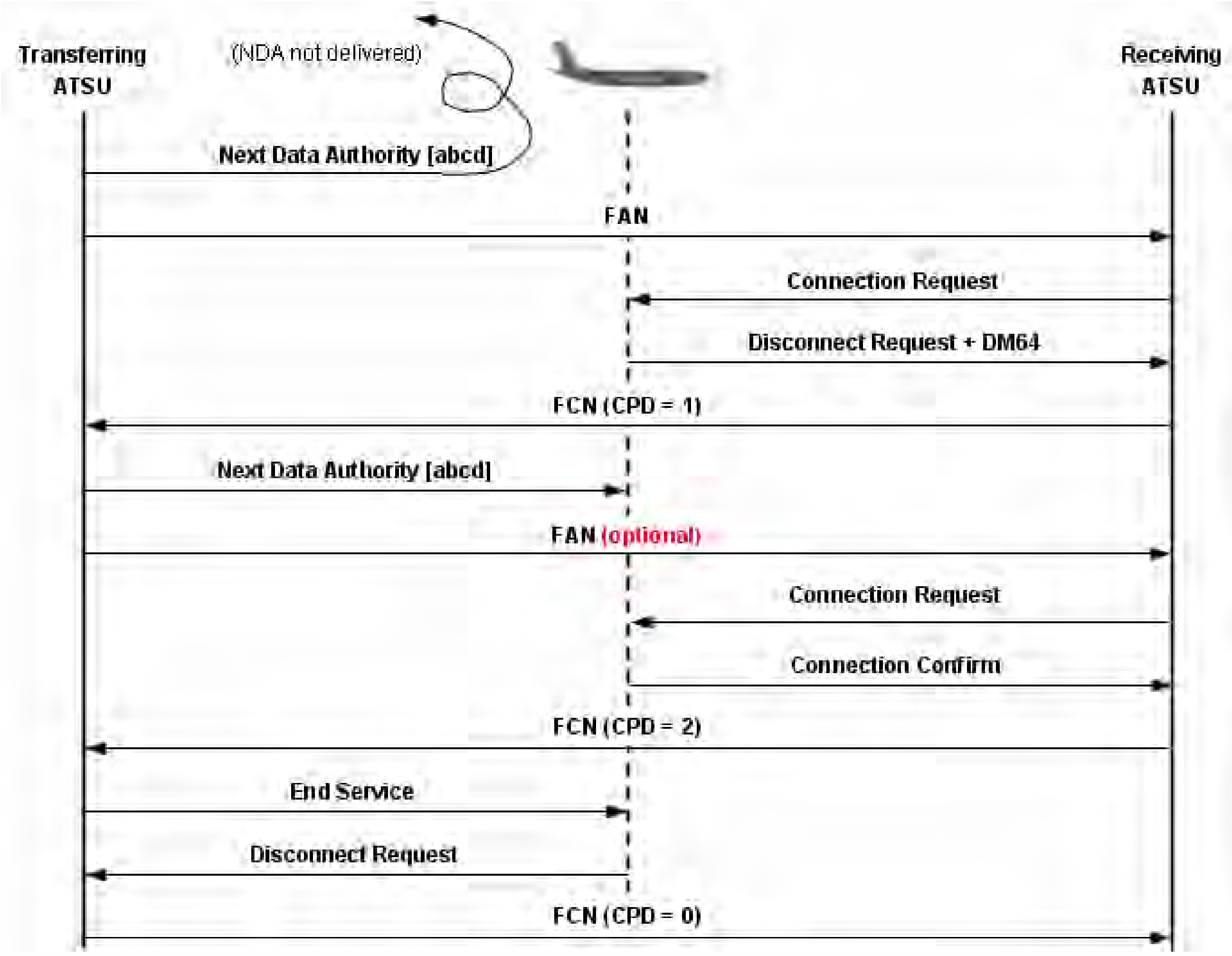
2.4.13.3 Figure D-2 shows a data link transfer where there is no response by the avionics to the initial Connection Request uplinked by the receiving ATSU. A subsequent Connection Request is uplinked to the aircraft which is successful. Because the CPDLC Connection is finally established prior to the 'time out' VSP before the FIR boundary, a successful FCN (CPD=2) is transmitted to the transferring ATSU. On termination of the CPDLC Connection, the transferring ATSU transmits an FCN (CPD=0) to the receiving ATSU.

Figure D-3. CPDLC Transfer using FAN and FCN messaging – Unable to establish CPDLC Connection



2.4.13.4 Figure D-3 shows an attempted data link transfer where there is no response by the avionics to multiple CPDLC Connection requests uplinked by the receiving ATSU before the ‘time out’ VSP prior to the FIR boundary. An unsuccessful FCN (CPD=0) is transmitted to the transferring ATSU. Letters of Agreement should describe the procedures to be followed in the event that the receiving ATSU establishes a CPDLC Connection after this FCN has been transmitted. Even though the receiving ATSU has advised of their inability to establish a CPDLC connection, the transferring ATSU still transmits an FCN (CPD=0) when their CPDLC Connection with the aircraft is terminated.

Figure D-4. CPDLC Transfer using FAN and FCN messaging – initial NDA not delivered



2.4.13.5 Figure D-4 shows a data link transfer in which the original Next Data Authority message uplinked by the transferring ATSU is not delivered to the aircraft. An FCN (CPD=1) is transmitted by the receiving ATSU advising of the failure of their CPDLC Connection request. Another Next Data Authority message is uplinked to the aircraft. The transferring ATSU may send another FAN message after which the receiving ATSU successfully establishes a CPDLC Connection. Because this occurs before the time out VSP prior to the FIR boundary, a successful FCN (CPD=2) is transmitted back to the transferring ATSU. On termination of the CPDLC Connection, the transferring ATSU transmits an FCN (CPD=0) to the receiving ATSU.

3. PHASES OF FLIGHT

3.0.1 From an ATSU's perspective, a flight is considered to progress through several phases. The IGM is principally concerned with three phases: Notification, Coordination, and Transfer of Control.

3.1 Notification Phase

3.1.1 An ATSU receives information during the Notification phase on a flight which will at some future time enter its ACI.

3.1.2 **Notification Dialogue**. ABI messages shall be used to transfer notification information. The sending ATSU transmits an ABI to the downstream ATSUs (D-ATSUs) (including the next Receiving ATSU - the R-ATSU) with which it must coordinate the flight. The sending ATSU is responsible for determining which D-ATSUs must be notified.

3.1.3 **Re-Route Notification**. All D-ATSUs to the destination aerodrome shall be notified when a re-route has been made. Re-route dissemination shall be performed as a minimum capability on a stepwise (i.e., from one D-ATSU to the next D-ATSU) basis. In stepwise dissemination, an ATSU receiving an ABI is responsible for passing it on to any other affected D-ATSUs at the appropriate time.

3.1.4 **Route to Destination**. The above procedure requires the C-ATSU to acquire the complete route to destination. Initially, this information is found in the route field of the Filed Flight Plan (FPL). As re-routes occur, the filed route must be updated by the C-ATSU, and transmitted to D-ATSUs. In cases where this is not possible, the route field shall be terminated after the last known significant point with the ICAO truncation indicator, which is the letter "T".

Note: In accordance with PANS-ATM Doc 4444 the truncation indicator shall only follow a significant point or significant point/Cruising Speed and Cruising level in Field 15 and shall not follow an ATS route designator.

3.1.5 **Re-route to new destination.** The procedures described below apply when the notification and coordination of amended destinations has been included in bilateral agreements.

3.1.5.1 If an amendment to the destination aerodrome occurs **prior to** the transmission of the first ABI to an adjacent ATSU:

- Field 16 shall contain the original destination of the aircraft;
- The Amended destination field shall contain the new destination of the aircraft.

3.1.5.2 Subsequent AIDC messages shall contain the new destination in Field 16, without reference to an amended destination.

3.1.5.3 If an amendment to the destination aerodrome occurs **after** the transmission of the first ABI to an adjacent ATSU, but before coordination has occurred, a new ABI shall be transmitted:

- Field 16 shall contain the original destination of the aircraft;
- The Amended destination field shall contain the new destination of the aircraft.

3.1.5.4 Subsequent AIDC messages shall contain the new destination in Field 16, without reference to an amended destination.

3.1.5.5 The format of the Amended destination field shall be one of the options described below:

- ICAO four-letter location indicator; or
- Name of the destination aerodrome, for aerodromes listed in Aeronautical Information Publications; or
- Latitude/longitude in the format dd[NS]ddd[EW] or ddmm[NS]dddmm[EW]; or
- Bearing and distance from a significant point, using the following format:
    - the identification of the significant point, followed by
    - the bearing from the significant point in the form of 3 figures giving degrees magnetic, followed by
    - the distance from the significant point in the form of 3 figures expressing nautical miles.

3.16 **Notification Cancellation**. A notification can be cancelled using a MAC message. Receipt of a MAC by an ATSU means that any notification data previously received for that flight is no longer relevant. Filed flight plan information (and any modifications) shall continue to be held, in accordance with local ATSU procedures.

3.2 Coordination Phase

3.2.1 Coordination between adjacent ATSUs occurs when the flight approaches a shared FIR boundary. An initial coordination dialogue can be automatically initiated a parameter time or distance from the boundary, as documented within a bi-lateral agreement, or it can also be manually initiated. There are several types of coordination dialogues which may occur, depending on where the aircraft is and what previous dialogues have occurred.

3.2.2 **Initial Coordination Dialogue**. This coordination dialogue (or an Abbreviated Initial Coordination dialogue) is always required to be successfully completed before later coordination dialogues are initiated. The C-ATSU transmits a CPL to the R-ATSU. The R-ATSU then responds with either an ACP, which signifies acceptance of the coordination conditions contained within the CPL, or a CDN which proposes a modification to the conditions contained in the CPL. If a CDN is the R-ATSU's response to the CPL, a sequence of CDNs may be exchanged between the two ATSUs. This dialogue is eventually terminated by the ATSU which last received a CDN transmitting an ACP to the other ATSU. Transmission of an ACP indicates that coordination conditions are mutually acceptable, and an initial coordination has been achieved.

3.2.3 **Abbreviated Initial Coordination Dialogue**. An Abbreviated Initial Coordination dialogue may be used in place of an Initial Coordination Dialogue when it is known *apriori* (e.g. by letters of agreement) that a flight's coordination data is mutually acceptable to both the C-ATSU and R-ATSU, accurate route information is available at the R-ATSU (e.g. from either an ABI or FPL message), and both ATSUs have agreed to permit the use of this dialogue. The C-ATSU transmits an EST or PAC to the R-ATSU. The R-ATSU then responds with an ACP, which signifies acceptance of the coordination conditions (i.e. boundary crossing data) contained within the EST or PAC. Either this dialogue or a full (i.e. CPL-based) Initial Coordination dialogue shall be successfully completed before any later coordination dialogues are initiated. Note that negotiation via CDNs is not permitted within this dialogue.

3.2.3.1 PAC is only used when coordination is required before departure. This normally only occurs when the FIR boundary is close to the departure airport. PAC signals to the R-ATSU that the departure is imminent as well as initiating coordination.

3.2.4 **Re-Negotiation Dialogue**. This is an optional dialogue used to propose new coordination conditions after the initial dialogue has been completed. Either ATSU may initiate this dialogue by transmitting a CDN (in contrast to a CPL in the Initial Coordination Dialogue) to the other ATSU. The dialogue then proceeds with an exchange of additional CDNs as necessary. Either ATSU may terminate the dialogue in one of two ways: (1) with an ACP, indicating that the coordination proposal contained in the latest CDN is acceptable; or (2) with an REJ, indicating that the previously agreed upon coordination conditions remain in effect.

3.2.5 **Active CDN**. For a given flight, only one CDN may be active between any pair of ATSUs. Note, however, that coordination between more than two ATSUs (for the same flight) may have a total number of active CDNs greater than one, though each pair of ATSUs is still restricted to a maximum of one active CDN per flight. In the exceptional (rare) case where a C-ATSU and D-ATSU both simultaneously transmit CDNs, the C-ATSU shall transmit an REJ to the D-ATSU, cancelling the D-ATSU's CDN.

3.2.6 **CDNs Are Proposals**. Note that CDNs are only proposals; no changes are made in a flight's profile until an ACP is sent and acknowledged.

3.2.6.1 To ensure interoperability between ATSUs, when using a CDN to propose a diversion to an alternative destination, the following procedures shall be used:

3.2.6.2 The mandatory Field 16 shall contain the original (i.e. the "current") destination aerodrome. The Amended Destination text field shall contain the amended destination.

3.2.6.3 The format of the Amended destination field shall be one of the options described below:

- ICAO four-letter location indicator; or
- Name of the destination aerodrome, for aerodromes listed in Aeronautical Information Publications; or
- Latitude/longitude in the format dd[NS]ddd[EW] or ddmm[NS]dddmm[EW]; or
- Bearing and distance from a significant point, using the following format:
  - the identification of the significant point, followed by
  - the bearing from the significant point in the form of 3 figures giving degrees magnetic, followed by
  - the distance from the significant point in the form of 3 figures expressing nautical miles.

3.2.6.4 The mandatory Field 16 contained in the operational response (ACP, REJ, CDN) to a CDN that proposes an amended destination shall contain the original (i.e. the "current") destination aerodrome.

Note: Due to the complexities involved with maintaining multiple profiles for "current destination" vs. "amended destination" ATSUs should consider prohibiting (via bilateral agreement) an operational response of CDN in any coordination renegotiation dialogues that contain an amended destination.

3.2.6.5 Provided that the proposed amendment is agreed to, all subsequent AIDC messages concerning this aircraft shall contain the new destination in the mandatory Field 16.

3.2.7 **Cleared Flight Profile Update**. The cleared flight profile (which is used for control purposes) shall only be updated after successful completion of a coordination dialogue, i.e., an ACP has been sent and acknowledged. This will require temporarily storing a proposed flight profile undergoing coordination separate from the cleared flight profile. The cleared flight profile shall then be updated using the newly coordinated profile upon successful completion of the coordination dialogue.

3.2.8 **Automatic update of coordination conditions**. When included in bilateral agreements between ATSUs, changes to previously agreed coordination conditions may be coordinated by way of a TRU message. The intent of this message is to allow amendments to certain elements of an aircraft's clearance to be coordinated to an adjacent ATSU. In contrast to the CDN, there is no operational response to a TRU message – this message is used when there is agreement to what amendments can be made to an aircraft's clearance by the controlling ATSU after initial coordination has occurred without prior coordination.

3.2.8.1 Whilst a number of the elements that may be coordinated by a TRU message may be more suited to an environment associated with an ATS Surveillance system (e.g. Heading, Direct to, etc), other elements may be applicable in *any* ATS environment (e.g. Cleared Flight Level, Off track deviation, Speed, etc).

3.2.8.2 The TRU message makes use of the Track data field to provide updated clearance information to an adjacent ATSU. Track data may be used to update assigned heading, assigned level, off track clearances, assigned speed or 'direct to' information.

3.2.8.3 When using the DCT/[position] element in the TRU message, [position] would normally be located on the flight planned route of the aircraft. Local procedures should specify the actions to be taken in the event that [position] is not on the flight planned route.

3.2.8.4 For the purpose of the TRU message, the format of [position] is one of the following:

- From 2 to 5 characters, being the coded designator assigned to an en-route point or aerodrome; or
- ddmm[NS]dddmm[EW]; or
- dd [NS]ddd[EW]; or
- 2 or 3 characters being the coded identification of a navigation aid, followed by 3 decimal numerics giving the bearing from the point in degrees magnetic followed by 3 decimal numerics giving the distance from the point in nautical miles.

3.2.9 **Coordination Cancellation**. Coordination can be cancelled using a MAC message. Receipt of a MAC by an ATSU means that any coordination (or notification) data previously received for that flight is no longer relevant. Filed flight plan information (and any modifications) shall continue to be held, in accordance with local ATSU procedures.

3.2.10 **Coordination and the ACI**. ATSU A may need to coordinate with or provide information to ATSU B on all aircraft that enter ACI B, even if they do not enter FIR B. Consider the case of aircraft A in FIR A and aircraft B in FIR B, both flying near the FIR A - FIR B boundary but never penetrating the other FIR's airspace. The maintenance of adequate separation between these two aircraft may require coordination between or the provision of information to adjoining ATSUs.

3.3 Transfer of Control Phase

3.3.1 **Transfer Dialogue**. This phase occurs when the C-ATSU is ready to relinquish control of the flight to the R-ATSU, normally just before the FIR boundary crossing. The C-ATSU transfers a TOC message to the R-ATSU, which responds with an AOC message. The R-ATSU then becomes the C-ATSU once an application response for the AOC has been received.

3.3.2 **Transfer of Control and the ACI**. Note that the Transfer of Control process will not occur for all flights. Some flights fly near an FIR boundary, and may require coordination or the provision of other information, but do not actually enter the FIR.

4. FLIGHT STATE TRANSITIONS

4.1 **Notifying States**. Consider an aircraft that is currently within an ASIA/PAC FIR - FIR A - controlled by ATSU A (i.e. the C-ATSU) progressing towards the next FIR, FIR B (i.e. the R-ATSU). The aircraft is several hours from the boundary between the two FIRs. The flight is initially in a Pre-Notifying state from ATSU B’s perspective. ATSU B usually will have previously received a Filed Flight Plan (an FPL message), possibly with later amendments (as contained in CHG messages). ATSU A will employ a Notification dialogue to transfer information to ATSU B. (This transfer occurs at either a system parameter time (e.g. 60 minutes) or distance prior to the flight crossing the FIR A - FIR B boundary.) This places the flight in a Notifying state from ATSU B’s perspective. Additional Notification dialogues may be invoked by ATSU A as needed to inform ATSU B of flight changes. If the aircraft for some reason, for example a change in route, is no longer expected to penetrate ACI B, ATSU A sends a MAC message to ATSU B, causing the flight to be placed back in a Pre-Notifying state from ATSU B's perspective.

4.2 **Initial Coordination States**. An Initial Coordination Dialogue is employed to effect the initial coordination. ATSU A transmits a CPL to ATSU B when the aircraft is at a mutually agreed upon predetermined time (e.g. thirty minutes) or distance from the FIR A - FIR B boundary. The flight is now in a Negotiating state from both ATSU A’s and ATSU B’s perspectives. ATSU B can accept the conditions specified in the CPL "as is" by transmitting an ACP message to ATSU A, or it can propose modifications using the CDN message. Negotiations between the two ATSUs are carried out using the CDN until a mutually acceptable flight profile is achieved. This acceptance is signalled by one ATSU sending an ACP, as before, to the other ATSU. This establishes the initial coordination conditions. From the perspective of both ATSUs the flight is now in a Coordinated state.

4.2.1 For an Abbreviated Initial Coordination, ATSU A transmits an EST to ATSU B when the aircraft is at a mutually agreed upon predetermined time (e.g. thirty minutes) or distance from FIR A - FIR B boundary. The flight is now in a Coordinating state. ATSU B responds with an ACP, which places the flight in a Coordinated state. This sequence of messages corresponds to an Abbreviated Initial Coordination Dialogue.

4.3 **Re-Negotiation States**. The initial coordination is typically the final coordination. However, in certain situations, it may be desirable, or necessary, to re-open the coordination dialogue after initial coordination has been completed. A Re-Negotiation dialogue is employed to effect profile changes. The dialogue is re-opened when one ATSU (either A or B) transmits a CDN to the other ATSU, causing the flight to be in a Re-Negotiating state. The dialogue proceeds as above using CDN messages until either an ACP or REJ is sent. Either ATSU can close the dialogue by issuing an ACP or REJ. An ACP closes the dialogue with a new, mutually agreed upon flight profile. An REJ, however, immediately terminates the dialogue with the previously accepted coordination conditions remaining in effect. Any proposed changes are null and void. Transmission of an ACP or REJ places the flight back into the Coordinated state.

4.4 **Transfer States**. Transfer of control is supported by the Transfer dialogue. ATSU A sends a TOC to ATSU B when the aircraft is about to cross the boundary. Alternatively, ATSU A can send a TOC when it is ready to relinquish control, even if the aircraft will remain in FIR A airspace several minutes before entering FIR B. The flight is now in a Transferring state from both ATSU A’s and ATSU B’s perspectives. ATSU B responds by transmitting an AOC to ATSU A, signalling acceptance of control responsibility. The flight is now in a Transferred state from ATSU A’s perspective.

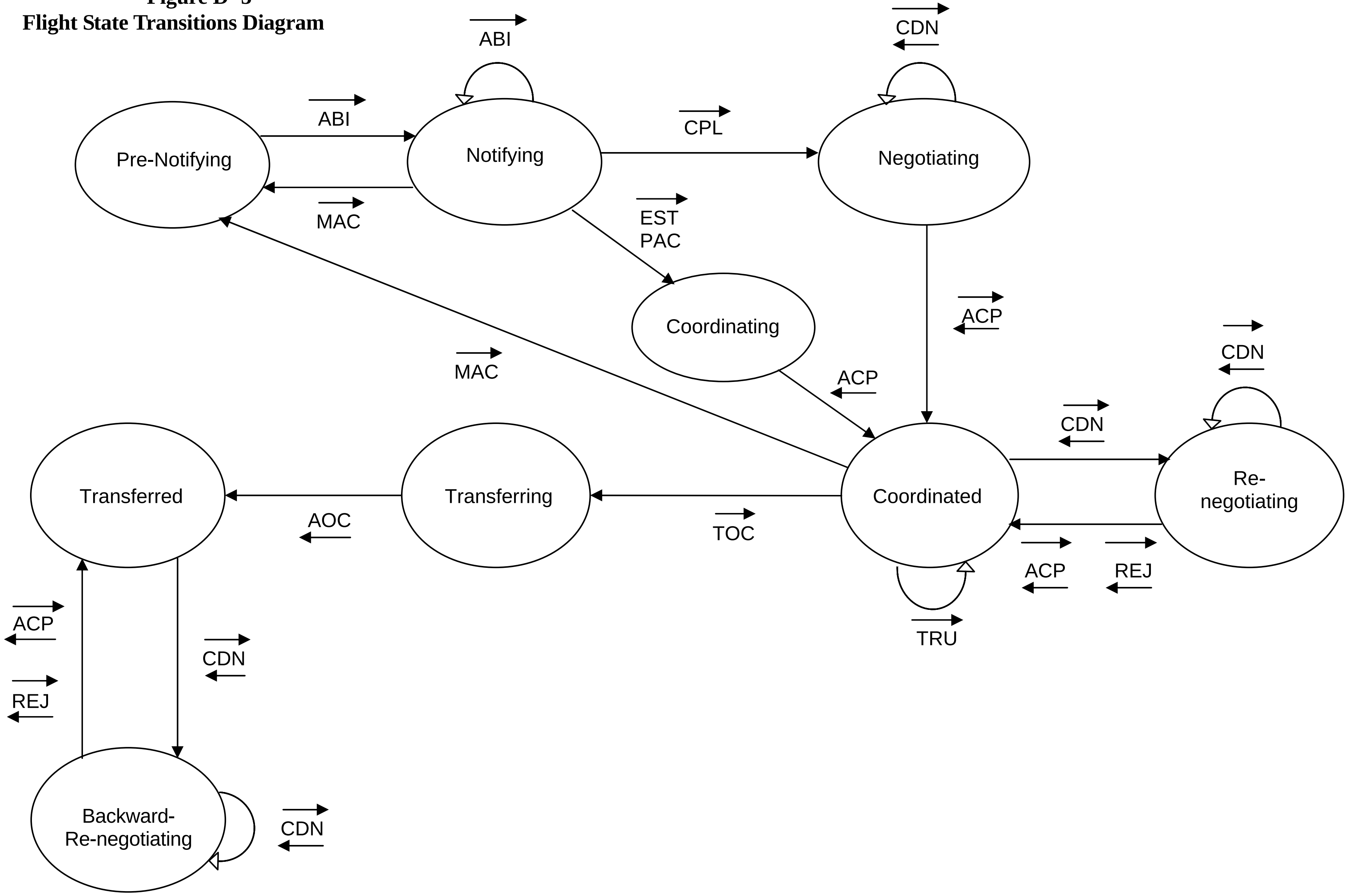
4.5 **Backward Re-Negotiating State**. A flight’s profile may occasionally require changes after Transfer of Control has been completed, but the aircraft is still within ATSU A’s ACI. A Re-Negotiating dialogue is employed to effect profile changes after transfer has been completed. This places the flight in a Backward Re-Negotiating State, from both ATSUs’ perspectives. Completion of this dialogue returns the aircraft to the Transferred state.

4.6 Several flight states are identified in the above discussion. These states are listed in Table D-3 below.

Table D-3 Flight States

Flight State	Description
Pre-Notifying	Flight plan information may have been received. Any previously received notification and coordination information for the given flight cancelled by a MAC is no longer relevant.
Notifying	The aircraft's progress is being monitored by one or more non-controlling ATSUs, in addition to the controlling ATSU.
Negotiating	Coordination data is being exchange between the controlling ATSU and the receiving ATSU as part of the initial coordination dialogue.
Coordinating	Abbreviated coordination data has been sent to the receiving ATSU.
Coordinated	Coordination of the boundary crossing conditions is completed.
Re-Negotiating	Coordination data is being exchange between the controlling ATSU and the receiving ATSU as part of a later coordination dialogue.
Transferring	Air traffic control responsibility for the aircraft is in the process of being transferred to the receiving ATSU.
Transferred	Air traffic control responsibility for the aircraft has been transferred to the receiving ATSU.
Backward- Re-Negotiating	The aircraft is now under the control of the receiving ATSU, but still near the boundary. Changes are being proposed to the coordination conditions while the aircraft is still in the vicinity of the boundary.

Figure D -5
Flight State Transitions Diagram



4.7 A flight state transition diagram is shown in Figure D-5. This diagram depicts graphically how the flight transitions from one state to the next. It can be seen that the ASIA/PAC AIDC messages act as triggers, forcing the necessary state transitions. A description of the allowable flight state transitions, along with the message event that triggers the transition, is given in Table D-4 below.

Table D-4 Flight State Transitions

State Transition	Message Trigger	Description
Pre-Notifying/ Notifying	ABI	An initial ABI begins the Notification phase.
Notifying/ Notifying	ABI	An ABI updates the information a downstream ATSU maintains on a flight that is expected to enter its ACI at some future time. This data can be sent hours in advance of the actual entry.
Notifying/ Pre-Notifying	MAC	A flight that was expected to enter a downstream ATSU's ACI will no longer do so.
Notifying/ Negotiating	CPL	A CPL is used to initiate the Coordination process for an aircraft that will enter the downstream ATSU's ACI. A CPL contains the current clearance to destination.
Notifying/ Coordinating	EST	An EST is used to initiate an Abbreviated Coordination process for an aircraft that will enter the downstream ATSU's ACI.
Notifying/ Coordinating	PAC	A PAC is used to initiate an Abbreviated Coordination process for an aircraft, not yet airborne, that will enter the downstream ATSU's ACI.
Negotiating/ Negotiating	CDN	If the downstream ATSU does not like the current clearance (and boundary crossing conditions), a Negotiation process is carried out using CDNs.
Negotiating/ Coordinated	ACP	The negotiation process is terminated when one ATSU signals its acceptance of the coordination conditions using an ACP.
Coordinating/ Coordinated	ACP	The Abbreviated Coordination dialogue is terminated by the receiving ATSU transmitting an ACP.
Coordinated/ Re-Negotiating	CDN	The coordination dialogue can be re-opened at any time after the initial coordination and before the initiation of the transfer of control procedure.
Re-Negotiating/ Re-Negotiating	CDN	Either ATSU may attempt to change the previously agreed upon coordination conditions any time after the initial coordination dialogue has been completed.
Re-Negotiating/ Coordinated	ACP REJ	An ACP terminates a re-negotiation dialogue, with a new mutually agreed upon profile in effect. An REJ immediately terminates the dialogue, with the coordination conditions remaining as previously agreed (which is usually, but not necessarily, the initial coordination conditions).
Coordinated/ Coordinated	TRU	A TRU may be sent by the controlling ATSU after the initial coordination dialogue has been completed to update previously agreed coordination conditions
Coordinated/ Transferring	TOC	A TOC is sent after Coordination occurs but (usually just) before the boundary is crossed to the accepting ATSU. The TOC informs the accepting ATSU that it now has control authority for the aircraft.
Coordinated/ Pre-Notifying	MAC	A flight that was expected to enter a downstream ATSU's ACI will no longer do so.
Transferring/ Transferred	AOC	The formerly downstream ATSU is now the controlling ATSU.

State Transition	Message Trigger	Description
Transferred/ Backward- Re-Negotiating	CDN	An attempt is made (by either the previous or new controlling ATSU) to change the coordination conditions while the aircraft is near the common boundary.
Backward- Re-Negotiating/ Backward- Re-Negotiating	CDN	Either ATSU may attempt to change the previously agreed upon coordination conditions any time after transfer of control has been completed, but while the aircraft remains in the common boundary region.
Backward- Re-Negotiating/ Transferred	ACP REJ	Similar to a Re-Negotiation/Coordinated state transition. An ACP terminates a backward coordination dialogue, with a new mutually agreed upon profile in effect. An REJ immediately terminates the dialogue, with the coordination conditions remaining as previously agreed (which is usually, but not necessarily, the initial coordination conditions).

5. MESSAGE SEQUENCING

5.1 The preceding section identified the flight states and showed how the aircraft transitions from one state to the next, based on the receipt of ASIA/PAC AIDC messages by ATSU B. In this section, a table of two-message sequences is constructed, as shown in Table D-5. These sequences identify the allowable messages (the next message column) that may correctly follow a given, just received message (the first column). Application Management messages LAM and LRM are not shown.

Table D-5 Message Sequences

Received Message	Next Valid Message	Comments
Notification Sequences		
ABI	ABI	Update the flight information.
	MAC	Indicates that the flight is no longer expected to enter the downstream ATSU's ACI.
	CPL	Receipt of the ABI signals the beginning of the Notification phase for a particular flight. Coordination will take place when the aircraft is within a parameter distance/time of the boundary.
	EST	Receipt of the ABI signals the beginning of the Notification phase for a particular flight. Coordination will take place when the aircraft is within a parameter distance/time of the boundary.
Coordination Sequences		
CPL	ACP	The aircraft's current clearance is acceptable.
	CDN	The aircraft's current clearance is not acceptable to the receiving airspace and must be modified.
EST	ACP	The boundary crossing conditions are in accordance with the agreement that exists between the two ATSUs.
PAC	ACP	The boundary crossing conditions are in accordance with the agreement that exists between the two ATSUs.
CDN	ACP	The negotiated clearance is acceptable to both ATSUs.
	CDN	The proposed clearance modification is not acceptable to one of the airspaces and a new proposal is submitted.
	REJ	The last clearance agreed to by both airspaces must be honoured.

TRU	CDN	The proposed clearance modification is not acceptable to one of the airspaces and a new proposal is submitted.
	TOC	The aircraft is at or near the boundary.
	TRU	Notification of an amendment to the previously accepted clearance
	MAC	Indicates that the flight is no longer expected to enter the downstream ATSU's ACI
ACP	CDN	A request for modification of a previously accepted clearance is submitted.
	TRU	Notification of an amendment to the previously accepted clearance
	TOC	The aircraft is at or near the boundary.
	MAC	Indicates that the flight is no longer expected to enter the downstream ATSU's ACI.
Transfer of Control Sequences		
TOC	AOC	The aircraft is at or near the boundary.
AOC	CDN	A request for modification of a previously accepted clearance is submitted.

5.2 Table D-6 lists the AIDC messages which are valid for each state. The ATSU which can transmit the message is also identified.

Table D-6 Valid Messages by ATSU

Flight State	Message	Sent by
Notifying	ABI	Controlling ATSU
Notifying	MAC	Controlling ATSU
Notifying	CPL	Controlling ATSU
Notifying	EST	Controlling ATSU
Notifying	PAC	Controlling ATSU
Negotiating	CDN	Either ATSU
Negotiating	ACP	Either ATSU
Coordinating	ACP	Receiving ATSU
Coordinated	CDN	Either ATSU
Coordinated	TRU	Controlling ATSU
Coordinated	TOC	Controlling ATSU
Coordinated	MAC	Controlling ATSU
Re-Negotiating	CDN	Either ATSU
Re-Negotiating	ACP	Either ATSU
Re-Negotiating	REJ	Either ATSU
Transferring	AOC	Receiving ATSU
Transferred	CDN	Either ATSU
Backward-Re-Negotiating	CDN	Either ATSU
Backward-Re-Negotiating	ACP	Either ATSU
Backward-Re-Negotiating	REJ	Either ATSU

6. OTHER MESSAGES

6.0 The previous sections have discussed the use of Notification, Coordination, Transfer of Control, and Application Management messages. There are two remaining message subgroups in the ASIA/PAC AIDC Messages: (1) General Information messages; and (2) Surveillance Data Transfer messages. All messages within these two subgroups require an application response; no operational response is defined.

6.1 General Information Messages.

6.1.1 **EMG and MIS Messages**. These messages support the exchange of text information between ATSUs. A communicator (usually a person, but a computer or application process is also permitted) in one ATSU can send a free text message to a functional address at another ATSU. Typical functional addresses could be an area supervisor or an ATC sector. If further EMG or MIS messages are transmitted in response to a previously received EMG or MIS, the later messages shall include the original message identifier within field 3 of the AFTN header. The EMG shall have an AFTN emergency priority (SS).

6.1.2 **Track Definition Message**. The TDM is generated and disseminated to all affected ATSUs. It is also sent to Airline Operational Control (AOC) Centres, where it is used for flight planning purposes. This message contains, in a structured text format, the track definition and the time when it is active.

6.2 **Surveillance Data Transfer Messages**. The ADS message is used to transfer data contained within an ADS-C report, including optional ADS-C groups, to an adjacent ATSU.

6.2.1 The ADS message contains a text field – the ADS-C data field - which contains information from the ADS-C report in its original hexadecimal format. The ADS-C data field consists of the text that immediately follows the “ADS” IMI (but excluding the 4 character CRC) within the Application data portion of the ADS-C report.

6.2.2 The following example shows an encoded ACARS ADS-C report – as it would be received by an ATSU – as well as an example of what information from this report would be transferred into the corresponding ADS-C data field. The ATSU receiving the AIDC ADS message simply decodes the ADS-C data field, and extracts the data that is required by the ATSU.

ACARS ADS-C report	QU BNECAYA .QXSXMXS 011505 PAR FI NZ0090/AN ZK-OKC DT QXT POR1 011505 F59A - ADS.ZK-OKC030007FF946B6F6DC8FC044B9D0DFC013B80DA88F C0A64F9E4438B4AC8FC000E34D0EDC00010140F3E8660F3
ADS-C data field	ADS/.ZK-OKC030007FF946B6F6DC8FC044B9D0DFC013B80DA88FC 0A64F9E4438B4AC8FC000E34D0EDC00010140F3E86

Note. Because it is part of the 7 character registration field, the leading “.” must be retained in front of the registration (“.ZK-OKC”). The 4 character CRC (“60F3”) at the end of the ACARS message is not included in the ADS-C data field.

6.2.3 The types of ADS-C reports (i.e. periodic or event) transmitted by the AIDC ADS message shall be in accordance with bilateral agreements. When implementing the AIDC ADS message, ATSUs should consider the effect of relaying numerous ADS-C periodic reports via ground-ground links (e.g. AFTN) when a high periodic reporting rate is in effect.

Note 1. The AIDC ADS message is used to transfer ADS-C information only. Other messaging protocols exist for the transfer of ADS-B information.

Note 2. While the AIDC ADS message may be used to transfer ADS-C information this data may also be transferred using the ACARS Ground-Ground network by re-addressing the received ADS-C message to the other ATSU. States should agree on the method to be used on a bilateral basis.

Example: Brisbane ATSU (BNECAYA) receives an ADS-C downlink via the ACARS network from its Datalink Service Provider SITA (QXSXMXS)

```
QU BNECAYA
.QXSXMXS 011505
PAR
FI NZ0090/AN ZK-OKC
DT QXT POR1 011505 F59A
-ADS.ZK-OKC0300FF946B6F6DC8FC044B9D0DFC013B80DA88FC0A64F9E4438B4AC8FC00
0E34D0EDC00010140F3E8660F3
```

Brisbane re-addresses the downlink and forwards to Auckland via the ACARS Ground-Ground network:

```
QU AKLCBYA
.BNECAYA 011505
PAR
FI NZ0090/AN ZK-OKC
DT QXT POR1 011505 F59A
-ADS.ZK-OKC0300FF946B6F6DC8FC044B9D0DFC013B80DA88FC0A64F9E4438B4AC8FC00
0E34D0EDC00010140F3E8660F3
```

7. EXAMPLES

7.1 Standard Coordination

7.1.1 Brisbane transmits a notification message (ABI) to Auckland forty five minutes prior to the time that QFA108 is expected to cross the FIR boundary (1209). The destination of the flight is Christchurch.

7.1.2 The abbreviated coordination message (EST) is transmitted by Brisbane thirty minutes prior to the boundary estimate (which is now 1213). Auckland accepts the proposed coordination conditions by responding with an ACP.

7.1.3 Brisbane transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Auckland accepts ATC responsibility by responding with an AOC.

Note. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

Example 1. Standard coordination

Brisbane	***Auckland***
(ABI-QFA108-YBBN-33S163E/1209F350 -NZCH-8/IS-9/B744/H-10/SDHIWRJ -15/M084F350 35S164E 36S165E ...)	
(EST-QFA108-YBBN-33S163E/1213F350-NZCH)	
	(ACP-QFA108-YBBN-NZCH)
(TOC-QFA108-YBBN-NZCH)	
	(AOC-QFA108-YBBN-NZCH)

7.2 **Negotiation of coordination conditions**

7.2.1 Brisbane transmits a notification message (ABI) to Auckland forty five minutes prior to the time that QFA56 is expected to cross the FIR boundary (1209). The destination of the flight is Christchurch.

7.2.2 The coordination message (CPL) is transmitted by Brisbane thirty minutes prior to the boundary estimate (which is now 1213).

7.2.3 Auckland responds with a negotiation message (CDN) requesting a change in the boundary crossing altitude to F390. Brisbane responds with an ACP, indicating that the revised altitude is acceptable.

7.2.4 Brisbane transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Auckland accepts ATC responsibility by responding with an AOC.

Note. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

Example 2. Negotiation of Coordination Conditions

Brisbane	***Auckland***
(ABI-QFA56-YBBN-33S163E/1209F350-NZCH-8/IS-9/B744/H-10/SDHIWRJ-15/M084F350 35S164E 36S165E ...)	
(CPL-QFA56-IS-B744/H-SDHIWRJ-YBBN -33S163E/1213F350-M084F350 35S164E 36S165E NZCH -0.)	
	(CDN-QFA56-YBBN-NZCH -14/33S163E/1213F390)
(ACP-QFA56-YBBN-NZCH)	
(TOC-QFA56-YBBN-NZCH)	
	(AOC-QFA56-YBBN-NZCH)

7.3 **Re-negotiation rejected**

7.3.1 Brisbane transmits a notification message (ABI) to Auckland forty five minutes prior to the time that QFA108 is expected to cross the FIR boundary (1209). The destination of the flight is Christchurch.

7.3.2 The coordination message (CPL) is transmitted by Brisbane thirty minutes prior to the boundary estimate (which is now 1213). Auckland accepts the proposed coordination conditions without modification by responding with an ACP.

7.3.3 Some time after the initial coordination process has been completed, but before the start of the Transfer of Control process, Auckland requests an amendment to the boundary crossing altitude by transmitting a negotiation message (CDN). Brisbane cannot accept the proposed change due to conflicting traffic in its FIR, and therefore rejects the request (REJ).

7.3.4 Brisbane transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Auckland accepts ATC responsibility by responding with an AOC.

Note. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

Example 3. Rejection of Renegotiated Coordination

Brisbane	***Auckland***
(ABI-QFA108-YBBN-33S163E/1209F350 -NZCH-8/IS-9/B744/H-10/SDHIWRJ -15/M084F350 35S164E 36S165E ...)	
(CPL-QFA108-IS-B744/H-SDHIWRJ-YBBN -33S163E/1213F350-M084F350 35S164E 36S165E NZCH-0 ...)	
	(ACP-QFA108-YBBN-NZCH)
	(CDN-QFA108-YBBN-NZCH -14/33S163E/1213F390)
(REJ-QFA108-YBBN-NZCH)	
(TOC-QFA108-YBBN-NZCH)	
	(AOC-QFA108-YBBN-NZCH)

7.4 Abbreviated coordination

7.4.1 Several minutes before AAA842’s departure time (e.g. at taxi time), coordination between Bali and Brisbane is effected by Bali transmitting a coordination message (PAC). This message alerts Brisbane that the flight is pending, and indicates a boundary estimate of 1213 at F290. Brisbane accepts the coordination conditions by responding with an ACP.

7.4.2 On departure, the aircraft’s actual estimate differs from that coordinated by more than the value specified in bilateral agreements. The new estimate is coordinated to Brisbane by Bali transmitting a CDN message to Brisbane. Brisbane accepts this revised estimate by responding with an ACP message.

7.4.3 Bali transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Brisbane accepts ATC responsibility by responding with an AOC.

Note. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

Example 4. Abbreviated coordination

Bali	***Brisbane***
(PAC-AAA842/A4534-IS-B737/M-WRRR- -OGAMI/1213F290-YPPH ...)	
	(ACP-AAA842/A4534-WRRR-YPPH)
(CDN-AAA842/A4534-WRRR-YPPH- 14/OGAMI/1219F290)	
	(ACP-AAA842/A4534-WRRR-YPPH)
(TOC-AAA842/A4534-WRRR-YPPH)	
	(AOC-AAA842/A4534-WRRR-YPPH)

7.5 Multiple notifications + AIDC cancellation

7.5.1 Brisbane transmits a notification message (ABI) to Auckland forty five minutes prior to the time that QFA11 is expected to cross the FIR boundary (1105). The destination of the flight is Los Angeles.

7.5.2 Prior to transmitting the coordination message, a modification to the cleared flight level is made resulting in the transmission of another notification message. This ABI contains the latest boundary information on the aircraft, showing that the current boundary estimate is now 1107.

7.5.3 The abbreviated coordination message (EST) is transmitted by Brisbane thirty minutes prior to the boundary estimate (which is now 1108). Auckland accepts the proposed coordination conditions by responding with an ACP

7.5.4 Due to weather QFA11 requests, and is issued, an amended route clearance that will now no longer affect Auckland. To advise of the cancellation of any previously transmitted AIDC messages, a MAC message is transmitted to Auckland.

Note. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

Example 5. Multiple notifications + AIDC cancellation

Brisbane	***Auckland***
(ABI-QFA11-YSSY-31S163E/1105F290 -KLAX-8/IS-9/B744/H-10/SDHIWRJ -15/M085F290 33S158E 30S168E ...)	
(ABI-QFA11-YSSY-31S163E/1107F310 -KLAX-8/IS-9/B744/H-10/SDHIWRJ -15/M084F290 33S158E 30S168E ...)	
(EST-QFA11-YSSY-31S163E/1108F310-KLAX)	
	(ACP-QFA11-YSSY-KLAX)
(MAC-QFA11-YSSY-KLAX)	

7.6 Multiple negotiations

7.6.1 Brisbane transmits a notification message (ABI) to Auckland forty five minutes prior to the time that QFA108 is expected to cross the FIR boundary (1209). The destination of the flight is Christchurch.

7.6.2 The abbreviated coordination message (EST) is transmitted by Brisbane thirty minutes prior to the boundary estimate (which is now 1213). Auckland accepts the proposed coordination conditions by responding with an ACP

7.6.3 QFA108 requests F370. The bilateral Letter of Agreement between Brisbane and Auckland requires that prior coordination is required before issuing a change of level after initial coordination. Brisbane transmits a negotiation message (CDN) proposing a change of level to F370. This level is not available in Auckland's airspace but an alternative level is available. Auckland therefore responds with a negotiation message proposing F360. Brisbane responds with an ACP, indicating that this level is acceptable to Brisbane (and to QFA108).

7.6.4 Brisbane transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Auckland accepts ATC responsibility by responding with an AOC.

Note1. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

Note2. Complex re-negotiations may be more easily solved by voice communication

Example 6. Multiple negotiations

Brisbane	***Auckland***
(ABI-QFA108-YBBN-33S163E/1209F350 -NZCH-8/IS-9/B744/H-10/SDHIWRJ -15/M084F350 35S164E 36S165E ...)	
(EST-QFA108-YBBN-33S163E/1213F350-NZCH)	
	(ACP-QFA108-YBBN-NZCH)
(CDN-QFA108-YBBN-NZCH -14/33S163E/1213F370)	
	(CDN-QFA108-YBBN-NZCH -14/33S163E/1213F360)
(ACP-QFA108-YBBN-NZCH)	
(TOC-QFA108-YBBN-NZCH)	
	(AOC-QFA108-YBBN-NZCH)

7.7 Standard coordination with proposed amended destination

7.7.1 Brisbane transmits a notification message (ABI) to Auckland forty five minutes prior to the time that ANZ136 is expected to cross the FIR boundary (1400). The destination of the flight is Christchurch.

7.7.2 The abbreviated coordination message (EST) is transmitted by Brisbane thirty minutes prior to the boundary estimate (which is now 1401). Auckland accepts the proposed coordination conditions by responding with an ACP.

7.7.3 ANZ136 requests a deviation to Auckland (NZAA). Brisbane transmits a Coordination message (CDN) to Auckland proposing changes to the previously agreed coordination conditions (route and boundary estimate) as well as the new destination. Auckland accepts the proposed revision(s) by the transmission of an ACP. All subsequent AIDC messages for ANZ136 contain "NZAA" as the destination aerodrome.

7.7.4 Brisbane transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Auckland accepts ATC responsibility by responding with an AOC.

Note. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

Example 7. **Coordination of amended destination**

Brisbane	***Auckland***
(ABI-ANZ136-YBBN-RUNOD/1400F350 -NZCH-8/IS-9/A320/M-10/SDHIWR -15/M078F350 SCOTT Y32 LOKET L503 LALAP DCT ...)	
(EST-ANZ136-YBBN-33S163E/1401F350-NZCH)	
	(ACP-ANZ136-YBBN-NZCH)
(CDN-ANZ136-YBBN-NZCH-14/ESKEL/1357F350-15/ SCOTT Y32 LOKET WOOLY ESKEL L521 AA-DEST/NZAA)	
	(ACP-ANZ136-YBBN-NZCH)
(TOC-ANZ136-YBBN-NZAA)	
	(AOC-ANZ136-YBBN-NZAA)

7.8 Standard coordination including FAN/FCN exchange

7.8.1 Brisbane transmits a notification message (ABI) to Auckland forty five minutes prior to the time that UAL815 is expected to cross the FIR boundary (0330).

7.8.2 The abbreviated coordination message (EST) is transmitted by Brisbane thirty minutes prior to the boundary estimate. Auckland accepts the proposed coordination conditions by responding with an ACP.

7.8.3 Brisbane transmits a FAN message to Auckland providing the logon information that Auckland requires to establish a CPDLC connection as well as ADS contracts.

7.8.4 When a CPDLC connection is established, Auckland transmits an FCN to Brisbane, containing the appropriate frequency for the aircraft to monitor.

7.8.5 Brisbane transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Auckland accepts ATC responsibility by responding with an AOC.

7.8.6 Brisbane terminates the CPDLC connection with UAL815, and transmits an FCN to Auckland to advise them that the CPDLC connection has been terminated.

Note. The timing of the transmission of these messages is defined in bilateral agreements between the two units.

***Example 8*. Standard coordination including FAN and FCN exchanges**

Brisbane	***Auckland***
(ABI-UAL815/-YSSY-3200S16300E/0330F290 -KLAX-8/IS-9/B744/H-10/SDHIRZYWJP/CD-15/N0499F310 NOBAR A579 JORDY DCT 3200S16000E 3050S16300E 2800S16500E..)	
(EST-UAL815-YSSY-33S163E/0330F290-KLAX)	
	(ACP-UAL815-YSSY-KLAX)
(FAN-UAL815-YSSY-KLAX-SMI/FML FMH/UAL815 REG/N123UA FPO/3330S15910E FCO/ATC01 FCO/ADS01)	
	(FCN-UAL815-YSSY-KLAX-CPD/2-FREQ/13261)
(TOC-UAL815-YSSY-KLAX)	
	(AOC-UAL815-YSSY-KLAX)
(FCN-UAL815-YSSY-KLAX-CPD/0)	

7.9 **Standard coordination with TRU update**

7.9.1 An abbreviated coordination message (EST) is transmitted by Melbourne as soon as UAE412 departs Sydney. Brisbane accepts the proposed coordination conditions by responding with an ACP.

7.9.2 The Sydney Departures controller assigns the aircraft a heading of 100 degrees magnetic and issues an instruction to maintain F200. A TRU is transmitted to update the Brisbane controllers' flight details.

7.9.3 Melbourne transfers ATC responsibility approaching the FIR boundary by transmitting a TOC. Brisbane accepts ATC responsibility by responding with an AOC.

***Example 9.* Coordination of amended clearances via TRU**

Brisbane	***Auckland***
(EST-UAE412-YSSY-EVONN/0130F280-NZAA)	
	(ACP-UAE412-YSSY-NZAA)
(TRU-UAE412-YSSY-NZAA-HDG/100 CFL/F200)	
(TOC-UAE412-YSSY-NZAA)	
	(AOC-UAE412-YSSY-NZAA)

8. NOTES

8.1 The IGM concerns communications between two ATSU'S within the ASIA/PAC Regions. Inter-center communications within one country, and communications with ATSUs outside the ASIA/PAC regions, though important to an ATC system's design and implementation, are not part of the scope of this material.

APPENDIX E - RELATIONSHIP TO ICAO AIDC MESSAGES

1. The AIDC message set can be tailored to satisfy regional requirements. The OPLINKP documentation defining the AIDC data link application provides three means for achieving regional adaptation of the AIDC messages:

a) Regions select an AIDC subset that will support their regional operational procedures;

b) The selected messages are tailored by mandating the usage of optional components into one of three classes:

(1) the optional component that must always be used;
(2) the optional component that must never be used;
(3) the optional component is truly optional;

c) For interim, pre-ATN implementations, encoding rules may be specified by a region. The most frequently used encoding rules today employ ICAO ATS fields and messages. The default encoding rules are the ISO Packed Encoding rules.

2. Using the regional tailoring procedures stated above, the ASIA/PAC Core messages are related to a subset of the AIDC messages and are shown in Table E-1.

3. The encoding rules employed within the ASIA/PAC will remain for the foreseeable future as the ICAO ATS field and message-based, character-oriented rules currently defined in the ASIA/PAC AIDC Interface Control Document (ICD) (and ICAO PANS-ATM Doc 4444).

Table E –1 ASIA/PAC AIDC/ICAO AIDC Relationship

ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message
		Mandatory fields		Optional fields	
Notify	ABI	Aircraft identification Departure aerodrome Destination aerodrome Boundary estimate data	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome Boundary estimate data Number of aircraft Aircraft type Wake turbulence category Route	Flight rules Type of flight Number of aircraft (if more than one in the flight) Aircraft type Wake turbulence category CNS equipment Route Amended destination Code (SSR) Other information	Flight rules Equipment Other information Amended destination
Coordinate Initial	CPL	Aircraft identification Departure aerodrome Destination aerodrome Boundary estimate data	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome Boundary estimate data Flight rules Number of aircraft Aircraft type Wake turbulence category Equipment Route Other information	Flight rules Type of flight Number of aircraft (if more than one in the flight) Aircraft type Wake turbulence category CNS equipment Route Amended destination Code (SSR) Other information	

ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message
		Mandatory fields		**Optional fields**	
Coordinate Initial	EST	Aircraft identification Departure aerodrome Destination aerodrome Boundary estimate data	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome Boundary estimate data	Flight rules Type of flight Number of aircraft (if more than one in the flight) Aircraft type Wake turbulence category CNS equipment Route Amended destination Code (SSR) Other information	
Coordinate Initial	PAC	Aircraft identification Departure aerodrome Destination aerodrome Boundary estimate data	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome Boundary estimate data	Flight rules Type of flight Number of aircraft (if more than one in the flight) Aircraft type Wake turbulence category CNS equipment Route Amended destination Code (SSR) Other information	Flight rules Number of aircraft Aircraft type Wake turbulence category Equipment Route Other information.
Coordinate Negotiate	CDN	Aircraft identification Departure aerodrome Destination aerodrome Boundary estimate data	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome	Flight rules Type of flight Number of aircraft (if more than one in the flight) Aircraft type Wake turbulence category CNS equipment Route Amended destination Code (SSR) Other information	Equipment Boundary estimate data Route Other information Amended destination

ICAO AIDC message	**ASIA/PAC AIDC message**	**ICAO AIDC message**	**ASIA/PAC AIDC message**	**ICAO AIDC message**	**ASIA/PAC AIDC message**
		Mandatory fields		**Optional fields**	
Coordinate Accept	ACP		Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome	Aircraft identification Departure aerodrome Destination aerodrome	
Coordinate Reject	REJ		Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome	Aircraft identification Departure aerodrome Destination aerodrome	
Coordinate Standby	N/A			Aircraft identification Departure aerodrome Destination aerodrome	
Coordinate Cancel	MAC	Aircraft identification Departure aerodrome Destination aerodrome	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome	Fix Reason for cancellation	Boundary Estimate Data Other Information
Coordinate Update	TRU	Aircraft identification Departure aerodrome Destination aerodrome Boundary estimate data	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome Track data	Flight rules Type of flight Number of aircraft (if more than one in the flight) Aircraft type Wake turbulence category CNS equipment Route Amended destination Code (SSR) Other information	
Transfer Initiate	N/A	Aircraft identification Executive data (if available)		Track data	
Transfer Conditions Proposal	N/A	Aircraft identification Executive data (if available)		Track data	

ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message
		Mandatory fields		Optional fields	
Transfer Conditions Accept	N/A	Aircraft identification		Frequency	
Transfer Communication Request	N/A	Aircraft identification		Frequency	
Transfer Communication	N/A	Aircraft identification Executive data and/or Release indication (if available)		Frequency Track data	
Transfer Communication Assume	N/A	Aircraft identification			
Transfer Control	TOC	Aircraft identification	Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome	Departure aerodrome Destination aerodrome Executive data	
Transfer Control Assume	AOC	Aircraft identification	Aircraft identification, SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome	Departure aerodrome Destination aerodrome	
General Point	N/A	Aircraft identification Departure aerodrome Destination aerodrome		Sector designator (sending) Sector designator (receiving) Flight rules Type of flight Number of aircraft (if more than one in the flight) Aircraft type Wake turbulence category CNS equipment Route Track data Code (SSR) Other information	

ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message	ICAO AIDC message	ASIA/PAC AIDC message
		Mandatory fields		**Optional fields**	
General Executive Data	N/A	Aircraft identification		Executive data Frequency	
Free Text Emergency	EMG	Facility designation or Aircraft identification Free text	Functional address or Aircraft identification SSR Mode and Code (where applicable) Other information		
Free Text General	MIS	Facility designation or Aircraft identification Free text	Functional address or Aircraft identification SSR Mode and Code (where applicable) Other information		
Application Accept	LAM				
Application Reject	LRM	Error code	Other Information	Error data	
N/A	ASM				
N/A	FAN		Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome Application data		
N/A	FCN		Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome Communication Status		
N/A	ADS		Aircraft identification SSR Mode and Code (where applicable) Departure aerodrome Destination aerodrome ADS-C data		

APPENDIX F - INTERIM OPERATIONAL SUPPORT

1. INTRODUCTION

1.1 This ICD describes the end-state messages to be used within the ASIA/PAC region to ensure interoperability between automated ATS systems. However, during the transition to this end state architecture, current operations must be documented and supported. This appendix is the repository of messages not found in other ICD sections which will be used to support current operations during the interim transition period.

1.2 Each interim message will be described in a separate paragraph. Those ATS Providers employing an interim message contained in this appendix shall document this usage in the appropriate bilateral agreements.

2. INTERIM MESSAGES

2.1 Estimate (EST) Message

2.1.1 The Estimate message is contained within the Core Message set. However, its use has been constrained to those situations in which a flight will cross an FIR boundary in accordance with existing letters of agreement.

2.1.2 An EST message may be used in any situation in which a CPL is permitted. The EST is in actuality an abbreviated CPL, contingent upon prior receipt of route and ancillary information. This information could be provided by an FPL or ABI message.

2.1.3 Those ATS Provider States employing an EST in the more general manner during the interim transition period shall document this usage in the appropriate bi-lateral agreements.

2.1.4 The EST message format shall be as described in the Core Message set.

APPENDIX G – TEMPLATES FOR BILATERAL LETTER OF AGREEMENT ON AIDC

1. At an organisational level, the implementation of AIDC to enable data transfers between automated ATS systems is accomplished under the authority and strict operational terms of a bilateral letter of agreement or memorandum of understanding on AIDC arrangements that must be established between the two ATSUs involved. Depending on the particular circumstances, the legally less sophisticated Memorandum of Understanding (MOU) format could be used for the initial implementation of AIDC until the more formalised Letter of Agreement (LOA) is put in place. The choice of legal instrument will be a decision made by the two ATSUs as they prepare the formal agreement to enable AIDC data transfer between States.

2. In order to provide guidance in the structure and content of bilateral arrangements, templates have been included in this appendix to assist States in preparing suitable memorandums of understanding/letters of agreement on AIDC arrangements. The templates are based upon documentation developed by Airways New Zealand in implementing evolving AIDC arrangements between Auckland Oceanic and all neighbouring States over a period of approximately 10 years commencing from the mid 1990's. Three templates are included:

- Template 1 provides a generic example of a basic Letter of Agreement;
- Template 2 is an example of an actual Letter of Agreement between Auckland Oceanic (New Zealand) and Brisbane ATS Centre (Australia); and
- Template 3 is an example of an actual Memorandum of Understanding between Auckland Oceanic (New Zealand) and Nadi ATM Operations Centre (Fiji).

3. The templates are intended as guidance material only. It is important to note that although changes in the AIDC arrangements applicable to Auckland Oceanic will occur over time, Templates 2 and 3 will NOT be routinely updated. Accordingly, as the circumstances for each bilateral implementation will differ, appropriate adjustments should be made to the content of the templates to ensure that the resulting MOU or LOA is fit for the purpose intended.

Template 1
Generic Letter of Agreement

AIDC Procedures

AIDC Procedures

1. The format of AIDC messages (*List messages used e.g. ABI, PAC, CDN, CPL, ACP, REJ, MAC, LAM, and LRM*) are as defined by the Asia/Pacific Regional AIDC Interface Control Document (ICD) as amended from time to time, unless described otherwise in this LOA.

2. List messages not supported (*e.g. "EST, TOC, AOC*) messages are not supported".

3. Acceptance of a CPL or CDN message is approval of the flight's profile and requires no further voice coordination (i.e., Non-Standard Altitudes, Block Altitudes, Deviations).

4. *(Describe other procedures applicable to the use of AIDC for this LOA. Some examples are listed below.)*

5. *Example only. If there is any doubt with regard to the final coordination data, voice coordination shall be used for confirmation.*

6. *Example only. Receipt of a MAC message must not be interpreted as meaning that the flight plan has been cancelled. Voice coordination must be conducted by the transferring controller to confirm the status of the flight.*

7. *Example only. Each facility shall advise the other facility of any known equipment outage that affects AIDC. In the event of AIDC outage, voice coordination procedures will apply.*

8. *Example only. Truncation. Where route amendment outside the FIR is unavoidable:*

   a) *Terminate the route details at the farthest possible flight plan significant point of the flight and enter "T" immediately following this.*

   b) *Without amending the originally received details, every effort is to be made to truncate the route at a minimum of one significant point beyond the adjacent FIR to provide an entry track into that FIR.*

Letter of Agreement

AIDC Messages

(For each message used describe when it will be sent by each ATSU under the parameter column and use the Notes column to describe other applicable information for the message use by each ATSU. The data below provides an example of the type of information that could be incorporated)

Messages	Parameter	Notes
ABI	***ATSU1 :*** *Sends ABI approx. 80 minutes prior to boundary (73 min prior to the 50 nm expanded sector boundary).* ***ATSU2 :*** *Sends ABI approx. 87 minutes prior to boundary (80 min prior to the 50 nm expanded sector boundary).* *(Note: An updated ABI will not be sent once a CPL has been sent.)*	***ATSU1 : ATSU2*** *Updated ABI's will be sent automatically if there is any change to profile. ABI is sent automatically and is transparent to the controller. ABI automatically updates the receiving unit's flight data record.*
CPL	***ATSU1 : ATSU2*** *Send CPL messages approx 37 minutes prior to the Boundary (30 minutes prior to the 50 nm expanded sector boundary).*	***ATSU1 : ATSU2*** *CPL messages should be sent by the transferring controller in sufficient time to allow the completion of coordination at least 30 minutes prior to the boundary or 30 minutes prior to the aircraft passing within 50 nm of the FIR boundary for information transfers.*
CDN	***ATSU1 : ATSU2*** *CDN messages are sent by either the transferring or receiving facility to propose a change once the coordination process has been completed, i.e., CPL sent and ACP received. CDN's must contain all applicable profile restrictions (e.g., weather deviations, speed assignment, block altitude). If the use of a CDN does not support this requirement, then verbal coordination is required.*	***ATSU1 : ATSU2*** *The APS will display a flashing "DIA" until receipt of ACP. If ACP not received within ten (10) minutes controller is alerted with a message to the queue.* *CDN messages are not normally used for coordination of reroutes; however, with the receiving facilities approval a CDN may be used to coordinate a reroute on a critical status aircraft such as in an emergency.*

Continued on next page

Letter of Agreement

AIDC Messages, Continued

Messages	Parameter	Notes
PAC	***ATSU1 : ATSU2*** *PAC messages will normally be sent when the time criteria from the departure point to the boundary is less than that stipulated in the CPL.*	***ATSU1 : ATSU2*** *Will respond to a PAC message with an ACP. PAC messages shall be verbally verified with receiving facility.*
ACP	***ATSU1 : ATSU2*** *ACP messages are in reply to a CPL/CDN message if conditions specified in CPL/CDN are acceptable to controller.*	***ATSU1 : ATSU2*** *The APS will display a flashing "DIA" until receipt of ACP. If ACP not received within ten (10) minutes controller is alerted with a message to the queue.*
TOC	***ATSU1 : ATSU2*** *Not supported. Implicit hand in/off.*	
AOC	***ATSU1 : ATSU2*** *Not supported. Implicit hand in/off.*	
MAC	***ATSU1 : ATSU2*** *MAC messages are sent when a change to the route makes the other facility no longer the "next" responsible unit.*	***ATSU1 : ATSU2*** *Receipt of a MAC message must not be interpreted as meaning that the flight plan has been cancelled. Voice coordination must be conducted by the transferring controller to confirm the status of the flight.*
REJ	***ATSU1 : ATSU2*** *REJ messages are sent in reply to a CDN message when the requested change is unacceptable.*	***ATSU1 : ATSU2*** *REJ messages are sent only as a response to a CDN message.*

Template 2
Example: Auckland Oceanic - Brisbane ATS Centre

Letter of Agreement

Coordination - General

Transfer of Control Point

The Transfer of Control Point (TCP) shall be either on receipt of an Acceptance of Control (AOC) to a Transfer of Control (TOC) or the common FIR boundary, whichever occurs first. The TCP shall also be the point of acceptance of primary guard.

All ATS units shall coordinate an estimate for the FIR boundary at least thirty (30) minutes prior to the boundary. Such coordination constitutes an offer of transfer of responsibility.

After the estimate for the FIR boundary has been sent, units shall coordinate any revised estimate that varies by 3 minutes or more.

Communication Systems

Use of communications systems for coordination between adjacent units shall be in the following order of priority:

- ATS Interfacility Data Communication (AIDC);
- AIDC messages and procedures are specified in the following sections;
- ATS direct speech circuits;
- International telephone system;
- Any other means of communication available.

AIDC Messages

AIDC message format will be in accordance with the Asia/Pacific Regional Interface Control Document (ICD), as amended from time to time, unless described otherwise in this LOA.

Successful coordination via AIDC occurs on receipt of an ACP message in response to an EST message.

Each centre shall advise the other of any known equipment outage that affects AIDC.

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Letter of Agreement

Coordination - General, Continued

AIDC Message Parameters The following table details the AIDC parameters and messages to be used.

Message	Parameter	Notes
ABI	EUROCAT: 5-60 minutes prior to COP (Note: An updated ABI will not be sent once an EST has been sent) OCS: 40 minutes prior 50nm expanded boundary	ABI is sent automatically and is transparent to controller. ABI automatically updates flight plan.
EST	EUROCAT: 40 minutes prior to COP OCS: 30 minutes prior to 50nm expanded boundary.	Any change to EST level or estimate conditions as detailed in LOA to be notified by voice after initial coordination completed. See notes below on voice procedures. EST is required for track generation in EUROCAT.
ACP	EUROCAT: Sends automatic ACP on receipt of EST OCS: Sends automatic ACP on receipt of EST	EUROCAT: If ACP not received within 4 minutes the sending controller is alerted. Sending controller will initiate voice coordination if ACP is not received within 4 minutes of sending EST. Receiving controller will initiate voice coordination if proposed EST conditions are not acceptable. OCS: If ACP is not received within 5 minutes the sending controller is alerted. Sending controller will initiate voice coordination if ACP is not received within 5 minutes of sending EST. Receiving controller will initiate voice coordination if proposed EST conditions are not acceptable.
TOC	EUROCAT: Sent automatically 5 minutes prior to boundary OCS: Sent automatically 2 minutes prior to boundary	
AOC	EUROCAT: Sent automatically on controller acceptance of a TOC OCS: Sent automatically on receipt of a TOC	

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Letter of Agreement

Coordination – General, Continued

AIDC Message Parameters (continued)

Message	Parameter	Notes
CDN	EUROCAT: Manually by the controller when required.	• Responses to the CDN shall be ACP or REJ only – there will be no CDN negotiations. • CDN messages will be sent by Brisbane only to revise coordination on eastbound flights • CDN messages may be used to coordinate changes to estimate or assigned altitude only • Only one CDN dialogue may be open per aircraft at any time • Not to be used if the aircraft will not be maintaining the assigned altitude 10 minutes prior to the TCP.
MAC	As per ICD	
LRM	As per ICD. Controller alerted on receipt	
LAM	As per ICD. Controller alerted on non-receipt	

Amendment to Flight Data Record

Route amendment – routes/waypoints may be added/deleted as long as they do not change the original intent or integrity of the flight plan information.

Truncation – where route amendment outside the FIR is unavoidable:

a) Terminate the route details at the farthest possible ‘flight planned’ point of the flight outside the FIR and enter “T” immediately following this.
b) If insufficient ‘flight planned’ points exist outside the FIR for truncation, insert the first ‘defined’ point in the adjoining FIR and enter “T” immediately following this.
c) The minimum acceptable truncation point must be at least the first point in the adjoining FIR.
d) Every effort is to be made to truncate the route at a minimum of one point beyond the adjacent international FIR to provide an entry track in to that FIR.

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Letter of Agreement

Coordination – General, Continued

Address Forwarding and Next Data Authority

Brisbane ATSC and Auckland OAC shall send automatic Next Data Authority (NDA) and Address Forwarding (CAD) for data link aircraft as per the following table:

Brisbane ATSC	Auto NDA sent 22 minutes prior to the FIR boundary Auto CAD sent 20 minutes prior to the FIR boundary
Auckland OAC	Auto NDA sent 40 minutes prior to the FIR boundary Auto CAD sent 35 minutes prior to the FIR boundary

Voice Coordination

Voice coordination is not required when AIDC messaging has been successful to offer and accept transfer of control.

However, the receiving controller will initiate voice coordination if the proposed AIDC EST conditions are not acceptable.

If AIDC messaging is not to be sent following voice coordination, it shall be stated as part of the voice coordination by use of the phrase “AIDC messaging will not be sent”. A readback of the phrase is required.

Voice coordination is required for aircraft operating under any of the following conditions:

- block level clearance;
- weather deviations;
- offset track; or
- Mach Number technique.

Readbacks shall comprise all elements of the voice coordination passed by the transferring controller. Readback by the receiving unit confirms acceptance of the offer of transfer of control, subject to any other conditions negotiated.

Hemstitch Flights

A hemstitch flight is any flight that will remain within the New Zealand FIR for less time than the NDA VSP (40 minutes) prior to the flight entering the Brisbane FIR.

Auckland AOC shall voice coordinate any hemstitch flight.

Continued on next page

Letter of Agreement

Coordination – General, Continued

Near Boundary Operations	ATS units shall relay significant details of any flight which is, or intends, operating within fifty nautical miles (50NM) of the common FIR boundary.
HF Frequencies	Brisbane ATC and Auckland ATC shall update each other as to the current voice backup frequency for use by ATC data link equipped aircraft.

Template 3
Example: Auckland Oceanic - Nadi ATM Operations Centre

Memorandum of Understanding
Between
Airways New Zealand Limited
And
Nadi ATM Operations Centre

Subject	**Air Traffic Service Inter-facility Data Communications (AIDC) Coordination Procedures**
Validity Period	This Memorandum of Understanding shall be effective from 0506300300 UTC and may be cancelled by either party with written notice.
Signatories	The following signatories have ratified this Agreement:

Authority	**Signature**	**Date**
(Name of Officer) Oceanic Business Unit Manager Airways New Zealand		
(Name of Officer) Manager Operations Strategic Air Services Limited Fiji		
(Name of Officer) Chairman ATM Projects Committee Airports Fiji Limited Fiji		

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Memorandum of Understanding, Continued

Purpose

To establish procedures to permit AIDC messages for coordination purposes to be transmitted by Auckland Oceanic and received by Nadi Air Traffic Management Operations Centre (ATMOC).

Scope

This MOU between Auckland and Nadi is supplementary to the procedures contained in the Airways Corporation of New Zealand limited and Airports Fiji Limited LOA, dated 25 November 2004. Revision to this MOU shall be made only with the concurrence of all parties.

Procedures

8. The format of AIDC messages (ABI, EST, PAC, CDN, CPL, ACP, REJ, TOC, AOC, MAC, LAM, and LRM) are as defined by the Asia/Pacific Regional AIDC Interface Control Document (ICD) Version 2.0. The optional formats for the coordination of block levels, weather deviations and Mach Number Technique have not been implemented.

9. Each facility shall advise the other facility of any known equipment outage that affects AIDC. In the event of AIDC outage, voice coordination procedures will apply.

10. The following table details the messaging parameters and additional information for each message.

Messages	**Parameter**	**Notes**
ABI Non Hem-stitching flights	**Auckland**: Sends ABI 48 minutes prior to Boundary (Note: An updated ABI will not be sent once an EST has been sent)	Updated ABI's will be sent automatically if there is any change to profile. ABI is sent automatically and is transparent to the controller. ABI automatically updates the receiving units flight data record
EST (general) Non Hem-stitching flights	**Auckland**: Sends EST 38 minutes prior to Boundary	EST is sent automatically, and automatically coordinates the receiving unit's flight data record. Any change to the EST (level or estimate) conditions as detailed in LOA are to be notified by voice after the initial coordination completed. See section below on voice procedures.

Continued on next page

Memorandum of Understanding, Continued

ABI & EST Hemstitch flights	**Auckland:** Sends the ABI and EST message for flights that re-enter the Nadi FIR as soon as the aircraft enters the NZZO FIR	In these cases the ABI and EST are sent automatically.
PAC	**Auckland:** Voice coordination will take place in those situations when a PAC is sent.	
ACP	**Auckland:** Sent automatically on receipt of EST **Nadi:** Sent automatically on receipt of EST or PAC.	**Auckland:** The APS will display a flashing "DIA" until receipt of ACP. If ACP not received within ten (10) minutes controller is alerted with a message to the queue.
TOC	**Auckland:** Sent automatically 2 minutes prior to boundary	This proposes a hand-off to the receiving unit
AOC	**Auckland:** Sent automatically on receipt of TOC. **Nadi**: Sent by the controller on acceptance of TOC.	This completes the hand-off proposal.
MAC	**Auckland:** Sent manually when a change to the route makes Nadi no longer the "next" responsible unit.	Receipt of a MAC message should not be interpreted as meaning that the flight plan has been cancelled Voice coordination should be conducted by the receiving controller to confirm the status of the flight.

Continued on next page

Memorandum of Understanding, Continued

Procedures Continued

4. Block levels, offsets, and weather deviations, or Mach Number Technique are not included in the current version of AIDC messaging. Voice coordination shall be conducted for aircraft operating under these circumstances.

5. If there is any doubt with regard to the final coordination conditions, voice coordination shall be used for confirmation.

6. Truncation – Where route amendment outside the FIR is unavoidable:

   b) Terminate the route details at the farthest possible ‘flight planned’ point of the flight and enter “T” immediately following this.
   c) Without amending the originally received details, every effort is to be made to truncate the route at a minimum of one point beyond the adjacent FIR to provide an entry track in to that FIR.

7. For any reason where changes to this MOU are advisable the requesting unit shall propose the pertinent revision. The revision should be emailed or faxed to the appropriate Manager for action. The Manager or their designated deputies shall agree by email or telephone, followed by a confirming fax message signed by all parties. Formal exchange of signed copies of the amended MOU shall take place as soon as practicable thereafter.

Continued on next page

Memorandum of Understanding, Continued

Hemstitch Flights

A hemstitch flight is any flight that vacates FIR 1 and transits FIR 2, before re-entering FIR1.

When a hemstitching flight vacates FIR 1 and then re-enters FIR 1 from FIR 2, 30 mins or less later, the re-entry coordination is considered to have been completed when coordination for the initial entry is completed and further coordination is only required if the aircraft requests

- A weather deviation or
- A level change

or

- Any change to the EST time is received or
- If there is any doubt that the receiving FIR has the correct boundary information.

AIDC messages (ABI and EST) will still be sent by Auckland but only when the aircraft flight state becomes active control. For hem stitching flights this will usually be when the aircraft enters the NZZO FIR, therefore these messages will normally be sent at less than 30 minutes prior to the TCP.

Continued on next page

Memorandum of Understanding, Continued

Voice Coordination

The following is provided as a summary of occasions when voice coordination is required:

- In the event of an AIDC outage;
- Aircraft operating under any of the following conditions:
  - block level clearance;
  - unfulfilled time constraints;
  - weather deviations;
  - offset track; or
  - Mach Number technique.
- Any change to the EST (level or time) conditions
- On receipt of a warning that an ACP has not been received;
- On receipt of a MAC message;
- If there is any doubt with regard to the final coordination conditions
- If the receiving controller can not accept the aircraft at the coordinated level;

Notwithstanding the above, voice coordination shall take place for any flight that departs an airfield within the NZZO FIR and enters the NFFF FIR within 30 mins after departure.
For aircraft on fixed routes this specifically applies to :

- Aircraft departing Norfolk and entering the Nadi FIR via UBDAK or OSVAR;
- Aircraft departing Fua'amotu and entering the Nadi FIR via APASI;
- Aircraft departing Faleolo and entering the Nadi FIR via OVLAD or KETOT

Auckland OCA will obtain the appropriate level approval for these flights and will pass Nadi an "Estimate" based on the aircrafts probed profile at the same time as obtaining the level approval.
A PAC message will also be sent containing the time at the TCP and the climbing condition.
Time revisions will only be passed when the "Estimated" time changes by more than 2 minutes from that previously passed.
Level changes to that previously coordinated and/or off track requests shall be verbally coordinated in the usual manner.

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Memorandum of Understanding, Continued

Notification of Descent Restrictions by Nadi	Auckland OCS controllers may issue descent to aircraft entering the NZZO FIR from the NFFF FIR and landing at Norfolk, Tonga or Samoa without requesting descent restrictions from Nadi provided descent is commenced after the aircraft has passed the following positions. Should Nadi have any restrictions for descent they will advise Auckland at least 10 mins prior to these positions. For aircraft entering the NZZO FIR via: • UPDAK descent to commence after NOGOL • OSVAR descent to commence after OSVAR minus 10 mins • APASI descent to commence after APASI • All other occasions' descent to commence after the aircraft has crossed the FIR boundary.

Meteorological information and services in support of air traffic management

1. Focus

The focus of this survey is on forecast meteorological elements and advice on expected conditions in support of air traffic management. While completing this survey please consider the current and future requirements for meteorological information for all aspects of ATM.

2. Use of Met

A list of meteorological elements commonly required in support of ATM is provided in the table below. A sample response is provided at Attachment A. Please fill in the appropriate sections of the form to provide:

A. A brief description of how each element is used in your planning and operations (e.g. runway planning, capacity planning, sequencing etc)
B. Information source for this element (e.g. TAF, Trend, SIGWX chart, verbal advice etc.)
C. Deficiencies and suggestions. If your needs are not currently met provide comments on or explanation of why. (e.g. accuracy, information not available, inadequate lead time, inadequate spatial/temporal/vertical resolution, unsuitable format/presentation, use of inappropriate thresholds, etc). Please indicate any suggestions on the provision of the element to better satisfy your requirements (e.g. probability/forecast uncertainty/confidence/alternate scenario etc.)

Additional Met: If there are any elements/services affecting ATM that are not listed please add any elements to the table.
You may wish to consider the following elements which have been identified by the WMO CAeM Expert Team on New Terminal Forecast and European ICAO METG:

- Low level wind (in addition to “surface wind”)
- Temperature
- Runway condition forecast (temperature, icing, frost)
- Density altitude
- Precipitation rate
- Hail size
- CB activity
- Noise abatement parameters
- Low level temperature inversion
- Extended forecast (beyond 24 h) for specific hazard (TC).

State:
Organisation:

	A	B	C
Element	**Description of Use(s)**	**Current Source(s) of Information**	**Deficiencies and suggested improvements**
Surface Wind			
Surface Wind Gusts			
Visibility			
RVR			
Vertical Visibility			
Significant weather 1 (e.g. TS)			

Significant weather 2 (e.g SN)			
Significant weather 3			
Significant weather 4			
Cloud base/amount			
Turbulence (Terminal)			
Wake Turbulence/Vortex information			
Turbulence (Enroute)			

Upper Winds			
Icing			
Wind shear			
TC			
VA			
Other 1			
Other 2			
Other 3			
Other 4			

3. Prioritisation

Please indicate the 5 elements which have the biggest impact or cause you the greatest concerns to ATM.

	Element	**Impact/Concerns**
1		
2		
3		
4		
5		

4. MET Support in addition to Annex 3 products

Does your ATM Authority currently have access to:

a. Advice on terminal weather (in addition to Annex 3 type products)?: Yes/No

If so please provide a brief description of the additional service and information and how it is delivered (e.g. Routine web based product focussed on ATM specific cloud/visibility and wind thresholds, or daily elaborative telephone briefings).

………
………
………
………

b. Advice on en-route weather (in addition to Annex 3 type products)?: Yes/No

If so please provide a brief description of the additional service and information and how it is delivered.

………
………
………
………

5. Decision Support Tools

a. Has your ATM or/or MET authority developed any MET related decision support tools for use by ATM? Yes/No

If so please provide a brief description of the tool(s) and the benefits realised.

………
………
………
………

b. Is your ATM or/or MET authority developing any MET related decision support tools for use by ATM? Yes/No
If so please provide a brief description of the tool(s) and expected benefits.

………
………
………
………

6. Other Comments

Please feel free to provide any further comments on current and future ATM requirements for MET.

………
………
………
………

7. Contact Details

If you are happy to contacted for further follow-up or clarification please include your contact details here.

Name:
Organisation:
E-mail:
Phone:
Facsimile:

Attachment A – Example

STATE: Weatherland (fictitious country)

	A	**B**	**C**
Element	**Description of Use(s)**	**Current Source(s) of Information**	**Deficiencies and suggested improvements**
Surface Wind	Runway planning, capacity planning.	TAF, Trend, METAR, local report, Doppler Radar, real-time sensors	Information is of sufficient quality but could be packaged better. Forecast confidence indication would be beneficial. Graphical Display, longer lead times, confidence/alternate scenarios provided
Surface Wind Gusts	Runway planning, capacity planning.	TAF, Trend, METAR, local report, real-time sensors	Forecast gust information not available. No forecast information is available for low speed gusts threshold should be zero. Provided for whole of aerodrome but required for individual runway thresholds.
Visibility	Runway planning, flow management/capacity planning, sequencing	TAF, Trend, METAR, local report, real-time sensors	ATM thresholds reflected by forecasts or hourly values provided.
RVR	Not used	Nil	Not applicable
Vertical Visibility	Used to assess landing conditions	METAR, local report, real-time sensors	Nil
Thunderstorm	Runway planning, capacity planning. Assists with enroute diversion decisions.	TAF, Radar, Satellite Imagery, SIGWX charts (WAFS/Local),SIGMET/ AIRMET	Lack of spatial/temporal resolution. Require hourly en-route TS location forecast out the 3 hours, and to 60 minutes for terminal TS locations
Snow	Used to estimate surface movement delays, clearing requirements	TAF/Trend	Quantitative estimate would be useful.
Significant weather 3			
Significant weather 4			
Cloud base/amount	Runway planning, flow management/capacity planning, sequencing	TAF, Trend, METAR	Refer visibility

Turbulence (Terminal)	Short term capacity planning, sequencing	Aircraft reports, TAF, Trend, SIGMET/AIRMET	A intensity metric would be useful, more study the relationship between intensity and ATM impacts required
Wake Turbulence/Vortex information	Short term capacity planning, sequencing	Aircraft reports	Observed only - no forecast information available. Reliable forecasts could increase capacity through reductions in separation standards applied
Turbulence (Enroute)	Provides advice of possible enroute delays and congestion	Aircraft reports, SIGWX/SIGMET/AIRMET	Nil
Upper Winds	Flow management, sequencing	WAFS, Aircraft reports, Lidar	Temporal and spatial resolution inadequate for tailored arrival concept. Resolution required at least 3 hourly at 10km, and several more vertical levels.
Icing	Provides advice of possible en-route delays and congestion	Aircraft reports, SIGWX/SIGMET/AIRMET	Nil
Wind shear	Short term capacity planning, sequencing	Aircraft reports/Wind Shear Warnings	Information not available at long enough lead time for capacity planning Development of longer term forecasts required.
TC	Runway planning, capacity planning. Route planning	TC advisories, TAF/Trend/ briefings	Nil
VA	Route planning	VA advisories, briefings	Lack of VA information for poorly monitored volcanoes. Introduction of VA graphic has saved significant work and been very well received
Extended period forecasts (out to 72 hours)	Capacity planning, staff planning	Written briefing, verbal advice	Accuracy and temporal resolution of cloud base/visibility for airport capacity planning needs improvement at longer lead times.
Other 2			
Other 3			
Other 4			

STATE ATS SAFETY CONTACT POINTS

APANPIRG Conclusion 16/62 required the nomination by States of a Contact Officer or position to act as the focal point for ATS safety-related activities and in particular for the submission and coordination of ATS incident reports. The ICAO Asia and Pacific Regional Office (Bangkok, Thailand) maintains the following list in this regard.

Attention is drawn to the provisions in the ICAO Air Traffic Services Planning Manual (Doc 9426), Part II, Section 1, Chapter 3 – *ATS Incident Reporting* in relation to the reporting and investigation of ATS incidents.

(Last Updated 6 July 2007)

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CHAPTER 3

OPERATING PROCEDUES

FOR

AIS DYNAMIC DATA

(OPADD Edition 2.0)

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Appendix A1 - System Parameters

Appendix A2 - Glossary

1 INTRODUCTION

1.1 Preface

Within the Asia and Pacific Region, the AIS Implementation Task Force (AITF), which is a sub-group of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) ATM/AIS/SAR Sub-Group, has been monitoring the international and automation developments that relates to the NOTAM domain.

In particular, revisions to the EUROCONTROL Operation Procedures for AIS Dynamic Data (OPADD) have been tracked and compared to operating procedures used in the Asia Pacific region.

Principally, this work has been led by Japan and culminated in the second meeting of the AIRF (AITF/2, February 2007) where the Task Force formally agreed that EURO OPADD 2.0 excluding its Chapter 6 be adopted by APANPIRG for use as the Asia/Pacific OPADD.

Peter Hobson
Chairman of the AITF

1.2 Context

1.2.1 This document concerning the *Operating Procedures for AIS Dynamic Data* was developed within the frame of the European ATC Harmonisation and Integration Programme (EATCHIP), which has since become the European Air Traffic Management Programme (EATMP), for the benefit of the member States of the European Civil Aviation Conference (ECAC).

1.2.2 However, whilst elaboration of the document took place in the European context of EATCHIP/EATMP, the world-wide implication of AIS has been borne in mind during its development. The Standards and Recommended Practices (SARPS) of the Annex 15 – *Aeronautical Information Services* to the Chicago Convention on International Civil Aviation form the basis on which the Operating Procedures were detailed. Where elaboration of the definitions of the ICAO SARPS was found to be essential for the harmonised and coherent application of the Operating Procedures, these were collated to form an ICAO Annex 15 Amendment Proposal, which was submitted to the fourteenth Meeting of the ICAO EANPG in January 1999.

1.2.3 The new version of ICAO Annex 15 and ICAO Doc 8126 (Ref [1] and [2]) reflected a number of OPADD-derived proposals. Other such proposals were, however, not accepted for global applicability. Edition 2 of this OPADD document reflects in its Chapters 2-NOTAM Creation and 3-NOTAM Processing, the changes of which were agreed globally. The changes not agreed globally have either been deleted or moved to a separate chapter at the end of the document.

1.3 Purpose

1.3.1 These procedures correspond to the elaboration of the Specialist Task ST05 "Develop AIS Operating Procedures" of Executive Task 1 of the AIS Domain of EATCHIP/EATMP. Their objective is "*The provision of standardised procedures to improve the quality of AIS*" and they concur with the overall AIS Specialist Objectives:

"*To promote uniformity in the collection and dissemination of aeronautical information, in the interest of safety, quality, efficiency and economy*" and,

"*To improve overall efficiency of AIS, in terms of speed, accuracy and cost effectiveness, by the increased use of automation*".

1.3.2 Whilst all ECAC States consider that they act in conformity with the Annex 15 Integrated Aeronautical Information Package provision, significant differences of interpretation of the SARPS had been identified and it was acknowledged that a common understanding of procedures for NOTAM creation was a prerequisite for successful automated processing.

1.3.3 Therefore, the Operating Procedures contained in this Deliverable were developed to reach this common understanding.

1.4 Scope

1.4.1 The Operating Procedures for AIS Dynamic Data detail the procedures related to NOTAM, in general. Examples of SNOWTAM and ASHTAM as well as specific rules or guidance for harmonisation of these AIS Messages are also covered.

1.4.2 The ECAC States agree to follow them for NOTAM creation, as expressed in Chapter 2. The procedures are intended for guidance and may be implemented immediately in support of the EATM CIP Objectives.

1.4.3 The procedures for NOTAM creation detailed in Chapter 2 will also serve as a benchmark for the processing of incoming international NOTAM, in the sense that where incoming international NOTAM are not prepared in line with these procedures, they may be manually processed in accordance with the principles and procedures laid down in Chapter 3-NOTAM Processing. Chapter 3 is intended to be used as the default for harmonised NOTAM processing by a NOTAM Processing Unit (NPU).

1.4.4 The principles and procedures related to maintaining database completeness and coherence, along with the description of messages associated with this function, are provided in Chapter 4. These messages, such as request and reply messages are required to fulfil the maintenance function. These messages are based upon the use of AFTN, whereas the use of other communication means, using alternative formats, could be envisaged.

1.5 Referenced Documents

The following documents were used during the production of this edition:

Nº	Title	Edition	Date
1	ICAO International Standards and Recommended Practices Aeronautical Information Services - Annex 15	Twelfth	July 2004
2	ICAO Aeronautical Information Services Manual – Doc 8126-AN/872	Sixth	2003
3	ICAO Abbreviations and Codes – Doc 8400	Sixth	2004
4	EUROCONTROL Report on detailed NOTAM Processing Procedures		5 October, 1996
5	EUROCONTROL Static Data Procedures	1.0	15 Dec., 2002
6	ICAO Location Indicators – Doc 7910	123	March 2007

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2 NOTAM CREATION

2.1 Introduction

2.1.1 The international standard NOTAM format is contained in Annex 15 (Ref. [1]) to the ICAO Convention. It is the reference format for NOTAM and forms the baseline on which this document is developed.

2.1.2 The different types of NOTAM are identified by suffix letters 'N' (New), 'R' (Replacement) and 'C' (Cancellation) and the resulting identifier appears after the reference number as follows:

- NOTAMN (New NOTAM)
- NOTAMR (Replacement NOTAM)
- NOTAMC (Cancellation NOTAM)

Example: A0123/05 NOTAMN

2.1.3 Unless otherwise specifically stated in the text, the procedures described in this chapter refer to NOTAMN (New NOTAM); most of them also apply to NOTAMR and NOTAMC.

2.1.4 However, there are some particulars specification to NOTAMR (Replacement NOTAM) and NOTAMC (Cancellation NOTAM) creation. These are described in this chapter, at paragraph 2.4.

2.1.5 This chapter contains the operating procedures to be applied for the creation of NOTAM, and provides:

- Basic rules for NOTAM creation (paragraph 2.2 refers)

- Detailed procedures relative to each NOTAM Item (paragraph 2.3 refers)

- Procedures for NOTAMR and NOTAMC creation (paragraph 2.4 refers)

- Procedures for Checklist production (paragraph 2.5 refers)

- Procedures for the publication of Permanent information (paragraph 2.6 refers)

- Procedures for Trigger NOTAM creation (paragraph 2.7 refers)

2.1.6 The procedures relative to the processing of NOTAM are described in Chapter 3.

2.2 Basic Rules for NOTAM Creation

2.2.1 The ICAO NOTAM format shall be strictly adhered to and the only NOTAM types allowed are NOTAMN, NOTAMR and NOTAMC.

2.2.2 NOTAM intended for international distribution shall include English text for those parts expressed in plain language.

2.2.3 Each NOTAM shall be transmitted as a single telecommunication message.

2.2.4 A NOTAM shall deal only with one subject and one condition of that subject [Note exception for Trigger NOTAM – paragraphs 2.7.2.9, 2.7.2.10 and 2.7.2.11 refer].

2.2.5 Erroneous NOTAM shall be replaced; or they may be cancelled and a new NOTAM issued. No 'correct version' NOTAM shall be issued.

2.2.6 Renumbering of existing NOTAM (containing identical information, but with a new number) is not allowed. Renumbering at the beginning of each year is therefore also not permitted.

2.2.7 NOTAM are basically qualified according to the NOTAM Selection Criteria (NSC), as published in ICAO Doc 8126 (Ref. [2]) Chapter 6 Appendix B.

2.2.8 All published times shall be in UTC.

2.2.9 If Item C) contains 'EST', the NOTAM requires the later issue of a NOTAMR or NOTAMC.

2.2.10 A NOTAMR shall replace only one NOTAM. Both shall belong to the same NOTAM series.

2.2.11 A NOTAMC shall cancel only one NOTAM. Both shall belong to the same NOTAM series.

2.2.12 A NOTAM shall be cancelled only by a NOTAMC and never by a Checklist.

2.2.13 For NOTAMR and NOTAMC, the date/time in Item B) shall be equal to the actual date/time of creation of that NOTAMR and NOTAMC.

2.2.14 Item C) shall contain 'PERM' solely for NOTAM information that will be incorporated in the AIP. These NOTAM shall be cancelled according to the rules described in paragraph 2.6.3 when the AIP is updated.

2.2.15 Item E) should be composed by the Publishing NOF in such a way that it will serve for direct Pre-flight Information Bulletin entry without requiring additional processing by the receiving unit.

2.2.16 The following table shows the necessary data Items for each NOTAM type:

Data - Type	**NOTAMN**	**NOTAMR**	**NOTAMC**	**Checklist**
Series/Nr/Type	Yes	Yes	Yes	Yes
Ref to Series/Nr	No	Yes	Yes	Yes
FIR	Yes	Yes	Yes	Yes
NOTAM code	Yes	Yes	Yes	Yes
‘Traffic’	Yes	Yes	Yes	Yes
‘Purpose’	Yes	Yes	Yes	Yes
‘Scope’	Yes	Yes	Yes	Yes
Lower/Upper	Yes	Yes	Yes	Yes
Lat/Long/Radius	Yes	Yes	Yes	Yes
Item A)	Yes	Yes	Yes	Yes
Item B)	Yes	Yes	Yes	Yes
Item C)	Yes	Yes	No	Yes
Item D)	Optional	Optional	No	No
Item E)	Yes	Yes	Yes	Yes
Items F) & G)	Optional	Optional	No	No

Yes = Entry in Item is compulsory.
No = Entry in Item is not allowed.
Optional = Entry depending on the NOTAM contents.

2.3 Detailed Procedures

2.3.1 NOTAM Series Allocation

2.3.1.1 The use of a NOTAM Series identifier is always required, even for countries publishing only one single NOTAM Series.

2.3.1.2 Letters A to Z (1 character) are allowed, except S and T.

2.3.2 NOTAM Number

2.3.2.1 Consists of NOTAM number/year (4 digits/2 digits).

2.3.2.2 Each series will start on January 1st of each year with number 0001.

2.3.2.3 The NOTAM are issued in ascending and continuous sequence in each and every series.

2.3.3 NOTAM Type

2.3.3.1 Letters ‘N’ (new), ‘R’ (replace) and ‘C’ (cancel) are added as a suffix to the designator ‘NOTAM’ to indicate the NOTAM type or function.

Examples: A0123/05 NOTAMN;

A0124/05 NOTAMR A0123/05;

A0125/05 NOTAMC A0124/05

2.3.4 NOTAM Qualification Item Q) – General Rules

2.3.4.1 The NOTAM Selection Criteria (NSC) tables form the basis for NOTAM qualification. Guidance for their use is contained in ICAO Doc 8126 (Ref. [2]) Chapter 6 Appendix B.

2.3.4.2 NSC are used for the following:

a) the storage and retrieval of information;

b) to associate a NOTAM to particular purposes; and

c) to determine the relevance of a NOTAM for a given context (aerodrome, FIR, area, IFR or VFR flight, …).

2.3.4.3 Publishing NOF shall normally apply the qualifiers associated with the NOTAM code combinations in accordance with the NSC. Deviation from the corresponding 'Traffic', 'Purpose' and 'Scope' qualifiers is only allowed in exceptional cases; e.g. when required by National regulations or imposed by operational needs (refer to paragraph 2.3.6.6 for guidance).

2.3.4.4 All fields of the Item Q) shall be completed for each NOTAM type.

2.3.5 Qualifier 'FIR'

2.3.5.1 This Item shall normally contain the ICAO Location Indicator of the FIR within which the subject of the information is located geographically or, if the NOTAM is issued by a regional non-governmental agency, the location indicator allocated by ICAO to that agency.

<u>Example</u>: Q) RJJJ/QWELW/…..

A) RJAA

2.3.5.2 If more than one FIR of the same country are concerned, the ICAO nationality letters of that country (e.g. ZX) shall be followed by 'XX' (paragraph 2.3.5.4 Example 1 refers).

2.3.5.3 If more than one FIR of different countries are concerned (supra-national), the ICAO nationality letters of the responsible State (e.g. LI) shall be followed by 'XX' (paragraph 2.3.5.4 Example 2 refers).

2.3.5.4 In the case of multiple FIR, the ICAO location indicators of all FIR concerned shall be listed in Item A) (paragraph 2.3.15.2 refers).

<u>Example 1</u>: Q) ZXXX/QWELW/…..

A) ZGZU ZSHA ZBPE…..

<u>Example 2</u>: Q) LIXX/QWELW/…..

A) LIRR LIBB LATI…..

2.3.5.5 A location indicator allocated exclusively to an overlying UIR shall not be used.

Example: If the information relates to Rhein UIR, the allocated indicator ‘EDUU’ is not to be used in Item Q):

Q) EDXX/.....
A) EDFF EDMM

2.3.5.6 When a subject aerodrome is situated within the overlying FIR of another State, Item Q) shall contain the code for that overlying FIR (paragraph 2.3.14.4 refers).

Example: Q) LFRR/ …..
A) EGJJ.

2.3.5.7 Note that, in the absence of a clear and positive alternative, the insertion of location indicators such as LIXX in Item Q) (paragraph 2.3.5.4 Example 2 refers) enables identification of the Publishing NOF.

2.3.6 Qualifier ‘NOTAM CODE’

2.3.6.1 This Item shall contain the ICAO Doc 8126 (Ref. [2]) rationalised versions of NOTAM Codes published in ICAO Doc 8400 (Ref. [3]).

Note that if ICAO introduces new NOTAM Code subjects in Doc 8400 (Ref. [3]) (e.g. ‘GA’ and ‘GW’ for GNSS) before amending Doc 8126 (Ref. [2]), the allocation of qualifiers ‘Traffic’, ‘Purpose’ and ‘Scope’ shall be based on operational experience and orientated to similar subjects contained in the existing Doc 8126 NSC.

2.3.6.2 The NOTAM Selection Criteria (NSC) set out in ICAO Doc 8126 (Ref. [2]) Chapter 6 Appendix B provide a subject-related association of NOTAM Codes with the qualifiers ‘Traffic’, ‘Purpose’ and ‘Scope’.

2.3.6.3 Publishing NOF shall ensure that the NOTAM Code selected from the NSC describes the most important information to be promulgated.

Example: If required text reads: ‘Apron closed due work in progress’

Use QMK**LC** instead of QMK**HW**, i.e.:

Q) WSJC/**QMKLC**/IV/**BO**/A/.....

Instead of:

Q) WSJC/**QMKHW**/IV/**M**/A/.....

2.3.6.4 If the NSC tables do not contain an appropriate ‘Subject/Condition’ combination for the information to be promulgated, the letters ‘XX’ shall be used. However, every effort shall be made to use ‘Subjects’ and ‘Conditions’ that are listed in the NSC before deciding to use ‘XX’ as detailed in the following paragraphs.

2.3.6.5 If the Subject is not listed: use 'XX' as the 2nd and 3rd letters of the NOTAM Code. However, an overall term (such as ‘FA’ or ‘CA’) or a best fitting code shall be preferred whenever possible instead of ‘XX’.

Example: QXXAK

When 'XX' is used as the 2nd and 3rd letter combination, free association is possible with the qualifiers ‘Traffic’, ‘Purpose’ and ‘Scope’. These entries shall be selected with due regard to the qualifying NOTAM text.

2.3.6.6 If the Condition is not listed: use 'XX' as the 4th and 5th letters of NOTAM Code.

Example 1: QFAXX

When 'XX' is used as the 4th and 5th letter combination, free association is possible with the qualifiers ‘Traffic’ and ‘Purpose’ (but not with ‘Scope’ which is fixed by the NOTAM subject 2nd and 3rd letter combination). The ‘Traffic’ and ‘Purpose’ entries shall be selected with due regard to the qualifying NOTAM content and, by analogy, with the prevailing association of qualifiers to the respective subject (2nd and 3rd letters) in the NSC.

If the NOTAM contents do not justify the insertion of the prevailing qualifiers associated with the subject in the NSC, NOTAM shall be assigned the appropriate qualifiers taking into account the operational needs, especially for PIB output/query.

Example 2:

If required text reads: ‘Grass cutting in progress on aerodrome’, the prevailing qualifiers (‘Traffic’/‘Purpose’/‘Scope’) for ‘QFA’ (AD) are ‘IV/NBO/A/’.

But, depending on the activity’s expected impact on manoeuvring area operations, Item Q) could read: ‘…./QFAXX/IV/M/A/…..’

Example 3:

If required text reads: ‘RWY18 ILS LLZ coverage reduced to 25 degrees either side of the front course along a radius 10NM from the antenna …..’, the NOTAM Code and ‘Traffic’/‘Purpose’/‘Scope’ qualifiers in Item Q) may read: ‘QILXX/I/BO/A/ …..’

2.3.6.7 If, exceptionally, neither the Subject nor the Condition is listed: the code ‘QXXXX’ may be used.

When the NOTAM code 'QXXXX' is used, free association of the qualifiers ‘Traffic’, ‘Purpose’ and ‘Scope’ is possible.

Example:

Q) EKDK/QXXXX/IV/M/E/000/999/5533N00940E999

E) ACCORDING TO RESOLUTION 781 UNITED NATIONS HAS DECIDED TO ESTABLISH A BAN ON MIL FLIGHTS IN …..

2.3.7 Qualifier ‘TRAFFIC’

2.3.7.1 This qualifier relates the NOTAM to a type of traffic:

I = IFR Traffic

V = VFR Traffic

IV = IFR and VFR Traffic

K = NOTAM is a checklist, see paragraph 2.5.

2.3.7.2 The appropriate type of traffic should be taken from the NOTAM Selection Criteria (NSC).

2.3.7.3 However, the NSC contain certain subjects (2nd and 3rd letters) where the NOTAM subject/text may demand a different choice of ‘Traffic’ qualifier (I, V or IV). In these cases, the correct ‘Traffic’ entry shall be determined by the Publishing NOF.

Example: NOTAM code for ‘VFR REPORTING POINT ID CHANGED’ is ‘QAPCI’

The given NSC ‘Traffic’ Qualifier for ‘QAPCI’ is ‘IV’

But as the Reporting Point is for VFR use only;

Entry in Item Q) may be: ‘Q) LFFF/QAPCI/V/BO/E/000/200....’

2.3.8 Qualifier ‘PURPOSE’

2.3.8.1 This qualifier relates a NOTAM to certain purposes (intentions) and thus allows retrieval according to the user's requirements.

2.3.8.2 The appropriate ‘Purpose’ qualifier(s) should be taken from the NSC.

2.3.8.3 ‘PURPOSE’ entries:

N = NOTAM selected for the immediate attention of aircraft operators

Due to their importance these NOTAM require immediate attention of aircraft operators. Aircraft Operators may request specific delivery of such NOTAM or for their inclusion in specific Pre-flight Information Bulletins.

The NOTAM will appear in a specific Pre-flight Information Bulletin containing only NOTAM related to subjects of extreme importance selected for immediate attention. NOTAM qualified BO, B or M will not appear, so only NOTAM qualified NB[1] or NBO shall appear.

B = NOTAM selected for PIB entry

The NOTAM will appear in a Pre-flight Information Bulletin containing all NOTAM relevant to a general Pre-flight Information Bulletin query. NOTAM qualified B, BO, NB[1] or NBO shall appear in the Pre-flight Information Bulletin.

O = NOTAM Concerning flight operations

The NOTAM will appear in a specific Pre-flight Information Bulletin containing only NOTAM related to subjects that concern flight operations. NOTAM qualified B, NB[1] or M will not appear, only NOTAM with BO or NBO shall appear.

M = Miscellaneous

The NOTAM is for a 'miscellaneous' purpose and will not appear in a Pre-flight Information Bulletin, unless specifically requested.

K = The NOTAM is a checklist (see paragraph 2.5).

2.3.8.4 'PURPOSE' combinations:

The following combinations of one to three letters are permissible:

B, BO, NB[1], NBO and M

For a NOTAM Checklist, only K shall be used.

2.3.9 Qualifier 'SCOPE'

2.3.9.1 This qualifier relates the NOTAM subject (2nd and 3rd letters) to a specific scope. This qualifier is used to determine under which category a NOTAM is presented in a Pre-flight Information Bulletin, i.e. under 'Aerodrome', 'En-Route' or 'Navigational Warning'.

2.3.9.2 The following entries are permissible:

A = Aerodrome

Relates the NOTAM to the scope of 'Aerodromes'. Entry of an aerodrome (e.g. EGLL) in Item A) is compulsory.

E = En-route

Relates the NOTAM to the scope of 'En-route information'. Entry of one or more FIR in Item A) is compulsory.

W = Warning

Relates the NOTAM to the scope of 'Navigation Warnings'. Entry of one or more FIR in Item A) is compulsory.

AE = Aerodrome/En-route

Relates the NOTAM to both scopes 'A' and 'E'.

Scope 'AE' is used whenever an aerodrome-related NOTAM (e.g. certain navigational aids) affects both aerodrome and en-route operations. For navigation warnings refer to 'AW'.

[1] Note that, whilst change is expected, the use of 'NB' remains prescribed in the ICAO NSC at the time of writing this edition.

Item A) shall contain the location indicator of the Aerodrome (e.g. EHAM).

Example: Q) EHAA/QNMAS/IV/BO/AE/000/999/5216N00442E025
A) EHAM B) 0504170500 C) 0504170700
E) VOR/DME AMS FREQ 113.95MHZ/CH96Y U/S

In this example, Item Q) shall contain geographical co-ordinates and a radius centred on the Navigational Aid.

When such a Navigational Aid is serving two or more aerodromes, only one NOTAM shall be published with scope 'AE'. NOTAM for other aerodromes concerned shall be published with scope 'A' only.

AW = Aerodrome/Warning

Relates the NOTAM to both scopes ‘A’ and ‘W’.

Although scope ‘AW’ is not explicitly listed in the ICAO NSC tables, it shall be used whenever both aerodrome and en-route traffic is affected by a Navigational Warning taking place on or in the near vicinity of an aerodrome.

Item A) shall contain the aerodrome location indicator, and Item Q) shall contain the geographical co-ordinates of the location where the activity takes place, followed by the radius.

Example: Q) LOVV/QWPLW/IV/M/AW/000/160/4720N01113E010
A) LOWI B)0410201400 C) 0410202200
E)MIL PJE WILL TAKE PLACE AT SEEFELD 471940N0111300E RADIUS 10NM.
F) GND G) FL160)

Note that co-ordinates for LOWI AD are 471539N0112040E, but the actual co-ordinates of the site where the activity takes place are entered in Item Q).

When a Navigational Warning affects two or more aerodromes, only one NOTAM shall be published with scope 'AW'. NOTAM for other aerodromes concerned shall be published with scope 'A' only.

K = Checklist

Relates the NOTAM to a checklist, which will not appear in a Pre-flight Information Bulletin. Entry in Item A) of the FIR(s) valid for the Publishing NOF is compulsory (refer to paragraph 2.5).

2.3.9.3 The appropriate entries should be taken from the NOTAM Selection Criteria.

2.3.9.4 However, the NSC contain certain subjects (2nd and 3rd letters) where the ‘Scope’ (A, E, W, AE or AW) depends on the NOTAM text. In these cases, the correct ‘Scope’ entry shall be determined by the publishing NOF according to NOTAM text.

Examples: ‘QOB . .’ = Obstacle = ‘AE’ in NSC but could also be ‘A’ or ‘E’ only;

‘QWA . .’ = Air Display = ‘W’ in NSC but could also be ‘AW’;

‘QNV . .’ = VOR = ‘AE’ in NSC but could also be ‘E’.

‘QOA . .’ = AIS = ‘A’ in NSC but could also be ‘AE’ (e.g. if AIS is also responsible for other aerodromes in the FIR) or ‘E’ if the NOTAM refers to national NOF or information provision.

‘QST . .’ = TWR = ‘A’ in NSC but could also be ‘AE’ (e.g. if TWR also serves en-route traffic).

2.3.9.5 If the letters ‘XX’ are inserted as 4th and 5th letters of the NOTAM code, the appropriate ‘Scope’ must be derived from the NOTAM-subject (2nd and 3rd letters of the NOTAM Code) according to the NSC.

2.3.9.6 Recapitulation of ‘Scope’ qualification possibilities and respective Item A) contents:

Qualifier ‘SCOPE’	Item A) contents
A	Aerodrome
AE	Aerodrome
E	FIR(s)
W	FIR(s)
AW	Aerodrome
K	FIR(s)

2.3.10 Qualifiers ‘LOWER/UPPER’

2.3.10.1 These qualifiers relate a NOTAM to a vertical section of airspace by reference to specific lower/upper limits. This allows lower/upper limits to be specified in requests for pre-flight information and, by doing so, any NOTAM not relating to all or part of the requested vertical section may be excluded from the retrieved Pre-flight Information Bulletin obtained.

2.3.10.2 The limits specified in these qualifiers are given as ‘flight levels’ only.

Example: ‘Q) …/090/330/…’ = from ‘Lower’ FL 090 up to ‘Upper’ FL 330

2.3.10.3 The ‘Lower’ limit shall be inferior or equal to the ‘Upper’ limit.

2.3.10.4 In the case of Navigation Warnings and Airspace Reservations, the values specified in 'Lower' and 'Upper' shall correspond to the values specified in Items F) and G) (paragraph 2.3.23 refers).

2.3.10.5 The addition of ‘buffers’ to these qualifiers, either manually or within system software, which increase the airspace to be considered for PIB purposes, shall be avoided.

2.3.10.6 When the values in F) and G) are expressed as ‘flight levels’ (FL), then the same FL values will be entered respectively as the ‘Lower/Upper’ values in Item Q).

2.3.10.7 When the values in F) and G) are expressed as an ‘altitude’ (AMSL), then the corresponding FL values (based on the standard atmosphere) will be entered as the ‘Lower/Upper’ values in Item Q).

Example: F) 2000FT AMSL G) 7500FT AMSL

= ‘Lower/Upper’: 020/075

2.3.10.8 When the values in F) and G) are expressed as a ‘height’ (AGL), and no corresponding flight levels can be defined (i.e. the terrain elevation of the affected area is unknown to the Publishing NOF despite all possible action having been taken to obtain the data), then, as an exception, the default values '000/999' should be entered for the ‘Lower/Upper’ values in Item Q).

Example: F) 2000FT AGL G) 7500FT AGL

= ‘Lower/Upper’: 000/999.

2.3.10.9 In the case of Airspace Organisation (NOTAM related to structure of ATS Routes, TMA, CTR, ATZ, etc.), the specified ‘Lower/Upper’ values shall correspond to the vertical limits of the airspace concerned. The use of default values 000/999 shall be avoided whenever possible.

Example: Q) LFFF/QATCA/IV/NBO/AE/000/**055**/4929N00212E027

A) LFOB

B) 0502010630

C) 0503262130

D) 0630-2130

E) BEAUVAIS CTR, TMA 1, TMA 2 AND TMA 3 ACTIVATED 0630-2130 WHEN CREIL S/CTR DEACTIVATED, TMA 4 ACTIVATED DURING SLOTS DESCRIBED ABOVE.

The upper limit of the BEAUVAIS TMA is FL055 as correctly reflected in the Q-line qualifier ‘Upper’.

2.3.10.10 In the case of en-route obstacles (e.g. TV masts) no Items F) and G) are included, but appropriate values shall be used in Item Q), based on local elevation. Use of default value '000/999' shall be avoided.

2.3.10.11 Most aerodrome-related information, 'Scope' ‘A’, refers to ground installations for which the insertion of an Upper Limit is not relevant. Therefore, if specific height indications are not required, these NOTAM shall include the default values '000/999'.

2.3.10.12 Whenever the aerodrome-related information also affects the overlying or surrounding airspace, the Lower/Upper Limits need to be specified; and the ‘Scope’ qualifier shall read ‘AE’ or ‘AW’.

2.3.10.13 The values entered in the qualifier 'Lower' shall be rounded off to the nearest lower flight level and the values entered in the qualifier 'Upper' shall be rounded off to the nearest higher flight level. The indicated flight levels shall correspond to the semi-circular table of cruising levels. Below FL200 increments of 500ft shall be used, above FL200 increments of 1000ft shall be used.

Example: F) 2300FT AMSL G) 6200FT AMSL

= ‘Lower/Upper’: 020/065.

2.3.11 Qualifier 'GEOGRAPHICAL REFERENCE' – General Rules

2.3.11.1 This qualifier allows the geographical association of a NOTAM to a facility, service or area that corresponds to the aerodrome or FIR(s) given in Item A), and is composed of two elements.

2.3.11.2 The first element contains one set of co-ordinates comprising 11 characters rounded up or down to the nearest minute; i.e. Latitude (N/S) in 5 characters; Longitude (E/W) in 6 characters.

2.3.11.3 The second element contains a radius of influence comprising 3 figures rounded up to the next higher whole Nautical Mile encompassing the total area of influence; e.g. 10.2NM shall be indicated as 011.

<u>Example</u>: Q) EDLL/QWELW/IV/BO/W/000/310/**5410N00845E011**.

2.3.12 Qualifier 'GEOGRAPHICAL REFERENCE' – Co-ordinates

2.3.12.1 For NOTAM with 'Scope' 'A' the Aerodrome Reference Point (ARP) co-ordinates shall be inserted.

2.3.12.2 For NOTAM with 'Scope' 'AE' or 'AW' the appropriate co-ordinates shall be inserted. These co-ordinates may be different from the ARP.

e.g. A VOR situated at an aerodrome will not necessarily have the same co-ordinates as the ARP. The same applies for a Navigation Warning that affects the aerodrome traffic, at or in the close vicinity of an aerodrome, and whose co-ordinates may also be different from the ARP.

2.3.12.3 For NOTAM with 'Scope' 'E' or 'W' referring to a given/known point (Navigational Aid, Reporting point, City, etc.) these co-ordinates shall be inserted.

2.3.12.4 If a NOTAM with 'Scope' 'E' or 'W' refers to an area (FIR, Country, Danger Area etc.), the co-ordinates represent the approximate centre of a circle whose radius encompasses the whole area of influence.

2.3.12.5 For NOTAM with 'Scope' 'E' or 'W' containing information that cannot be allocated a specific geographical position (e.g. VOLMET, Entry requirements, Communication failure, SRS publications etc.) the co-ordinates represent the approximate centre of a circle whose radius encompasses the whole area of influence (this may be the centre of an FIR or multiple FIR, e.g. for an entire State)

2.3.13 Qualifier 'GEOGRAPHICAL REFERENCE' – Radius

2.3.13.1 Radius shall be used in a way that it encompasses the total area of influence of the NOTAM. The radius entered shall be as precise as possible. Use of an excessive radius indication (e.g. by entering the default '999' instead of the actual radius) causes unnecessary PIB coverage and shall be avoided.

2.3.13.2 Whenever a NOTAM relates to an entire FIR or FIR group (e.g. for a State with more than one FIR or for those FIRs encompassed by the indicator of an organisation responsible for the provision of ANS in more than one State), then '999' shall be entered as the radius.

The use of the radius value ‘999’ shall allow an automated system to retrieve such information only against the FIR(s) indicated in Item A). Adjacent FIR(s), even within the radius of influence, are never affected by this information.

Example: Q) EDXX/QXXXX/IV/BO/E/000/999/5120N01030E**999**
A) EDBB EDFF EDLL EDMM EDWW
B) 0501010000 C) PERM
E) FLIGHTS TO/FROM THE CONTRACTING STATES OF THE SCHENGEN REGIME MAY BE CONDUCTED TO/FROM ANY AERODROME WITHIN THE FEDERAL REPUBLIC OF GERMANY. THE OBLIGATION TO USE A DESIGNATED CUSTOMS AERODROME IS WITHDRAWN.

2.3.13.3 For certain specific NOTAM subjects, the radius should be standardised for the sake of uniformity and simplicity. A list of default radius per NOTAM Code is given in the following table.

Table of Default Radius Indicators for NOTAM Creation

NOTAM Code	Plain Language	Radius (NM)
Q - - - -	All Aerodrome-related NOTAM (‘Scope’ ‘A’ only) The default value shall also be used for ‘Scope’ ‘AE’/‘AW’, but only if appropriate values cannot be defined.	005 005 if no appropriate value can be found
QN - - -	All Navigation Aids (VOR, NDB ...) except: Long Range Navigation Systems, e.g. GPS, LORAN-C, en-route DME…	025
QOB - -	OBST	005
QOL - -	OBST LIGHT	005
QPH - -	Holding Procedure	025
QPX - -	Minimum Holding Altitude	025
QAP - -	Reporting Point	005
QAX - -	Intersection	005

Note: Due to the dense network of ground-based navigation aids in Europe, these default values should be used by the Publishing NOF in order not to overload Pre-flight Information Bulletins with superfluous information.

2.3.14 Item A) – Single Location (FIR or AD)

2.3.14.1 In the case of a single FIR, the Item A) entry must be identical to the ‘FIR’ qualifier entered in Item Q).

2.3.14.2 The use of FIR (rather than UIR) indicators in Item A) is encouraged, unless specifically required by the NOTAM text.

2.3.14.3 If the NOTAM text relates to an overlying UIR, either the FIR or the UIR location indicator shall be inserted in Item A) with appropriate levels of the UIR in the Lower/Upper fields of the Item Q).

2.3.14.4 Note that in the case of Item Q), only an FIR indicator or the ICAO nationality letters followed by XX (or XXX for countries with a single-letter indicator) shall be inserted.

2.3.14.5 When an aerodrome indicator is given, it must be an aerodrome situated in the FIR entered in Item Q). This shall apply even when the aerodrome is situated within an overlying FIR of another State, e.g. NOTAM for EGJJ shall have LFRR in Item Q).

2.3.14.6 If no 4–letter ICAO location indicator for an aerodrome exists, Item A) shall contain either the two ICAO nationality letters + XX (EDXX) or the single ICAO nationality letter + XXX (KXXX); with the full name of the aerodrome as the first element in Item E).

Note: States shall take urgent steps to ensure that:

- all aerodromes which may be the subject of international NOTAM have an ICAO location indicator;

- the same location indicator is not used for an aerodrome and an FIR.

Examples: A) RJJJ (ICAO location indicator for a single FIR)

A) ZSHA (ICAO location indicator for an Aerodrome)

A) EDXX (used for locations in Germany without an ICAO indicator - the full name of the aerodrome, e.g. SACHSENRING-HOHENSTEIN-ERNSTTAL must then be stated as the first element in Item E)

2.3.15 Item A) – Multi-Location (FIR or AD)

2.3.15.1 If more than one AD is involved, separate NOTAM shall be issued.

2.3.15.2 If more than one FIR is concerned:

(a) all FIR location indicators affected by the information shall be entered in Item A), each separated by a space;

(b) the number of FIR in Item A) is restricted to 7 by the current ICAO NOTAM format (length of an AFTN line). If more than 7 FIR are affected, the Publishing NOF or responsible non-governmental agency (paragraph 2.3.5 refers) may use a unique and unambiguous ICAO location indicator that serves the purpose of publication of NOTAM information related to more than 7 FIRs. If no such unique ICAO location indicator exists, additional NOTAM shall be published as required.

Example: UUUU is the ICAO location indicator for the Moscow AFTN COM Centre. This indicator is also used to represent all FIRs in the

Commonwealth of Independent States included in the AIP of the Russian Federation. This unique location indicator can be used by the Moscow NOF to publish information that relates to all FIR, such as NOTAM Checklists.

In such cases both Item A) and Item Q) could read 'UUUU'

(c) the FIR qualifier of the Item Q) contains the ICAO nationality letter(s) + XX (or XXX). For 'supra-national' information, i.e. more than 1 FIR belonging to several countries, the ICAO nationality letter of the Publishing NOF (followed by XX or XXX) must be entered as the 'FIR' qualifier in Item Q).

Example 1: Multiple FIRs in one country:
Item A) LFFF LFBB LFRR
Item Q) LFXX

Example 2: Multiple FIRs in different countries:
Item A) EDFF EBBU LFFF
Item Q) EDXX *(if the NOTAM is originated by the German NOF)*

Example 3: Multiple FIRs in different countries issued by a non-governmental agency:
Item A) EGTT EHAA EKDK
Item Q) EUXX *(if the NOTAM is originated by the CFMU)*

2.3.15.3 If referring to a navigation aid serving more than one AD: issue separate NOTAM for each AD.

Note that NOTAM 'Scope' for navigation aid serving both AD and ENR shall be 'AE' for the primary AD location and 'A' for any other AD.

2.3.15.4 If referring to GNSS, insert the appropriate ICAO location indicator allocated for a GNSS element or the common location indicator allocated for all elements of GNSS (except GBAS).

Note that in the case of GNSS, the location indicator KNMH is being used by USA NOF to notify a GNSS element outage.

2.3.16 Item B) – Start of Activity

2.3.16.1 Ten-figure date-time group giving year, month, day, hour and minutes at which the NOTAM comes into force.

Example: B) 0507011200 (1st of July 2005, 12:00 UTC)

2.3.16.2 Insertion of 'WIE' or 'WEF' is not permitted.

2.3.16.3 The start of a UTC day shall be indicated by '0000' (i.e. do not use '0001').

2.3.16.4 A NOTAM is 'valid' from the moment it is published, whereas it only becomes 'in force' at the date-time group specified in Item B).

2.3.16.5 The Item B) date/time group should be equal to or later than the actual date/time of creation of the NOTAM.

2.3.16.6 However, for NOTAMR and NOTAMC, the Item B) time shall correspond to the actual date/time of creation of that NOTAMR or NOTAMC. No future coming into force is permitted (paragraph 2.4.1.5 refers).

2.3.16.7 Note that the date/time of creation may precede the date/time of transmission by a few minutes, due to the time required for the full completion and review of the NOTAM data;

2.3.16.8 Refer to paragraph 2.3.18.17 for NOTAM advising changes to previously published operating or activity hours.

2.3.17 Item C) – End of Validity

2.3.17.1 For NOTAM of a known duration of validity, a ten-figure date-time group giving year, month, day, hour and minute at which the NOTAM ceases to be in force and becomes invalid. This date and time shall be later than that given in Item B).

Example: C) 0507022030

2.3.17.2 The end of a UTC day shall be indicated by ‘2359’ (i.e. do not use ‘2400’).

2.3.17.3 For NOTAM of uncertain duration of validity, the date-time group shall be followed by ‘EST’ (estimate).

Example: C) 0507031230EST

Note that any NOTAM which includes an ‘EST’ shall be cancelled or replaced before the date-time specified in Item C).

2.3.17.4 Insertion of ‘UFN’ or ‘APRX DUR’ are not permitted.

2.3.17.5 For NOTAM containing information of permanent validity that will be incorporated in the AIP, the abbreviation ‘PERM’ is used instead of a date-time group.

Example: C) PERM

2.3.17.6 Item C) shall not be included in a NOTAMC.

2.3.17.7 In cases where the activity promulgated by a NOTAM does or does not take place on a given alternative date (or dates), the Publishing NOF shall take the necessary action to ensure that the NOTAM is cancelled or replaced with updated information at the appropriate time.

2.3.17.8 Refer to paragraph 2.3.18.17 for NOTAM advising changes to previously published operating or activity hours.

2.3.18 Item D) – Day/Time Schedule – General Rules

2.3.18.1 This Item needs to be inserted only when the information contained in a NOTAM is not relevant for users at certain periods within the overall 'in force' period, i.e. between the dates and times given in Items B) and C). In these cases, Item D) will detail the actual periods of activation.

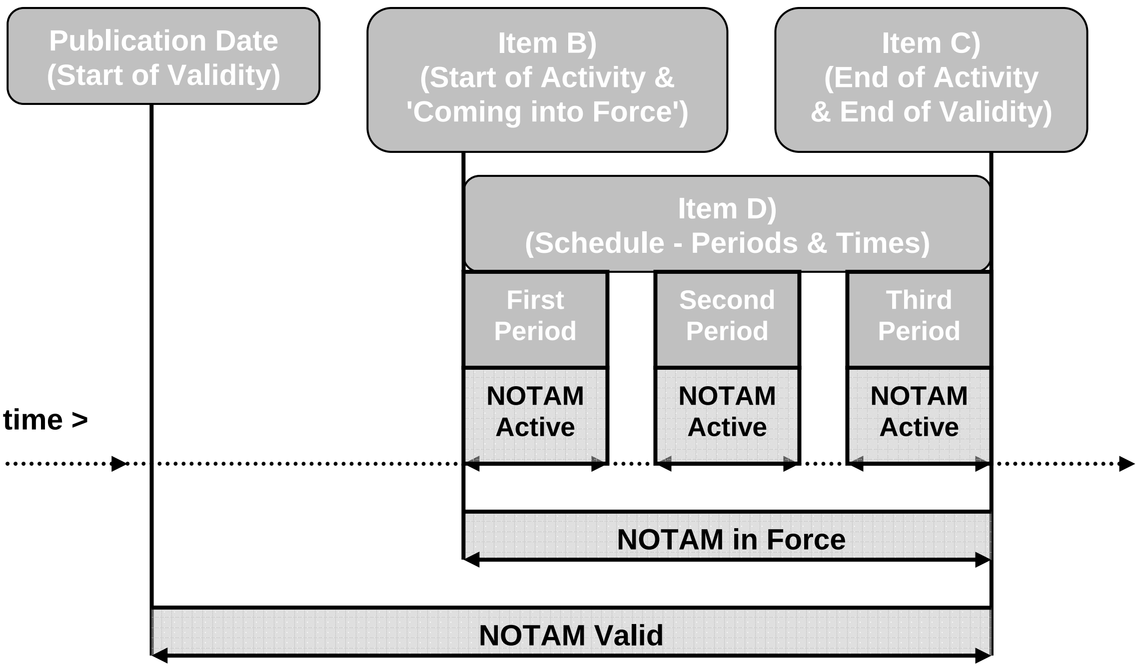
2.3.18.2 The start of the first activity in Item D) shall always correspond with the Item B) date and time. This period shall always appear as the first entry in Item D) – see paragraph 2.3.21 Examples.

2.3.18.3 Note that if the NOTAM is issued during an activity period that is defined by days of the week and that will be repeated, then the first day given in Item D) may not equate literally to the date in Item B).

Example: If D) = MON-FRI, the date in B) may be a WED (i.e. the first activity period starts on the WED and ends on the FRI, and subsequent periods run from MON to FRI)

2.3.18.4 The end of the latest activity period notified in Item D) shall always correspond with the end of the validity of the NOTAM given in Item C). Note that this period may not always be listed as the final entry in Item D) – see paragraph 2.3.21 Examples.

2.3.18.5 The following diagram illustrates the relationship between the time-related expressions used in the OPADD:



2.3.18.6 Automated processing (and to a certain extent manual processing) thus allows exclusion of a NOTAM from PIB whenever it is inactive between the dates and times given in Items B) and C).

2.3.18.7 Item D) shall be structured according to the following rules. These provide clear and unambiguous standard expressions allowing automated processing for Pre-flight Information Bulletin production, while maintaining a good and clear readability in manual environments.

2.3.18.8 A time indication shall be inserted for each period of activity. When the activity covers a full day, H24 shall be inserted after the date(s).

2.3.18.9 When the activity covers more than 24 hours, the following syntax is recommended:
(start date) (start time)-(end date) (end time)

2.3.18.10 When the activity covers less than 24 hours, the following syntax is recommended:
(date) (start time)-(end time)

2.3.18.11 When the activity is a succession of identical periods of less than 24 hours on consecutive days, the following syntax is recommended:

(start date)-(end date) (start time)-(end time)

2.3.18.12 When entering a succession of activities that spans midnight UTC, the following syntax is recommended:

(start date) (start time)-(end time)

Note that the end date is omitted from Item D) but that it will appear in Item C).

Example 1: a period 05 2200-0500 would mean from the 5th at 2200 until the 6th at 0500 (i.e. B) 05052200 C) 05060500).

Example 2: a period WED 2200-0500 would mean from WED at 2200 until THU at 0500.

2.3.18.13 When the activity spans midnight UTC on successive days, the following syntax is recommended:

(start date)-(start date of last period) (start time)-(end time)

Note that the period end dates are omitted from Item D) but that the last one will appear in Item C).

Example 1: a period 05-07 2200-0500 would mean from the 5th at 2200 until the 6th at 0500 and from the 6th at 2200 until the 7th at 0500 and from the 7th at 2200 until the 8th at 0500 (i.e. B) 05052200 C) 05080500).

Example 2: a period WED-FRI 2200-0500 would mean from WED at 2200 until THU at 0500 and from THU at 2200 until FRI at 0500 and from FRI at 2200 until SAT at 0500.

2.3.18.14 If all periods of activity start in the same month, it is not necessary to include the name of the month in Item D) – see paragraph 2.3.21 Example 6.

2.3.18.15 If Item D) exceeds 200 characters, additional NOTAM shall be issued.

2.3.18.16 The maximum time period between 2 consecutive activity periods shall not exceed 7 days. If the time gap between consecutive activity periods is 8 days or more, additional NOTAM shall be issued.

2.3.18.17 When a NOTAM is issued to notify a change to previously published operating or activity hours, the time range indicated by Items B) and C) shall, if necessary, combine the new and previous periods to encompass the widest time period. The new schedule shall be presented in Item E) and not in Item D).

Example 1: Operating hours of ATC are changed from **1000**-**2000** to 1200-1900:
B) YYMMDD**1000**
C) YYMMDD**2000**
E) OPERATION HOURS OF ATC CHANGED FROM 1000-2000 TO 1200-1900 (AIP AD 2.3 REFERS)

Example 2: Operating hours of ATC are changed from **1000**-1800 to 1200-**1900**:
B) YYMMDD**1000**

C) YYMMDD**1900**
E) OPERATION HOURS OF ATC CHANGED FROM 1000-1800
TO 1200-1900 (AIP AD 2.3 REFERS)

Example 3: Operating hours of ATC are changed from 1000-1800 to **0800**-**1900**:
B) YYMMDD**0800**
C) YYMMDD**1900**
E) OPERATION HOURS OF ATC CHANGED FROM 1000-1800
TO 0800-1900 (AIP AD 2.3 REFERS)

2.3.19 Item D) – Day/Time Schedule – Abbreviations and Symbols Used

2.3.19.1 Standardised abbreviations and punctuation shall be used in Item D) as described in the following paragraphs.

2.3.19.2 Abbreviations for Dates and Times:

Year: The year shall not be inserted in Item D), as it is stated in Items B) and C).

When the planned time schedule goes from one year into another, the displayed data shall remain in chronological order; i.e. December of this year shall precede January of next year.

Months: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Dates: 01 02 03 .... 29 30 31

Days: MON TUE WED THU FRI SAT SUN

Times: Written as 4 digits (e.g.: 1030)

2.3.19.3 Abbreviations for Time Periods and associated text:

‘EXC’ for ‘except’

‘DAILY’ is optional for a ‘daily’ schedule

‘EVERY’ for a schedule on fixed days

‘HJ’ for the period from Sunrise (SR) till Sunset (SS)

‘HN’ for the period from Sunset (SS) till Sunrise (SR)

‘H24’ for the whole day/dates concerned. Not be used as a single entry.

‘SR’ and/or ‘SS’ if appropriate to indicate Sunrise or Sunset

‘AND’ if used, shall be included in front of the last date or the last group or time period specified in Item D).

2.3.19.4 Punctuation:

‘ , ’ (comma)	for separation of the schedule elements; or groups of dates or days to which the same time periods apply; or groups of time periods that all apply to the preceding and qualifying dates or days (refer to paragraph 2.3.21 Example 5 last sample for clarification).
‘ - ’ (hyphen)	means ‘TO’ or ‘FROM-TO’
‘ ’ (blank)	is read as ‘AND’. If appropriate, the last date or time period shall be preceded by the word 'AND' instead of a blank.
‘ / ’ (oblique)	shall not be used in Item D).

2.3.20 Item D) – Day/Time Schedule – Special Cases

2.3.20.1 Sunrise (SR) and Sunset (SS): If the active time of a NOTAM corresponds to sunrise or sunset, the actual times of sunrise on the first day of validity and of sunset on the last day of validity should be inserted in Items B) and C) respectively.

Examples: B) 0505150446 C) 0505201633 D) HJ

B) 0505151920 C) 0505200437 D) SS-SR

2.3.20.2 Twilight Periods: The keywords for expressing the beginning and end of twilight periods, are ‘SR MINUS**’ and ‘SS PLUS**’ (** = number of minutes up to a maximum of 99). Note that there shall be a blank space after ‘SR’ and ‘SS’ and that the number of minutes shall be inserted immediately after ‘MINUS’ or ‘PLUS’.

Example: B) 0505110413 C) 0505211701 D) SR MINUS30-SS PLUS30

2.3.20.3 Processing of SR and SS Formats: Due to the daily variation of SR and SS times, it may not be possible to automatically interpret the special formats as actual times for PIB output. If this is the case, the NOTAM will be displayed in the PIB for the whole day concerned.

2.3.20.4 Legal or Public Holidays: The dates must be stated explicitly due to differences existing between States.

2.3.20.5 Long or Complicated Schedules: These should not be given in a structured Item D). Such schedules should be ‘split’ and separate NOTAM should be issued.

2.3.21 Item D) – Day/Time Schedule – Examples

2.3.21.1 The following examples pre-suppose a correct calendar and the application of the rule that the start of the first activity in Item D) coincides with the Item B) date and time, and the end of the last activity with that in Item C). Therefore, Items B) and C) (i.e. the defined time periods) are not shown in the examples unless required for clarification.

Example 1: Repetitive event active every day:

D) 0700-1000

or

D) DAILY 0700-1000

Example 2: Repetitive event active on a certain weekday:

B) 0503070000 C) 0503282359

D) EVERY MON H24

Example 3: Activity only on specific days within the period:

B) 0502070000 C) 0502112359

D) 07 09 AND 11 H24

Example 4: Various day-periods explained by FROM-TO:

D) 07-11 AND 16-18 H24

Example 5: Combination of day-periods and time-periods:

D) FEB 08-28 2000-2200 AND MAR 01-05 1800-2200

D) FEB 08-28 DAILY 2000-2200 AND MAR 01-05

DAILY 1800-2200

D) WED SAT 1000-1400 AND SUN-TUE 1500-1800

D) FEB 08 10 12 1000-1600 1800-2000, 13-28 1200-1900,

MAR 01-05 1000-1300 AND 1500-1700

Example 6: Combination of whole day-periods (H24) with part day-periods:
Activity H24 on WED and FRI, and from 0600 to 1700 on SUN:

B) 0502130600 C) 0502252359

D) SUN 0600-1700, WED AND FRI H24

or

D) 13 20 0600-1700, 16 18 23 AND 25 H24

Example 7: Day-period and time-period with specific exceptions:

D) SUN 0700-1800 EXC FEB 20 AND MAR 13

or, for an ‘overnight’ period where the exception is from Thursday 17th until Friday 18th:

D) THU 1200-0300 EXC FEB 17

or, for where alternative times apply on the excepted date:

D) THU 0300-1200 EXC FEB 17 AND FEB 17 1400-1600

Example 8: Activity from WED 1900 to FRI 0600, during 2 consecutive weeks.

B) 0506011900 C) 0506100600

D) WED 1900-FRI 0600

or

D) 01 1900-03 0600 AND 08 1900-10 0600

Example 9: The activity takes place every day between 2300 and 0500. The periods start on April 30 at 2300 and ends on May 05 at 0500:

B) 0504302300 C) 0405050500

Instead of:
D) APR 30-MAY 04 2300-0500

Recommend:
D) DAILY 2300-0500

or

D) 2300-0500

Example 10: First period of activity starts on May 06 at 2300 and ends on May 07 at 0500 and a series of subsequent 2300-0500 periods starts on May 10 at 2300 and ends on May 15 at 0500:

B) 0505062300 C) 0505150500

D) 06 AND 10-14 2300-0500

A series of 2300-0500 periods starts on May 06 at 2300 and ends on May 10 at 0500 and the final period starts on May 10 at 2200 and ends on May 11 at 0600:

B) 0505062300 C) 0505110600

D) 06-09 2300-0500 AND 10 2200-0600

Example 11: The following alternative methods for schedules starting on one date and ending on the next may be considered more descriptive but they are not recommended because of their complexity:

B) 0505062300 C) 0505101300

Instead of:
D) 06 2300-2359, 07-09 0000-1300 2300-2359 AND 10 0000-1300

Recommend:
D) 06-09 2300-1300

and

B) 0509112110 C) 0510310740

Instead of:

D) SEP 11 17-19 22 24 25 OCT 01 02 08-10 15 16 22 23 29 30 2110-2359, SEP 12 18-20 23 25 26 OCT 02 03 09-11 16 17 23 24 30 AND 31 0000-0740

Recommend:
D) SEP 11 17-19 22 24 25 OCT 01 02 08-10 15 16 22 23 29 AND 30 2110-0740

Example 12: Description of a schedule omitting the unnecessary abbreviation for the month:

B) 0505051300 C) 0505271930

Instead of:
D) MAY 05 07 09 1300-1600, MAY 11-23 1330-1500 AND MAY 24-27 1630-1930

Recommend:
D) 05 07 09 1300-1600, 11-23 1330-1500 AND 24-27 1630-1930

Example 13: Activity relative to Sunrise and/or Sunset:

D) SR-SS

D) SR MINUS30-SS

D) SR MINUS30-1500

D) 0800-SS

D) 0800-SS PLUS30

Example 14: Periods of activity longer than 24 hours:

B) 0505050300 C) 0505201450

D) 05 0300-13 1400 AND 15 1800-20 1450

This Item D) indicates two periods of continuous activity: the first starting on the 5th at 0300 and ending on the 13th at 1400; the second from the 15th at 1800 to the 20th at 1450.

Example 15: Given the following Complex/Mixed schedule:

There are several alternative ways of presenting the following information more clearly and effectively by using more than one NOTAM.

B) 0503220700 C) 0504210900

D) MON TUE 0700-1000 1200-1300 EXC MAR 23 30, WED 0700-0900, APR 01-04 1800-2000, 08 09 1700-1900, 10 H24, 11 SR MINUS30-SS AND 15 2000-17 0900

A preferred method is to divide it into two monthly periods and, to facilitate greater PIB clarity, create a third NOTAM for the period 01-04 April in which activities are not expressed using weekday abbreviations.

For the two elements using weekday abbreviations:

NOTAM 1: B) 0503220700 C) 0503310900

D) MON TUE 0700-1000 1200-1300 EXC 23 30, AND WED 0700-0900

NOTAM 2: B) 0504050700 C) 0504210900

D) MON TUE 0700-1000 1200-1300, WED 0700-0900, 08 09 1700-1900, 10 H24, 11 SR MINUS30-SS AND 15 2000-17 0900

For the elements using dates:

NOTAM 3: B) 0504011800 C) 0504042000

D) 1800-2000

2.3.22 Item E) – NOTAM Text

2.3.22.1 Item E) is free text in plain language and does not contain NOTAM Code.

2.3.22.2 In NOTAM intended for international distribution the plain language text shall be in English. An English language translation of the NOTAM Code is provided by the NOTAM Selection Criteria.

2.3.22.3 Item E) text should be kept as short and concise as possible and so compiled that its meaning is clear without the need to refer to another document. Publishing NOF should endeavour not to exceed 300 characters; whilst ensuring that all essential information needed for the safe conduct of flight is included.

2.3.22.4 The essentials of the information (i.e. translated and amplified NOTAM Q-code Subject and Condition) shall be given in the first line of Item E).

2.3.22.5 Item E) text shall be related to one NOTAM subject only. (Except in case of a trigger NOTAM, paragraph 2.7.2.10 refers).

2.3.22.6 Item E) may contain ICAO abbreviations (Doc 8400, Ref [3]), and other abbreviations used for directions and units of measurements (e.g. N, SE, FT, GND, AMSL, NM, etc.). Non-common abbreviations (e.g. those abbreviations listed at GEN 2.2 in AIPs but marked as ‘not included in Doc 8400’) shall not be used. The NOTAM users’ understanding shall always be considered (e.g. use of ‘CW’ and ‘CCW’ for ‘clockwise’ and ‘counter-clockwise’ is likely to result in user query).

Examples:

E) RWY 25R ILS LLZ U/S

E) OBST ERECTED. CRANE 1.5 NM W THR RWY 07L 2500FT S RCL 07L/25R HEIGHT 150FT AGL/191FT AMSL.

2.3.22.7 As entries in Items F) and G) are only required for Navigational Warnings (QW) and Airspace Reservations (QR) and the ‘Lower/Upper’ indication in Item Q) is usually not visible in a PIB, inclusion of applicable vertical limits in Item E) shall be considered whenever appropriate, e.g. for Airspace Organisation (QA) subjects.

2.3.22.8 Until ICAO guidance is issued, when there is a need to include an e-mail address in the Item E) text, the @ symbol shall be represented by the word 'at' within brackets i.e. (AT).

2.3.22.9 Item E) should be composed by the Publishing NOF in such a way that it will serve for direct Pre-flight Information Bulletin entry without requiring additional processing by the receiving Unit.

2.3.22.10 Unclear and/or incomplete NOTAM Text shall be avoided.

Example: Instead of:

….. C) PERM

E) WARNING WITHDRAWN REF AIP ENR 4-2-7.3 PARA 6.5.

Use:

….. C) PERM

E) ULTRALIGHT AREA SAN TEADORA 5048N 09339E COMPLETELY WITHDRAWN. REF AIP ENR 4-2-7.3 PARA 6.5.

2.3.22.11 AIP references should be avoided (Paragraph 2.3.22.3 above also refers), especially whenever the information is of short duration.

Example: Instead of:

E) TACAN ALA CH88 (114.1MHZ) OUT OF SERVICE REF AIP ENR 2-1.

Use:

E) TACAN ALA CH88 (114.1MHZ) OUT OF SERVICE.

2.3.23 Items F) and G) – Lower and Upper Limit

2.3.23.1 Lower and Upper limits shall be inserted in Items F) and G) only for Navigation Warnings (‘QW’) and for Airspace Reservations (‘QR’).

2.3.23.2 If entries are required (by 2.3.23.1), then both Items F) and G) shall always be included.

2.3.23.3 Items F) and G) shall contain an altitude (Above Mean Sea Level – AMSL) or a height (Above Ground or Sea or Surface Level – AGL or SFC) expressed in meters or feet, or a Flight Level (always expressed in 3 digits). In addition, SFC (surface) and GND (ground) may be used in Item F) as well as UNL (unlimited) in Item G).

2.3.23.4 Reference datum (AGL or SFC or AMSL) and units of measurement (FT or M) shall be clearly indicated.

2.3.23.5 Only a single entry is permitted in each Item, i.e. G) 10000FT (3280M) AGL shall not be used.

2.3.23.6 There shall not be a blank between the value and the unit of measurement. (i.e. ‘3000 FT AMSL’ shall not be used)

2.3.23.7 Abbreviations FT or M shall be divided from AGL or SFC or AMSL by a blank character. No other character (e.g. "/", "-"...) shall be used. Correct annotation is ‘3000FT AMSL’ (i.e. ‘3000FT/AMSL’ shall not be used).

2.3.23.8 Acceptable entries and formats are therefore as follows:

Item F):
SFC
GND
XXXXXFT AGL
XXXXXFT SFC
XXXXXFT AMSL
XXXXXM AGL
XXXXXM SFC
XXXXXM AMSL
FLXXX (see 2.3.23.9)

Item G):
UNL
XXXXXFT AGL
XXXXXFT SFC
XXXXXFT AMSL
XXXXXM AGL
XXXXXM SFC
XXXXXM AMSL
FLXXX (see 2.3.23.9)

2.3.23.9 The Item Q) default FL values 000 and 999 shall not be used in Items F) and G). The abbreviations GND or SFC shall be used in Item F) and UNL in Item G) instead.

2.3.23.10 The values in qualifiers ‘Lower’ and ‘Upper’ of the Item Q) must correspond to the flight levels or altitudes specified in Items F) and G). If Items F) and/or G) are expressed as a height, the values specified in the 'Lower' or 'Upper' qualifiers in Item Q) shall indicate the equivalent FL and may therefore require calculation. For detailed conversion procedures see paragraph 2.3.10.

2.3.23.11 Where an event is notified in a form such as ‘ACTIVITY UP TO FL040, AFTER ATC APPROVAL UP TO FL080’, the higher value (FL80) shall be used in Item G) and the 'Upper' qualifier in Item Q) shall read ‘080’.

2.3.23.12 Similarly, where the lower limit of activity is variable, the lowest limit shall be used in Items Q) and F).

2.4 Creation of NOTAMR and NOTAMC

2.4.1 General Procedures Related to NOTAMR and NOTAMC Creation

2.4.1.1 NOTAMR and NOTAMC are issued in the same series as the NOTAM to be replaced or cancelled.

2.4.1.2 NOTAMR and NOTAMC respectively replace and cancel only one NOTAMN or NOTAMR.

Example 1: A0124/05 NOTAMR A0106/05

Example 2: A0234/05 NOTAMC A4567/04

2.4.1.3 NOTAMR and NOTAMC deal with precisely the same subject as the NOTAM to be replaced or cancelled. Therefore the 2nd and 3rd letters of the NOTAM code in Item Q) shall be the same as those in the NOTAM to be replaced or cancelled.

2.4.1.4 NOTAMR and NOTAMC have the same Item A) contents as the NOTAM to be replaced or cancelled.

2.4.1.5 The date-time group in Item B) of a NOTAMR or NOTAMC shall be the actual date and time that this NOTAMR or NOTAMC is created.

i.e. NOTAMR and NOTAMC shall take effect immediately and no future start of coming into force is permitted.

2.4.1.6 Note that replaced or cancelled NOTAM cease to be valid from the very moment their replacing NOTAMR or NOTAMC are issued (paragraph 2.4.1.5 refers) and that most automated systems are programmed to immediately withdraw replaced or cancelled NOTAM on receipt of a NOTAMR or NOTAMC.

2.4.1.7 Any NOTAM which includes an ‘EST’ shall be replaced by NOTAMR or cancelled by NOTAMC before the ‘estimated’ end date specified in Item C).

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2.4.2 Specific Procedures Related to NOTAMR Creation

2.4.2.1 NOTAMR are Replacement NOTAM.

2.4.2.2 NOTAM which are to become invalid before their given End of Validity, or did not have a defined End of Validity (i.e. have ‘EST’ or ‘PERM’ in Item C) may be replaced but must be ‘in force’ at the time of replacement (paragraph 2.4.1.5 refers).

2.4.2.3 If the condition described in a NOTAM to be replaced is to remain valid for a period before being changed, then a NOTAMR shall be issued for the period up to the intended date and time of the change (i.e. to immediately replace the existing NOTAM by notifying the same conditions but with a changed Item C) end of validity). A NOTAMN detailing the intended change in condition may then be issued with a future date and time in Item B).

2.4.3 Specific Procedures Related to NOTAMC Creation

2.4.3.1 NOTAMC are Cancellation NOTAM.

2.4.3.2 NOTAM which are to become invalid before their given End of Validity, or did not have a defined End of Validity (i.e. have 'EST' or 'PERM' in Item C) may be cancelled at any time.

2.4.3.3 NOTAMC shall be published whenever NOTAM are incorporated in an AIP AMDT (see chapter 2.6.3).

2.4.3.4 NOTAMC Qualifier 'NOTAM Code' shall be as follows:

Subject: 2nd and 3rd letters shall be identical to the original NOTAM (paragraph 2.4.1.3 refers)

Condition: permitted 4th and 5th letters are as follows:

Q - - AK = RESUMED NORMAL OPS

Q - - AO = OPERATIONAL

Q - - AL = OPERATIVE SUBJECT PREVIOUS CONDITION

Q - - CC = COMPLETED

Q - - XX = OTHER (Plain Language – Refer to paragraph 2.4.3.8)

2.4.3.5 NOTAMC Qualifiers 'Traffic', 'Purpose', 'Scope', 'Lower/Upper' and 'Coordinates/Radius' shall be identical to the cancelled NOTAM. Maintaining the original qualifiers allows additional use of NOTAMC for the preparation of 'Updates' to Pre-flight Information Bulletins.

2.4.3.6 NOTAMC shall not contain Items C), D), F) and G).

2.4.3.7 For all NOTAMC, the text of the decoded NOTAM Code shall be inserted in Item E) together with details of the NOTAM subject.

Example: NOTAM Code = QNVAK

Item E) = VOR DKB RESUMED NORMAL OPS.

2.4.3.8 In order to facilitate work in manual environments, NOTAMC, which are to be followed immediately by a NOTAMN (instead of using a NOTAMR), shall contain XX as 4th and 5th letters of the NOTAM Code and, at the end of the text in Item E), the remark: 'NEW NOTAM TO FOLLOW'.

Example: NOTAM Code = QMRXX

Item E) = RWY 07L/25R NEW NOTAM TO FOLLOW.

2.4.3.9 Cancellation of NOTAM solely on the basis of a Checklist is not allowed (paragraph 2.2.12 refers).

2.4.3.10 Once the immediate cancellation has been effected, the cancelling NOTAMC ceases to have validity.

2.5 Checklist Production

2.5.1 Checklists – General

2.5.1.1 Checklists are issued as a NOTAM in the series that they refer to.

2.5.1.2 A separate Checklist shall be issued for each NOTAM Series.

2.5.1.3 The first Checklist in a new NOTAM series shall be issued as a NOTAMN.

2.5.1.4 Subsequent Checklists shall be issued as NOTAMR, replacing the previous Checklist with immediate effect. Consequently Item B) is the issuing time of the Checklist and supersedes the previous one immediately.

2.5.1.5 Item A) shall contain the FIR, or a list of all FIR, covered by the Checklist or the location indicator of the issuing non-governmental agency. Third and fourth letters 'XX' shall not be used.

2.5.1.6 Item C) shall contain the estimated (EST) end of validity, normally not more than one month after the Checklist is issued.

2.5.1.7 Checklists shall contain the numbers of the NOTAM incorporated in a normal AIP AMDT or AIP SUP until the time that these NOTAM are specifically cancelled by the publication of a NOTAMC.

2.5.2 Checklist Qualification – Item Q)

2.5.2.1 Qualifier 'FIR' shall be either:

- the FIR indicator, or

- the country or non-governmental agency nationality letters followed by 'XX' if there is more than one FIR concerned, or

- the country or non-governmental agency nationality letters of the Publishing NOF followed by 'XX' if publishing for FIR in different countries.

2.5.2.2 Qualifier 'NOTAM Code' shall be the special dedicated code 'QKKKK'.

2.5.2.3 Qualifiers 'Traffic', 'Purpose' and 'Scope' shall be given the artificial value 'K'.

2.5.2.4 Qualifiers 'Lower'/'Upper' shall be the default values '000/999'.

2.5.2.5 Qualifier 'Geographical Reference' shall always contain the geographical co-ordinates of the centre of the FIR(s) listed in Item A), followed by the default radius '999'.

<u>Example</u>: Q) LIXX/QKKKK/K/K/K/000/999/4323N01205E999

2.5.2.6 Qualifiers 'QKKKK' (NOTAM code) and 'K' ('Traffic', 'Purpose', 'Scope') are used to allow selective retrieval of the Checklist. This also prevents the Checklist from appearing in a Pre-flight Information Bulletin.

2.5.3 Checklist Format – Item E)

2.5.3.1 Item E) shall be divided into two sections.

2.5.3.2 First Section, identified by the keyword ‘CHECKLIST’

a) This contains the list of the valid NOTAM numbers which have been promulgated in the same series as the Checklist, in a specific format. Note that the list shall not contain the number of the replaced NOTAM checklist nor its own NOTAM checklist number.

b) The text in Item E) shall start with the word ‘CHECKLIST’

c) The numbering of NOTAM is grouped by year (indicated by 4 digits) using the word ‘YEAR’ plus ‘=’ sign, followed by the year of publication without blanks (e.g. YEAR=1999)

d) Each NOTAM number (always 4 digits) is separated by a blank with no other punctuation mark.

e) Each indicator of a different year shall start on a new line.

2.5.3.3 Second Section, identified by the keywords ‘LATEST PUBLICATIONS’

a) This contains the list of the latest publications issued, in a format suitable for manual processing.

<u>Example</u>:

A00467/05 NOTAMR A0396/05
Q) LIXX/QKKKK/K/K/K/000/999/4323N01205E999
A) LIBB LIMM LIRR B) 0508310900 C) 0509300900EST
E) CHECKLIST
YEAR=2003 0244 0288 0511
YEAR=2004 0104 0347 0601 0653 0687
YEAR=2005 0004 0073 0109 0256 0312 0315 0394 0418 0425 0447 0459 0464 0465
LATEST PUBLICATIONS
AIRAC AIP AMDT 009/05 EFFECTIVE 01 SEP 05
AIP SUP 027/05
AIP AMDT 513
AIC A012/05

b) Additional possibilities to differentiate between IFR or VFR publications (volumes) can be stated, if so required:

AIP SUP VFR 015/05

AIP SUP IFR 038/05

AIRAC AIP AMDT IFR 008/05 EFFECTIVE 04 AUG 05

<u>Note</u>: Whenever the numbering of AIP AMDT takes place on a yearly basis, a reference to the year of publication will be added to the number.

2.5.4 Checklist Errors

2.5.4.1 When the publication of the Checklist contains an error, the following procedures will apply.

2.5.4.2 Whenever a valid NOTAM number was omitted from the Checklist:

a) if the omitted NOTAM is in force, a NOTAMR shall be issued replacing the omitted NOTAM with the new number;

b) if the omitted NOTAM is not yet in force, a NOTAMC and NOTAMN shall be issued.

This procedure will allow consistency of the data in the database of all recipients, whatever the method of processing of Checklists.

2.5.4.3 Whenever an invalid NOTAM number was erroneously inserted in the Checklist, a revised Checklist (NOTAMR replacing the erroneous Checklist) will be published without the invalid NOTAM number (no correct version).

2.6 Publication of Information by NOTAM, AIP Amendment or AIP Supplements

2.6.1 Permanent information shall not be distributed by means of a NOTAM only. This information shall be incorporated in an AIP Amendment.

2.6.2 Publication of permanent information by NOTAM

2.6.2.1 When the urgency of publication of an Amendment to the AIP is such that the 'normal' AIRAC or Non-AIRAC Amendment publication is considered to be unsuitable, the responsible NOF will issue a NOTAM 'PERM' according to the following rules.

2.6.2.2 Item Q) shall be completed according to the NOTAM Selection Criteria.

2.6.2.3 Item B) of the NOTAM shall contain the effective date of the change.

2.6.2.4 Item C) of the NOTAM shall contain the term 'PERM' to indicate that the change itself is of a permanent nature. Note that Item C) shall never include the expected publication date or the effective date of the Amendment.

2.6.2.5 In cases where a NOTAM is issued to correct a mistake in an AIP AMDT, Item E) shall remind of the operational content of the AMDT and not only of the mistake.

Example:

text such as: 'E) AIRAC AIP AMDT 10/05 PART AD : EGNX 1-12 RWY 08 READ 1850M INSTEAD OF 1805M'

shall read: 'E) RWY 08/26 EXTENSION, AIRAC AIP AMDT 10/05 PART AD : EGNX 1-12 RWY08 READ 1850M INSTEAD OF 1805M'.

This allows users to be aware of the subject when reading the PIB and to refer to the AIP AMDT content only if necessary.

2.6.3 Incorporation of NOTAM information in AIP Amendment

2.6.3.1 Permanent information should be incorporated in AIP within 3 months after NOTAM publication. As reissuing of NOTAM with the same contents is not permitted, the interim use of an AIP SUP should be considered. (ICAO Doc 8126 Ref. [2]) Paragraph 6.1.3 and Table 6-1 refer).

2.6.3.2 When permanent (PERM) information has been published in a NOTAM, the NOTAM will require cancellation after an appropriate AIP Amendment has been issued to formally amend the AIP (paragraph 2.4.3.3 refers).

In this case, the NOF shall issue a NOTAMC which cancels the NOTAM 'PERM', 15 days after the effective date of the AIP Amendment that contains the 'PERM' information.

Note 1: 'Effective date' in this instance can be equal to an AIP Amendment publication date. This broadens the Annex 15 use of this expression which relates currently to AIRAC AIP Amendments only.

Note 2: It is assumed that the AIP Amendments will be available at all receiving units by the time the NOTAMC is sent.

2.6.3.3 The NOTAMC shall contain in Item E) a reference to the AIP Amendment that incorporates the originally published NOTAM.

Example:

'INFORMATION INCORPORATED IN AIP AMDT 04/05 WEF 14 APR 05'

2.6.3.4 The numbers of the NOTAM incorporated in the AIP Amendment shall be published on the cover page of the AIP Amendment.

2.6.3.5 The date on which NOTAMC will be issued to cancel NOTAM incorporated in the AIP Amendment shall be published on the cover page of the AIP Amendment.

Example: 'NOTAM incorporated to this AMDT will be cancelled by NOTAMC on the 12th May 2005'.

2.6.4 Incorporation of NOTAM information in AIP Supplement

2.6.4.1 Publication of an AIP Supplement to replace and/or modify information in an existing NOTAM may occur at any time. A Trigger NOTAMN shall be published to refer to this AIP Supplement (ICAO Doc 8126 (Ref. [2]) Chapter 6 App A paragraph 4.9 and OPADD paragraph 2.7.4 refers).

2.6.4.2 The previously published NOTAM containing the affected information shall be cancelled by a NOTAMC.

2.7 Trigger NOTAM and Related Procedures

2.7.1 Trigger NOTAM – Definition

2.7.1.1 NOTAM used to announce the existence and subject content of AIRAC AIP Amendments or AIP Supplements of operational significance are referred to as 'Trigger NOTAM'.

2.7.1.2 The text of Trigger NOTAM is included in Pre-flight Information Bulletins (PIB) to ensure that pilots and operators are advised or reminded that permanent changes of operational significance take effect from the given date or that details of temporary changes of operational significance are to be found in an AIP Supplement.

2.7.2 Trigger NOTAM – General Rules

2.7.2.1 AIRAC AIP Amendments and AIRAC AIP Supplements shall always be triggered by a NOTAM. Note that information concerning any circumstances listed in Annex 15 (Ref. [1]), Appendix 4, Parts 1 and 2, shall be disseminated under the regulated 'AIRAC' system, either as an AIRAC AIP Amendment or as an AIRAC AIP Supplement.

2.7.2.2 Trigger NOTAM shall contain a brief description of the contents, the effective date and the reference number of the AIP Amendment or Supplement concerned.

2.7.2.3 Trigger NOTAM shall be issued on the publication date of the AIRAC AIP Amendment or the AIP Supplement (AIRAC or operationally significant Non-AIRAC) and must come into force on the effective date of that Amendment or Supplement.

2.7.2.4 Trigger NOTAM shall be issued in the appropriate NOTAM series, according to the information to be promulgated.

2.7.2.5 Trigger NOTAM shall follow the normal NOTAM procedures (but see following paragraphs for exceptions).

2.7.2.6 The NOTAM Code for a Trigger NOTAM shall always contain 'TT' as 4th and 5th letters (= 'Condition'). This exclusive 'TT' 'Condition' indicator shall be used with all subjects of the NOTAM codes, even if not explicitly listed in the NSC tables.

2.7.2.7 The NOTAM Code 2nd and 3rd letters (= 'Subject') shall be selected from the NSC and shall never be 'XX'. If no suitable 2nd and 3rd letter combination exists then use 'FA' for Aerodrome or 'AF' for FIR.

2.7.2.8 The exclusive 'TT' 'Condition' indicator can be used to retrieve specific Trigger NOTAM from any Publishing NOF, and can additionally be used for the inclusion (or non-inclusion) of Trigger NOTAM in PIB, at a specific time before their effective date.

2.7.2.9 Publishing NOF may group all the information that relates to one (or several) FIR - regardless of the subject - in order to reduce the amount of NOTAM to be published [Note exception to Basic Rule – paragraph 2.2.4 refers].

Example:

Q) EFXX/QAETT/IV/BO/E/065/660/6425N02519E999

A) EFES EFPS B) 0511240000 C) 0512082359

E) TRIGGER NOTAM - PERM AIRAC AIP AMDT 91 WEF 24NOV 2005. CHANGES TO AIRSPACE CLASSIFICATION AND UPPER LIMIT OF CONTROLLED AIRSPACE.

2.7.2.10 In the case of Amendments or Supplements containing information dealing with different subjects and/or locations (except aerodromes), a single Trigger NOTAM for each location may be issued; each NOTAM dealing with the different subjects related to that location [Note exception to Basic Rule – paragraph 2.2.4 refers].

2.7.2.11 For Aerodromes, a separate Trigger NOTAM shall be issued for each aerodrome. Different subjects relating to the same aerodrome, may however be grouped in the same NOTAM [Note exception to Basic Rule – paragraph 2.2.4 refers].

Example:

Q) EFES/QPATT/I/BO/A/000/999/6031N02216E005

A) EFTU B) 0511240000 C) 0512082359

E) TRIGGER NOTAM-PERM AIRAC AIP AMDT 91 WEF 24NOV 2005. CHANGES TO STAR.

2.7.2.12 In the cases described in paragraphs 2.7.2.9, the NOTAM qualifiers ‘Traffic’, ‘Purpose’ and ‘Scope’ shall be filled according to the subject of highest operational importance.

When grouping different subjects it may happen that the subject of highest operational importance does not cover qualifiers ‘Traffic’ and ‘Scope’ for all the subjects. For example, the Q-lines for two AD subjects (ILS, VFR APCH PROC) read as following: …/QICTT/I/BO/A/… and …/QPKTT/V/BO/A…. Whichever is taken as highest, both traffic types (I and V) concerned are never covered. In this special case a deviation from NSC is permitted to guarantee necessary bulletin entries.

Example: In the following case, the ‘Traffic’ qualifier ‘IV’ is a combination to cover both subjects (QICTT and QPKTT):

Q) EFES/QICTT/**IV**/BO/A/000/999/6240N02937E005

A) EFJO B) 0511240000 C) 0512082359

E) TRIGGER NOTAM - PERM AIRAC AIP AMDT 91 WEF 24NOV 2005. INTRODUCTION OF ILS RWY28 AND REVISED VFR APCH PROC.

2.7.2.13 The text in Item E) should not exceed 300 characters and shall always start with the words ‘Trigger NOTAM’, followed by a reference to the published AIP AMDT or SUP concerned.

2.7.3 Trigger NOTAM relative to AIRAC AIP AMDT

2.7.3.1 AIRAC Amendments represent permanent changes to the AIP on a predefined date.

2.7.3.2 Effective Date: AIRAC AIP Amendments become effective on the AIRAC cycle date. Item B) shall always contain the AIRAC effective date.

2.7.3.3 Period of validity: The validity of Trigger NOTAM relative to AIRAC AIP Amendments will be from the effective date until 15 days thereafter. Therefore, Trigger NOTAM relative to AIRAC AIP Amendments must contain in Item C) a date which is calculated by adding 14 days to the AIRAC effective date and a time equal to '2359'.

2.7.3.4 Trigger NOTAM relative to AIRAC AIP Amendments must contain in Item E) a reference to the Amendment, and an indication that 'permanent' changes are taking place.

Example:

Q) LOVV/QARTT/I/BO/E/245/999/4720N01330E999

A) LOVV

B) 0503170000 (effective date and start at 0000)

C) 0503312359 (effective date + 14 days and end at 2359)

E) TRIGGER NOTAM - PERM AIRAC AIP AMDT 3/05 IMPLEMENTATION OF NEW ATS ROUTE UA15.

Note that the term 'PERM' is inserted in Item E) to stress that Item C) contains an artificial end-date and that the information is of a permanent nature.

2.7.4 Trigger NOTAM relative to AIP SUP (AIRAC and Non-AIRAC)

2.7.4.1 Whilst current ICAO SARPs do not specify a requirement for Non-AIRAC AIP Supplements to be triggered, Publishing NOF shall trigger all Operationally Significant AIP SUP to ensure that all relevant elements of the integrated aeronautical information package are available for inclusion in PIB.

2.7.4.2 Effective Date: AIP Supplements become effective at the date stated in the Supplement. Information to be published under the AIRAC system does not always start on an AIRAC cycle date (e.g. major works, large air exercises etc. ...). Consequently, both the AIP Supplement and the Item B) of the Trigger NOTAM shall contain the effective date of the start of the information.

2.7.4.3 Triggering of AIRAC information in Non-AIRAC Supplements: Due to time constraints, AIP Supplements are sometimes published to promulgate information that should have been published as an AIRAC AIP Supplement. In such exceptional cases, the operational nature of the information shall prevail and a Trigger NOTAM shall be issued for this Non-AIRAC AIP Supplement. The 'Subject' and ‘Condition’ shall relate the information to at least the ‘Purpose’ ‘BO’, according to the NOTAM Selection Criteria.

2.7.4.4 Period of Validity: AIP Supplements normally contain information of a temporary nature, the duration of which is either ‘known’ or ‘unknown’ (i.e. until APRX ...).

2.7.4.5 Validity of a Known Duration: The NOTAM remains in force and in the PIB for the entire duration of the Supplement. i.e. Item B) contains the effective date, and Item C) contains the ‘end date’ of the Supplement.

2.7.4.6 Validity of an Unknown Duration: The validity of Trigger NOTAM relative to AIP Supplements of ‘unknown’ duration shall be described in Item C) by a 10-figure date/time group followed by ‘EST’ (Cancellation or Replacement required). If not possible to determine an estimated end DTG, add a default 'EST' period of 3 months.

2.7.4.7 Item E): Trigger NOTAM relative to AIP Supplements shall contain in Item E) a reference to the Supplement.

Example:

Q) EDFF/QRDTT/IV/BO/E/000/240/4935N00910E035

A) EDFF

B) 0503170000 *(effective date of the information)*

C) 0512162359 *(end of validity of the information)*

E) TRIGGER NOTAM - AIRAC AIP SUP 018/05 CHANGE IN LATERAL LIMITS OF ED-D142

2.7.5 Notification of changes to AIP SUP

2.7.5.1 Changes: Any change to an AIP Supplement and its associated Trigger NOTAM, shall be published by the Publishing NOF in a way that the information itself is always clear and without any ambiguities. No detailed procedures for such cases will be given here because of the great variety and the complexity of the different circumstances possible. However, special care should be taken that the Item B) ‘start date’ and the Item C) ‘end date’ sufficiently cover the operational needs imposed for the display of the information in Pre-flight Information Bulletins.

2.7.5.2 The Supplements of ‘unknown’ duration could be replaced in due time by another Supplement and, in this case, its corresponding Trigger NOTAM shall be replaced.

2.7.5.3 Notification of a Later end date/time: If an existing Trigger NOTAM is ‘in force’, it shall be replaced by a Trigger NOTAMR which will remain valid until the new end date/time. Note that if the existing Trigger NOTAM is not ‘in force’, a NOTAMC followed by a NOTAMN will be required (paragraph 2.4.1.5 refers).

2.7.5.4 Notification of an Earlier end date/time: Exceptionally, the original end date specified in the AIP SUP may be changed to an earlier date by NOTAM.

In this case, if the AIP SUP was the subject of an existing Trigger NOTAM, a Trigger NOTAMR is issued on the date of cancellation (new end of validity), and remains in force until the originally published end of validity of the Supplement or until the next AIP SUP checklist or printed plain-language list of valid NOTAM, if either of these is issued earlier.

The Item C) date/time of such ‘cancellation’ Trigger NOTAMR shall contain the originally published end of validity of the Supplement or the date of the next AIP SUP checklist (whichever is earlier).

Note that Item E) shall always contain text clearly indicating that the planned end date has been brought forward.

Example:

Original:	A0034/05 NOTAMN Q) ESAA/QFATT/IV/BO/A/000/999/5739N01217E005 A) ESGG B) 0504140600 C) 0509301600 E) TRIGGER NOTAM – AIRAC AIP SUP 14/05 USE OF AERODROME RESTRICTED DUE TO MAJOR CONSTRUCTION WORKS.
Replacement:	A0126/05 NOTAMR A0034/05 Q) ESAA/QFALT/IV/BO/A/000/999/5739N01217E005 A) ESGG B) 0506171600 C) 0507011600 E) REF AIRAC AIP SUP 14/05 WORKS HAVE BEEN COMPLETED. THE RESTRICTIONS ARE NO LONGER IN FORCE.

Note that if the AIP SUP was not originally triggered, a NOTAMN may also be issued exceptionally to announce the cancellation in accordance with the above validity and Item E) procedures.

Note the use of Condition ‘LT’ (instead of ‘TT’) in the NOTAMR to indicate more precisely the nature of the information.

3 NOTAM PROCESSING

3.1 Introduction

3.1.1 The current standard NOTAM format was introduced in ICAO Annex 15, 8th Edition promulgated on 14th of November 1991. All NOTAM should be produced in this format, following the procedures on NOTAM creation explained in Chapter 2 of this Manual.

3.1.2 However, some NOTAM continue to be published in the former NOTAM Class I format and these need to be converted in order to allow their automatic processing.

3.1.3 Some States are also not adhering completely to the Integrated Aeronautical Information Package and do not publish Trigger NOTAM for operationally significant publications.

3.1.4 Finally, some States are publishing those of their NOTAM selected for international distribution in an official ICAO language other than English. In order to make this information available to the NOTAM Processing Unit (NPU) Clients in accordance with Annex 15 (Ref [1]) paragraph 5.2.2.1, a translation into English is required.

3.1.5 As a result, differences and discrepancies exist internationally in published NOTAM. NOTAM have to pass through a series of phases where their conformity to the ICAO format is analysed and their contents are assessed prior to their storage in automated NOTAM handling systems. The purpose of this Chapter on NOTAM processing is to define and describe the principles and detailed procedures applied throughout these different phases.

3.2 Objective

3.2.1 The goal of NOTAM processing, is to bring all received NOTAM in accordance with the procedures laid down in Chapter 2 of this Manual on NOTAM creation, so as to allow their storage in automated systems.

3.2.2 Processed NOTAM shall be distributed or made available to NPU Clients as soon as possible after receipt of the original NOTAM by the NOTAM Processing Unit.

3.2.3 NOTAM processing should result in a standardised level of service, regardless of which Unit was responsible for the processing.

3.2.4 It is essential that NOTAM Processing Units ensure that their Clients are made fully aware of the NOTAM processing procedures being applied.

3.2.5 This Chapter addresses NOTAM processing principles and procedures which support NOTAM storage and their consequent potential retransmission. The production of Pre-flight Information Bulletin is not addressed here.

3.3 Procedures for the processing of NOTAM

3.3.1 The procedures described in this Chapter refer to NOTAMN (New NOTAM). Most of them apply also to NOTAMR and NOTAMC.

3.3.2 Specific procedures relative to NOTAMR (Replacement NOTAM) and NOTAMC (Cancellation NOTAM) and the particulars of their processing are described in this Chapter after the NOTAMN procedures.

3.4 General Principles

3.4.1 Whilst it is expected that most Clients will work with the processed version of the NOTAM, the NOTAM Processing Unit shall be able to make the original version available in accordance with the requirements of its Clients.

3.4.2 The NOTAM Processing Unit shall keep track of any message (free text or ‘correct version’ NOTAM) which is related to the original NOTAM.

3.4.3 NOTAM processing functions are as follows:

conversion into the standard format;

triggering of information of operational significance;

translation into English;

syntax correction of obvious detected mistakes in syntax;

data correction of detected mistakes in data;

editing text in order to clarify it;

3.4.4 A NOTAM Processing Unit shall perform all of the above listed functions.

3.4.5 A NOTAM Processing Unit may also **summarise** (or reduce) text and make this summary available to its clients.

3.4.6 The following table shows the applicable processing functions to be performed on the respective NOTAM data and Items (Note that the matrix is not applicable to Triggering or Summarising):

NOTAM Items	Conversion	Translation	Syntax Correction	Data Correction	Editing
Series/Nr/Type	No	No	Yes	Yes	No
Ref Series/Nr	No	No	Yes	Yes	No
FIR	Yes	No	Yes	Yes	No
Q-Code	Yes	No	Yes	Yes	No
Traffic	Yes	No	Yes	Yes	No
Purpose	Yes	No	Yes	Yes	No
Scope	Yes	No	Yes	Yes	No
Lower/Upper	Yes	No	Yes	Yes	No

NOTAM Items	Conversion	Translation	Syntax Correction	Data Correction	Editing
Lat/Long	Yes	No	Yes	Yes	No
Radius	Yes	No	Yes	Yes	No
Item A)	No	No	Yes	Yes	No
Item B)	No	No	Yes	Yes	No
Item C)	No	No	Yes	Yes*	No
Item D)	No	Yes**	Yes	Yes	No
Item E)	Yes	Yes	Yes	Yes	Yes
Items F) & G)	No	No	Yes	Yes	No

Yes = Processing function to be performed, if necessary
No = Processing function not applicable
* = exc. EST/PERM
** = Only if names of weekdays, months etc., are not used in English language

3.5 Conversion of original NOTAM Class I

3.5.1 **Conversion** - the transposition of a NOTAM received in the old format into a correctly formatted ICAO NOTAM.

3.5.2 On reception of NOTAM from countries that do not adhere to the NOTAM format, the NOTAM Processing Unit shall transform these into the correct ICAO Annex 15 (Ref. [1]) NOTAM format before storing and making them available.

3.5.3 In converted NOTAM, each Item of the original NOTAM shall be transposed into the appropriate standard NOTAM Item, and those not present (e.g. Item Q) shall be added.

3.5.4 Converted NOTAM shall be qualified according to the NOTAM Selection Criteria published in ICAO Doc 8126 (Ref. [2). For this purpose, the NOTAM Code must be identified from Item E):

3.5.4.1 If the NOTAM Code is present in Item E), it shall be moved into the Item Q) for further qualification, and decoded in Item E) according to the text provided in the NOTAM Selection Criteria.

3.5.4.2 If no NOTAM Code is contained in Item E), the subject and condition shall be derived from the NOTAM contents.

Example 1: Incoming original NOTAM

A1324/05 NOTAMN
A) KJFK
B) 0507231000
C) 0507231700
E) QMRLC 13L/31R CLSD)

Corrected NOTAM

(A1324/05 NOTAMN

Q) KZNY/QMRLC/IV/NBO/A /000/999/4038N07347W005
A) KJFK B) 0507231000 C) 0507231640
E) RWY 13L/31R CLOSED)

Example 2: Incoming original NOTAM

231639 KDZZNAXX
(A1326/05 NOTAMC A1324/05
A) KJFK
)

Corrected NOTAM

(A1326/05 NOTAMC A1324/05
Q) KZNY/QMRXX/IV/NBO/A /000/999/4038N07347W005
A) KJFK B) 0507231639
E) REF RWY 13L/31R
NOTAM CANCELLED)

3.6 Triggering of printed publications

3.6.1 **Triggering** - the issuing of a Trigger NOTAM in Series ‘T’, by the NOTAM Processing Unit, relative to AIRAC AIP Amendments and operationally significant AIP Supplements (or NOTAM Class II) for which no Trigger NOTAM has been issued by the Publishing NOF.

3.6.2 The NOTAM Processing Unit cannot use any of the Publishing NOF's NOTAM series because the NOTAM numbering consistency would not be preserved. Therefore, the Series ‘T’ is allocated and reserved for this type of Trigger NOTAM.

3.6.3 A Trigger NOTAM in Series ‘T’ shall be created on the initiative of the NOTAM Processing Unit whenever an AIRAC AIP Amendment or AIP Supplement (or NOTAM Class II) containing operationally significant information is received for which it is established that no associated Trigger NOTAM is normally issued by the responsible NOF (paragraph 2.7 refers).

3.6.4 The NOTAM Processing Unit shall provide its Clients with a clear indication of those States that do not normally issue their own Trigger NOTAM and for which the issue of these Trigger NOTAM in Series ‘T’ is to be expected.

3.6.5 Refer to paragraph 3.14 for details of the procedures to be applied.

3.7 Translation of NOTAM

3.7.1 **Translation** - rendering the text of a NOTAM originated in French or Spanish, into the English language, while maintaining the original sense of the text.

3.7.2 Translation shall be carried out in the same spirit as translation of a technical document. The objective is to provide a text in the English language which corresponds as closely as possible to the original.

3.7.3 In Europe, NOTAM received in a language other than French or Spanish are not usually translated and shall therefore be subject to the paragraph 3.13 procedures for ‘NOTAM Subject to Query’.

3.8 Syntax correction

3.8.1 **Syntax correction** - changing the published format structure of the NOTAM where these are obviously wrong.

This may be carried out automatically by a system or manually by an operator.

3.8.2 Correction of syntax shall be based on the format described in ICAO Annex 15 (Ref. [1]) and in Chapter 2 of this Manual.

Example 1: Incoming original NOTAM

A00123/**20**05 NOTA**RM** A00122/05
Q)EDFF/**Q**QMRLC/IV/NBO/A/000/999/4841N00913E005
EDDS **A)** 0501121000 C) 0501131800
E) RWY 17 CLOSED

Corrected NOTAM

A0123/**05** NOTA**MR** A0122/05
Q)EDFF/QMRLC/IV/NBO/A/000/999/4841N00913E005
A) EDDS **B)** 0501121000 C) 0501131800
E) RWY 17 CLOSED

Example 2: Incoming original NOTAM

A0101/05 NOTAMR A0100/05
Q)OJAC/**QXXXX/IV/M/E**/000/999/3116N03706E159
A) OJAC B) 0501010001 C) 0501310001 EST
E) **THE FOLLOWING NOTAM ARE STILL IN FORCE:**
2001 :- 0020.
2003 :- 0023.
2004 :- 0001 0002 0019 0029 .
2005 :- 0052 0066 0067 0068 0069 0070.
LAST AIP AMDT :- 32/03.

Corrected NOTAM

A0101/05 NOTAMR A0100/05
Q)OJAC/**QKKKK/K/K/K**/000/999/3116N03706E159
A) OJAC B) 0501010001 C) 0501310001 EST
E) **CHECKLIST**
YEAR=2001 0020
YEAR=2003 0023
YEAR=2004 0001 0002 0019 0029
YEAR=2005 0052 0066 0067 0068 0069 0070
LATEST PUBLICATIONS
AIP AMDT 32/03

3.9 Data correction

3.9.1 **Data correction** - changing data elements where these are obviously wrong.

This may be carried out automatically by a system or manually by an operator (it does not include correction by the Publishing NOF).

3.9.2 Correction of data shall only be carried out when the error is such that there can be no possible ambiguity. Where appropriate, corrections will be made using validated Static data. Where there is ambiguity or any doubt whatsoever the Publishing NOF shall be consulted and the paragraph 3.12 procedures for 'NOTAM Subject to Query' shall be applied.

Example: Incoming original NOTAM

A0100/05 NOTAMN
Q)EDFF/**QMRXX/I/BO**/A/000/999/4841N00913E**999**
A) **RDDS** B) 0501011000 C) 0501011800
E) RWY **007** AVAILABLE FOR LANDINGS ONLY

Corrected NOTAM

A0100/05 NOTAMN
Q)EDFF/**QMRLT/IV/NBO**/A/000/999/4841N00913E**005**
A) **EDDS** B) 0501011000 C) 0501011800
E) RWY **07** AVAILABLE FOR LANDINGS ONLY

3.10 Editing

3.10.1 **Editing** - changing the Item E) wording and/or layout to make it clearer or to more explicitly express ideas that are implicit in that text.

e.g. correcting spelling or abbreviation errors and editing layout or changing line length in order to make it more readable.

3.10.2 Editing might be carried out in order to clarify text, or to draw specific attention to important elements which are implied by the original text but not stated explicitly. Under no circumstances shall editing change the sense of the original NOTAM.

Example: Incoming original NOTAM (Item E only)

E) MIL PJE WIL TAK PLAC AT BLOHFELD 471940N
0111300E RDS 10NM. INF ABUOT THE DRPOPING
ZONE MAY
BE OBTAI-
NED BY LOWI TWR 120.100MHZ OR BY WIEN
INFORMATION ON 124.400MHZ.

Corrected NOTAM (Item E only)

E) MIL PJE WILL TAKE PLACE AT BLOHFELD 471940N0111300E RADIUS
10NM. INFORMATION ABOUT THE DROPPING ZONE MAY BE OBTAINED
BY LOWI TWR 120.100MHZ OR BY WIEN INFORMATION ON 124.400MHZ.

Note: The line lengths in this example (maximum number of characters per line) do not reflect real NOTAM processing because of the format used to present the example; nevertheless, the erroneous carriage returns/line feeds in the example of the incoming NOTAM are made intentionally to show editing needs.

3.10.3 When the sense of the original NOTAM is not clear, the paragraph 3.12 procedures for 'NOTAM Subject to Query' shall be applied.

3.11 Summarising

3.11.1 **Summarising** - reducing text in order to make it more readable in a Pre-flight Information Bulletin (PIB).

3.11.2 Summarising may be carried out to shorten a long text or to remove unnecessary detail in order to make the information more readable in PIB.

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3.12 Procedures for dealing with NOTAM Subject to Query

3.12.1 If a received NOTAM contains ambiguities that cannot be clarified by the NOTAM Processing Unit, a query shall be addressed to the Publishing NOF. However, such NOTAM shall be made available as 'NOTAM Subject to Query' by the NOTAM Processing Unit without delay to all relevant addressees.

3.12.2 The NOTAM Processing Unit shall add the reason for the query after the statement 'NOTAM Subject to Query' in Item E).

3.12.3 If the Publishing NOF follows ICAO procedures the corrected version will consist of a NOTAMR (if the queried NOTAM is already in force) or a NOTAMC followed by a NOTAMN (if the queried NOTAM is not in force). In either case the new NOTAM shall be processed normally by the NOTAM Processing Unit.

3.12.4 If the reply is in the form of a 'Correct Version' NOTAM retaining the Series and Number of the queried NOTAM, the NOTAM Processing Unit shall make it available as an ordinary NOTAM. The words 'Correct Version' shall be removed.

3.12.5 When this newer version of the NOTAM is received by a Client the latter <u>must recognise</u> that:

it is a duplicate Series and Number; and

it was made available by a NOTAM Processing Unit; and automatically use it to overwrite the previous version in their NOTAM database.

3.12.6 If the reply is in the form of a free text message the NOTAM Processing Unit shall edit the last processed version of the queried NOTAM in accordance with the information provided, and the statement 'NOTAM Subject to Query' shall be removed. The corrected NOTAM shall then be made available retaining the Series and Number of the original.

3.12.7 The Client shall treat this newer version of the NOTAM as in the previous case.

3.13 Procedures for the creation of NOTAM Series 'T'

3.13.1 General procedures

3.13.1.1 NOTAM Series 'T' shall be created by the NOTAM Processing Unit in accordance with OPADD rules and numbered in sequences that reflect the Publishing NOF.

3.13.1.2 NOTAM Series 'T' are both used to trigger specific printed AIS publications, for which no Trigger NOTAM is normally issued by the Publishing NOF, and to deal with exceptional formatting errors made in NOTAM by some Publishing NOF.

3.13.1.3 The NOTAM Processing Unit is responsible for the follow-up of the NOTAM Series 'T' that it issues, and, if appropriate, may replace it with a NOTAMR and in due course shall cancel it with a NOTAMC unless the information time expires beforehand.

3.13.1.4 The NOTAM Processing Unit shall make NOTAM Series 'T' available to their Clients only.

3.13.1.5 No monthly checklist of Series 'T' NOTAM is issued by the NOTAM Processing Unit. Automatically produced 'ad hoc' Checklists, shall be made available upon request at any time.

3.13.1.6 In addition to normal NOTAM creation rules (Chapter 2 refers), the basic procedures listed in the following paragraphs (3.13.2 and 3.13.3) shall be observed:

3.13.2 Trigger NOTAM in Series 'T'

3.13.2.1 The State to which the Trigger NOTAM Series 'T' relates shall be identified by the FIR in Item Q) and by the content of Item A).

3.13.2.2 Item B) of a Trigger NOTAM in Series 'T' for AIRAC AIP Amendments should contain the effective date of the Amendment. If the information is received after the effective date of the Amendment, the date in Item B) shall be the issue date of the Trigger NOTAM. In other words, the date in Item B) cannot be in the past, even when the information contained in the printed publication was already effective before the day of its triggering by the NOTAM Processing Unit).

3.13.2.3 Item C) of a Trigger NOTAM in Series 'T' for AIRAC AIP Amendments shall contain the effective date +14 days (or the issue date of the Trigger NOTAM +14 days if information is received after the effective date of the Amendment) (paragraph 2.7.3 refers).

3.13.2.4 Item C) of a Trigger NOTAM in Series 'T' for AIP Supplements shall contain the end date of validity of the Supplement (paragraph 2.7.4 refers).

3.13.2.5 The Item Q) NOTAM Code shall be compiled in accordance with the guidance at paragraphs 2.7.2.6 and 2.7.2.7). The Qualifiers shall then be chosen according to the prevailing association.

3.13.3 NOTAM in Series 'T'

3.13.3.1 If the format of a received NOTAM does not allow standard processing, the NOTAM Processing Unit shall create a NOTAM Series 'T'.

3.13.3.2 The Original Publishing NOF shall be identified by the FIR in Item Q) and by the content of Item A).

3.13.3.3 A reference to the original NOTAM shall be included at the end of Item E).

3.13.3.4 If multiple aerodrome location indicators are listed in Item A), the original NOTAM shall be processed keeping only the first AD. In addition, NOTAM Series 'T' shall be created for the remaining aerodromes with data identical to the original NOTAM.

3.13.3.5 If more than 7 FIR are listed in Item A), the original NOTAM shall be processed keeping the first 7 FIR. In addition, NOTAM Series 'T' shall be created for the remaining FIR, with data identical to the original NOTAM.

3.13.3.6 If combinations of Aerodrome and FIR are listed in Item A), the original NOTAM shall be processed, according to the relevance of the NOTAM and based on the operational experience, for the FIR or aerodromes. In addition, NOTAM Series 'T' may be created for the other entities, if applicable.

<u>Example</u>: Incoming original NOTAM:

(A0131/05 NOTAMN
Q) LSAS/QNMAS/IV/BO/**AE**/000/999/4628N00627E100
A) **LSAS LSGG LSGC LSGS** B) 0504210700 C) 0504211400
E) ST PREX VOR/DME SPR 113.900 MHZ/CH86X U/S)

This original NOTAM is "**subject to query**" as 3 aerodromes and 1 FIR are stated in Item A).

Corrected NOTAM:

(**A0131/05** NOTAMN
Q) LSAS/QNMAS/IV/BO/**AE**/000/999/4628N00627E100
A) **LSGG** B) 0504210700 C) 0504211400
E) **NOTAM SUBJECT TO QUERY**. MULTIPLE LOCATIONS IN ITEM A).
ST PREX VOR/DME SPR 113.900 MHZ/CH86X U/S.

(**T0009/05** NOTAMN
Q) LSAS/QNMAS/IV/BO/**A**/000/999/4628N00648E005
A) **LSGC** B) 0504210700 C) 0504211400
E) ST PREX VOR/DME SPR 113.900 MHZ/CH86X U/S
REF NOTAM A0131/04)

(**T0010/05** NOTAMN
Q) LSAS/QNMAS/IV/BO/**A**/000/999/4627N00640E005
A) **LSGS** B) 0504210700 C) 0504211400
E) ST PREX VOR/DME SPR 113.900 MHZ/CH86X U/S
REF NOTAM A0131/04)

3.13.3.7 In the example at paragraph 3.13.3.6, NOTAM A0131/04 was processed in accordance with the paragraph 3.12 'NOTAM Subject to Query' procedure for AD

LSGG and FIR LSAS (‘Scope’ ‘AE’) and the 2 NOTAM Series ‘T’ were created for AD LSGC and LSGS (‘Scope’ ‘A’) giving a reference to the original at the end of Item E).

3.13.3.8 Note that, in the example at paragraph 3.13.3.6, if the FIR stated in Item A) of the original NOTAM is identical to the one in the Item Q) and the aerodromes are located in this FIR, then the NOTAM Processing Unit shall delete it.

3.13.3.9 When a NOTAM Series ‘T’ is published by a NOTAM Processing Unit, the related Publishing NOF shall be informed.

3.14 Procedures for Correction of NOTAM

3.14.1 If an error is detected by the NOTAM Processing Unit, appropriate action shall be taken to correct the received NOTAM and a query shall additionally be sent to the Publishing NOF.

3.14.2 If the NOTAM Processing Unit detects re-occurring errors, it shall inform the Publishing NOF, indicating the correct procedure.

3.14.3 If a NOTAM Processing Unit is alerted that an error has occurred in a NOTAM that it has processed, the NOTAM Processing Unit shall determine the origin of the error, and:

- if the error was made by the NOTAM Processing Unit: re-send the NOTAM after correction; or
- if the error was already contained in the original NOTAM: proceed with a request to the Publishing NOF (Paragraph 3.12 rules for ‘NOTAM Subject to Query’ shall be applied).

3.14.4 All NPU Clients shall be aware that only the last version received from the NOTAM Processing Unit is the valid version.

3.15 NOTAM Verification

3.15.1 All NOTAM Items shall be checked according to the rules described in Chapter 2 on NOTAM Creation.

3.15.2 In addition to the rules described in Chapter 2, the following general verification shall be performed by the NOTAM Processing Unit:

a) Check if the NOTAM has already been received and differentiate between a ‘Dupe’ and a ‘Correct Version’ NOTAM.

b) Check if there is a logical sequence in the origin time of the AFTN messages whenever an ‘identical’ NOTAM is received.

c) NOTAM Series/Number/Year/Sub-number, relative to the Publishing NOF, are valid and in logic ascending sequence. If not, appropriate request for missing NOTAM is sent by the NOTAM Processing Unit to the Publishing NOF (see Chapter 4).

d) NOTAM Number referred to in a NOTAMR or NOTAMC is a valid NOTAM from the same Publishing NOF.

3.15.3 Additional specific verification shall be performed as explained in the following sub-paragraphs.

3.16 NOTAM Identification

3.16.1 For storage in automated systems, the NOTAM identification consists of establishing the relation between the NOTAM series, number and the “Numbering Reference”, which is in most cases the Publishing NOF 4-letter location indicator. This allows unique identification of NOTAM and easy tracking of missing numbers.

3.16.2 Publishing NOF Identification

3.16.2.1 The identification of the Publishing NOF is not straightforwardly contained in the NOTAM format. According to ICAO Annex 10 SARPs, the location indicator (AFTN address) of the Publishing NOF is given in the AFTN message origin of the original NOTAM.

3.16.2.2 When transmitting or making available a NOTAM via AFTN, the NOTAM Processing Unit enters its own AFTN address into the message origin line according to the same ICAO SARPs.

3.16.3 NOTAM Series Allocation

3.16.3.1 The NOTAM Processing Unit retains the Series and NOTAM Number of the original NOTAM when transmitting it or making it available.

3.16.3.2 If the NOTAM Series letter has been omitted, the NOTAM Processing Unit shall try to derive it from the NOTAM sequence number and include this series.

3.16.3.3 If the Publishing NOF does not use a NOTAM Series letter, the NOTAM Processing Unit shall automatically allocate a Series letter (normally ‘A’) for such NOTAM.

3.16.4 NOTAM Number

3.16.4.1 If a NOTAM is received that is out of the numerical sequence, a query for the missing NOTAM number(s) shall be initiated, according to Chapter 4 procedures (Database Completeness and Coherence Messages).

3.16.4.2 If the NOTAM number consists of less than 4 digits the NOTAM Processing Unit shall add the leading zeros. If the ‘Year’ indicator is missing, it shall also be added.

3.17 NOTAM Type

3.17.1 If the Publishing NOF did not include the NOTAM type in the original NOTAM, the NOTAM Processing Unit shall insert the appropriate NOTAM type letter.

3.17.2 If the Publishing NOF wrongly allocated the NOTAM type in the original NOTAM, the NOTAM Processing Unit shall insert the appropriate type.

3.17.3 In both cases, the Publishing NOF shall be informed about the change.

3.18 NOTAM Qualification (Item Q)

3.18.1 General rule

3.18.1.1 If the Item Q) is missing, it shall be inserted by the NOTAM Processing Unit.

3.18.1.2 If Item Q) is obviously wrong, it shall be changed by the NOTAM Processing Unit in accordance with the following paragraphs(3.18.2 to 3.18.8).

3.18.2 Qualifier ‘FIR’

3.18.2.1 Item Q) may contain Location Indicators that indicate applicability to more than one FIR. In this case, the ICAO location indicators of all FIR concerned should appear in Item A).

3.18.2.2 The NOTAM Processing Unit shall check that this field correctly applies to the location indicator(s) of the FIR(s) entered in Item A). If not, the correct location indicator will be inserted.

3.18.2.3 Note that ‘dummy’ FIRs, such as UUUU, ZBBB, KFDC and KNMH, may sometimes be used for those countries with more than 7 FIR (i.e. the permitted maximum in Item A).

3.18.3 Qualifier ‘NOTAM CODE’

3.18.3.1 The NOTAM Selection Criteria are the basis for NOTAM Code allocation and qualification as described in paragraph 2.3.6.

3.18.3.2 If the NOTAM Code is not entered in the Item Q), the NOTAM Processing Unit shall include the NOTAM Code, corresponding to the Item E) content, together with the appropriate Qualifiers.

3.18.3.3 If the NOTAM Code does not correspond to the text of Item E), and the text of Item E) is clear and unambiguous, the Code may be brought into line with the text, provided that this does not imply a downgrading of the ‘Purpose’ Qualifier.

<u>Example</u>: Incoming original NOTAM

Q) EDMM/**QAFXX/I/B/W**/000/120/4841N00913E250

A) EDMM B) 0503011000 C) 0504011800
E) ATS ROUTE XYZ11 CLOSED BETWEEN XXX and YYY BETWEEN GND AND FL120

Corrected NOTAM

Q) EDMM/**QARLC/IV/NBO/E**/000/120/4841N00913E250
A) EDMM B) 0503011000 C) 0504011800
E) ATS ROUTE XYZ11 CLOSED BETWEEN XXX and YYY BETWEEN GND AND FL120

3.18.3.4 Overwriting of the original Qualifiers (‘Traffic’, ‘Purpose’ and ‘Scope’) (in accordance with paragraphs 3.18.4 to 3.18.6) should be avoided, unless to correct obvious mistakes.

3.18.3.5 If the original NOTAM has been coded ‘QXXXX’ and a more appropriate NOTAM Code exists, the NOTAM Processing Unit shall replace the Code and its associated Qualifiers. (subject to the limitations specified in paragraphs 3.18.4 to 3.18.8).

3.18.3.6 The NOTAM Processing Unit may also use ‘QXXXX’ to upgrade 'Scope' and 'Purpose' Qualifiers or for NOTAM where 'AG', 'CO' or 'RC' have been used as 2nd and 3rd letters (Note also the possibility of using ‘FA’ for Aerodrome or ‘AF’ for FIR).

3.18.3.7 For NOTAM received with a NOTAM Code that is not contained in the NSC, the NOTAM Processing Unit shall allocate a Code in accordance with the subject and the condition of that subject specified in the Item E) text (refer to paragraph 2.3.6 for further guidance).

3.18.3.8 If a Trigger NOTAM is received without the 4th and 5th letter ‘Condition’ indicator ‘TT’, the NOTAM Processing Unit shall replace it with ‘TT’. Similarly, if the 2nd and 3rd letter ‘Subject’ indicator is received as ‘XX’, the NOTAM Processing Unit shall change it in accordance with paragraph 2.7.2.7 (Note also the guidance at paragraphs 2.7.2.6 and 2.7.2.12).

Example: Incoming original NOTAM

Q) EDMM/**QXXTT/**I/BO/E/000/240/4841N00913E250
A) EDMM B) 0509010001 C) 0509162359
E) TRIGGER NOTAM – PERM AIRAC AMDT 09/05
NEW ATS ROUTE XYZ123 ESTABLISHED.

Corrected NOTAM

Q) EDMM/**QARTT/**I/BO/E/000/240/4841N00913E250
A) EDMM B) 0503011000 C) 0509162359
E) TRIGGER NOTAM – PERM AIRAC AMDT 09/05
NEW ATS ROUTE XYZ123 ESTABLISHED.

3.18.4 Qualifier ‘TRAFFIC’

3.18.4.1 If the ‘Traffic’ Qualifier is missing, it shall be filled according to the NOTAM Selection Criteria, or, if not specified therein, according to the NOTAM contents.

3.18.4.2 If the ‘Traffic’ Qualifier is not according to the NOTAM Selection Criteria, the NOTAM Processing Unit may adapt it to the NSC, taking into account the entry in Item E) and guidance at paragraphs 2.3.7.3 and 2.7.2.12.

3.18.5 Qualifier ‘PURPOSE’

3.18.5.1 If the ‘Purpose’ Qualifier is missing, it shall be filled according to the NOTAM Selection Criteria, or, if not specified therein, according to the NOTAM contents.

3.18.5.2 The ‘Purpose’ Qualifier of a NOTAM shall not be modified by a NOTAM Processing Unit, unless it implies an upgrading. i.e. Purpose ‘M’ may be changed to ‘B’, ‘BO’, ‘NB’[2] or ‘NBO’; Purpose ‘B’ may be changed to ‘BO’, ‘NB’[2] or ‘NBO’; purpose ‘BO’ may be changed to ‘NB’[2] or ‘NBO’; and purpose ‘NB’[2] may be changed to ‘NBO’.

3.18.6 Qualifier ‘SCOPE’

3.18.6.1 If the ‘Scope’ Qualifier is missing or is not filled according to the NOTAM Selection Criteria, it shall be filled according to the NOTAM contents, following the procedures described in paragraph 2.3.9.

3.18.7 Qualifiers ‘LOWER/UPPER’

3.18.7.1 The logical order of the vertical limits indicated in Qualifiers ‘Lower’ and ‘Upper’ shall be verified and corrected; these should also correspond to the values specified in Items F) and G) for Navigation Warnings and Airspace Reservations.

Example: ‘F) GND’ and ‘G) 7500 FT AMSL’ = ‘Q) (Lower/Upper) 000/075’

3.18.7.2 If vertical limits have been entered in Items F) and G) and:

the limits in Item Q) extend beyond those given in Items F) and G), they shall be left unchanged unless the 000/999 default has been used;

the limits in Item Q) do not equate but lie between the limits given in Items F) and G), they shall be modified to correspond to Items F) and G);

if the limits in Item Q) are 000/999, they shall be modified to correspond to Items F) and G) if the actual limits stated there are in FL or in FT or M AMSL (i.e. not for those stated in FT or M AGL – see below);

if the limits in Items F) and G) are given as FT or M AGL (or FT or M SFC), Item Q) shall be left unchanged unless the LOWER/UPPER limits are obviously wrong or are missing, then the default value 000/999 shall be inserted.

Example: Incoming original NOTAM:

A0564/05 NOTAMN

[2] Note that, whilst change is expected, the use of ‘NB’ remains prescribed in the ICAO NSC at the time of writing this edition.

Q) EDLL/QXXCA/IV/NBO/W/**000**/**200**/4841N00913E050
A) EDLL B) 0503011000 C) 0504011800
E) AREA XYZ11 ACTIVATED
F) **5500FT** G) **12000FT AGL**

Corrected NOTAM

A0564/05 NOTAMN
Q) EDLL/QXXCA/IV/NBO/W/**055**/**200**/4841N00913E050
A) EDLL B) 0503011000 C) 0504011800
E) AREA XYZ11 ACTIVATED
F) 5500FT **AMSL** G) 12000FT AGL

3.18.7.3 The NOTAM Processing Unit shall define the values used to amend NOTAM in accordance with the procedures specified in paragraph 2.3.10.

3.18.7.4 If vertical limits also appear in Item E), these shall be cross-checked and consolidated with Items Q), F) and G).

Example: Incoming original NOTAM:

A0564/05 NOTAMN
Q) EDLL/QARLC/IV/NBO/E/000/**999**/4841N00913E250
A) EDLL B) 0503011000 C) 0504011800
E) ATS ROUTE XYZ11 CLOSED BETWEEN XXX and YYY BETWEEN **FL055** AND **FL120**

Corrected NOTAM

A0564/05 NOTAMN
Q) EDLL/QARLC/IV/NBO/E/**055**/**120**/4841N00913E250
A) EDLL B) 0503011000 C) 0504011800
E) ATS ROUTE XYZ11 CLOSED BETWEEN XXX and YYY BETWEEN FL055 AND FL120

3.18.8 Qualifier 'GEOGRAPHICAL REFERENCE'

3.18.8.1 The Geographical Reference shall be present in each NOTAM made available by a NOTAM Processing Unit. If this value is not contained in a received NOTAM, the NOTAM Processing Unit has to add it, following the procedures described in paragraphs 2.3.11 (General Rules), 2.3.12 (Co-ordinates) and 2.3.13 (Radius).

3.18.8.2 If co-ordinates and radius are given, the NOTAM Processing Unit shall only change the entry if it contains an obvious error and the area covered by the given values is greater or less than necessary (e.g. when the whole FIR default 999 is used for a small danger area located within it or when an insufficient radius is used for a navigation aid's area of influence).

3.18.8.3 If a NOTAM is received without geographical reference, and no positional information appears in Item E) the entry in Item A) should permit the coordinates to be derived from the Unit's available Static Data.

3.18.8.4 If a NOTAM is received without a radius and it cannot be derived from the Static Database, the NOTAM Processing Unit shall include a default radius, as specified in the table at paragraph 2.3.13.3.

3.18.8.5 If Item E) contains reference to a published area or facility or the definition a temporary area or facility, this shall be used to correct or determine an appropriate entry in Item Q).

3.19 NOTAM Items

3.19.1 Item A) – Location 'FIR/AD' – General

3.19.1.1 The given aerodrome or FIR(s) should be valid for the country and for the Publishing NOF. If not, the paragraph 3.12 'NOTAM Subject to Query' procedure shall be applied.

3.19.1.2 If the location indicator is not filled or contains a typing error, the NOTAM Processing Unit shall try to deduce it from the Item Q) and from the Item E) content. The paragraph 3.12 'NOTAM Subject to Query' procedure shall be applied.

3.19.1.3 If the location indicator is unknown to the NOTAM Processing Unit (i.e. the aerodrome location indicator is not listed in ICAO Doc 7910 or the national AIP, SUP or NOTAM), the NOTAM Processing Unit shall replace the location indicator by the nationality indicator followed by 'XX' (or 'XXX'). The paragraph 3.12 'NOTAM Subject to Query' procedure shall be applied, mentioning 'ICAO LOCATION INDICATOR UNKNOWN'.

3.19.1.4 If a new location indicator is announced by a NOTAM in which the new indicator is used in Item A), the NOTAM Processing Unit shall make the NOTAM available as received.

3.19.1.5 If the Publishing NOF has no discrete FIR (e.g. Swaziland FD, Lesotho FX, Macau VM), Item Q) should contain the appropriate overlying FIR Indicator. Note that some States use a CTA/TMA indicator as pseudo FIR. If an FIR or CTA/TMA indicator appears in Item A), the NOTAM Processing Unit shall replace it with an indicator that reflects the Item E) text (for example by using the main aerodrome within a TMA or the area affected). Note that if an aerodrome is used, the NOTAM Processing Unit shall also change Item Q) 'Scope' to read 'AE' or 'AW'.

3.19.1.6 If a NOTAM is received with 'Scope' 'A' and an FIR in Item A), and if Item E) confirms the NOTAM applicability to an FIR, the 'Scope' shall be modified to 'W' or 'E', whichever is more appropriate. If the NSC does not provide for 'Scope' 'W' or 'E' to be applied, the 2nd and 3rd letters shall be modified to read 'XX'. However, if Item E) indicates applicability to an Aerodrome, changes to Item A) and to Item Q) ('Scope' 'AE' or 'AW') might be necessary.

3.19.1.7 If a NOTAM is received with 'Scope' 'E' or 'W' and an aerodrome in Item A), and if Item E) confirms the NOTAM applicability to an aerodrome, the 'Scope' shall be modified to 'AW' or 'AE', whichever is more appropriate. However, if Item E) indicates applicability to an FIR, a change to Item A) might be necessary.

<u>Example</u>: Incoming original NOTAM:

A2222/05 NOTAMN
Q) MUFH/QRACA/IV/BO/**W**/000/180/1918N10013W025
A) **MUHA** B) 0501211500 C) 0501312359

D) DAILY 1500-2359
E) AIRSPACE RESERVATION BTN UNG AND UCA, ACTIVITY COORD. WITH TWR MUHA.
F) GND
G) 18000FT AMSL

Corrected NOTAM

A2222/05 NOTAMN
Q) MUFH/QRACA/IV/BO/**AW**/000/180/1918N10013W025
A) **MUHA** B) 0501211500 C) 0501312359
D) DAILY 1500-2359
E) AIRSPACE RESERVATION BTN UNG AND UCA, ACTIVITY COORD. WITH TWR MUHA.
F) GND
G) 18000FT AMSL

3.19.2 Item A) – Location 'FIR/AD' – Single-Location NOTAM

3.19.2.1 This shall always be the ICAO Location Indicator of one aerodrome or FIR.

3.19.2.2 In the case of one FIR, the entry must be identical to the Qualifier 'FIR' in the Item Q). If not, this entry shall be corrected by the NOTAM Processing Unit.

3.19.2.3 If an aerodrome indicator is given, it must be an aerodrome situated in the FIR inserted in the Item Q). If not, the FIR in the Item Q) shall be changed according to the Static Database.

3.19.2.4 For aerodromes without ICAO location indicator Item A) shall contain the nationality indicator followed by 'XX' or 'XXX' (e.g. EDXX or KXXXX), with the full name of the aerodrome as first element in Item E).

3.19.2.5 If Item A) of a received NOTAM contains the full name of an aerodrome, the NOTAM Processing Unit shall replace it by a 4–letter code consisting of the nationality indicator followed by 'XX' or 'XXX' (e.g. LFXX or KXXXX), and shall enter the full name in Item E).

Examples: A) EBBU (ICAO location indicator for a single FIR)

A) LFPO (ICAO location indicator for an aerodrome)

A) FBXX (no location indicator published by Botswana)

In the latter example, Item E) shall contain the full name of the aerodrome as its first element, e.g.:

E) BOTTLEPAN …..

3.19.3 Item A) – Location 'FIR/AD' – Multi-Location NOTAM

3.19.3.1 According to the current NOTAM format there can be only up to 7 FIR location indicators in Item A). If more than 7 FIR were entered, only the first 7 listed shall remain in Item A). One or more NOTAM Series 'T' shall be issued with identical data as in the original NOTAM until all original FIR have been covered.

3.19.3.2 If multiple aerodromes are inserted in Item A), the NOTAM Processing Unit shall retain only the first indicated aerodrome. For the remaining aerodromes, one or more NOTAM Series ‘T’ shall be issued with identical data as in the original NOTAM until all original indicated aerodromes are covered.

3.19.3.3 Such NOTAM Series ‘T’ shall follow the rules described in paragraph 3.13.

3.19.3.4 In cases where a NOTAM contains ‘supra-regional’ information covering several FIR belonging to more than 1 country, the Qualifier ‘FIR’ in Item Q) shall contain the Publishing NOF’s nationality Code followed by ‘XX’ (or ‘XXX’). If this procedure is not applied by the Publishing NOF, the NOTAM Processing Unit shall correct the Item Q).

3.19.4 Item B) – Start of Activity

3.19.4.1 This shall be a 10-figure date-time group, giving year, month, day, hour and minutes at which the NOTAM comes into force (paragraph 2.3.16 refers).

3.19.4.2 If ‘WIE’ (With Immediate Effect) appears in Item B), the NOTAM Processing Unit shall replace it with a 10 figure date/time group corresponding to the time of origin of the original NOTAM.

3.19.4.3 If Item B) contains ‘SR’ or ‘SS’ and the NOTAM Processing Unit can calculate an actual time, it shall replace the letters with that time. If, however, the actual time cannot be calculated, the NOTAM Processing Unit shall insert ‘0000’ and add or complete an Item D) with the given ‘SR’ or ‘SS’.

3.19.5 Item C) – End of Validity

3.19.5.1 This shall be a 10-figure date-time group, giving year, month, day, hour and minutes at which the NOTAM ceases to be in force and becomes invalid (paragraph 2.3.17 refers).

3.19.5.2 If ‘UFN’ (Until Further Notice) appears in Item C), the NOTAM Processing Unit shall make the NOTAM available with Item C) changed to an ‘EST’ time 48 hours ahead of that given in Item B).

3.19.5.3 If ‘APRX DURATION’ appears in Item C), the NOTAM Processing Unit shall change it into a Date/Time Group of 10 figures, corresponding to the approximate duration given, followed by ‘EST’.

3.19.5.4 If the end of the day is expressed as ‘2400’, the NOTAM Processing Unit shall change it to read ‘2359’ (in accordance with ICAO Annex 5 provisions).

3.19.5.5 If Item C) contains ‘SR’ or ‘SS’ and the NOTAM Processing Unit can calculate an actual time, it shall replace the letters with that time. If, however, the actual time cannot be calculated, the NOTAM Processing Unit shall insert ‘2359’ and add or complete an Item D) with the given ‘SR’ or ‘SS’.

3.19.5.6 NOTAM containing ‘EST’ or an approximate duration should, at the end of the estimated validity, be replaced by NOTAMR or cancelled by NOTAMC. If the Publishing NOF does not react at the end of the estimated validity, the NOTAM

Processing Unit shall request action from all Publishing NOF concerned at least once a month.

3.19.6 Item D) – Day/Time Schedule

3.19.6.1 If the Item D) of the original NOTAM is not structured according to the procedures as detailed in paragraph 2.3.18 till 2.3.21, and if no ambiguity about the origintor's intention is present (for example Item E) may contain clear specification), it shall be edited by the NOTAM Processing Unit in accordance with these specifications.

3.19.6.2 Item D) shall not exceed 200 characters. If it does, then the Item D) time schedule shall be removed and inserted at the start of Item E). This procedure will however, exclude automatic retrieval into Pre-flight Information Bulletins on the specified days and times.

3.19.7 Item E) – NOTAM Text

3.19.7.1 The NOTAM Processing Unit shall check the correspondence between the Item E) text and the NOTAM code.

3.19.7.2 If a NOTAM is received in a non-standard format, the NOTAM Processing Unit must identify the subject and select the relevant NOTAM Code. If Item E) contains more than one subject, the subject of highest operational importance, based on the appropriate 'Purpose' Qualifier, shall be inserted in Item Q).

3.19.7.3 If the NOTAM Code is already present in Item E) of the original NOTAM, it shall be moved to Item Q) and decoded in Item E); using the text provided in the NOTAM Selection Criteria.

3.19.7.4 All navigational data, navigation aids, frequencies, location indicators, heights and any logical combinations shall be verified as to correctness.

3.19.7.5 If the text in the Item E) is ambiguous, the NOTAM Processing Unit shall make the original NOTAM available with the text 'NOTAM Subject to Query' added to the beginning of Item E) according to the procedures described in paragraph 3.12.

3.19.8 Items F) and G) – Lower and Upper Limit

3.19.8.1 If Item F) and G) appear in the NOTAM, refer to guidance at paragraph 2.3.23.

3.19.8.2 NOTAM Processing Unit shall make sure that Lower and Upper limits in Items F) and G) are inserted for Navigational Warnings and Airspace Reservations (NOTAM Codes 'QW...' or 'QR…'). If these Items are missing, the NOTAM Processing Unit shall add them after verification of the data in Item E), or in the Item Q) 'Lower/Upper' Qualifiers, or in the Static Database, and/or after consultation with the Publishing NOF. Use of the paragraph 3.12 'NOTAM Subject to Query' procedure may be required.

3.19.8.3 If NOTAM other than Navigational Warnings and Airspace Reservations are received with Items F) and G), the vertical limits shall be transferred to Item E) using the keywords ‘FROM’ and ‘TO’ followed by the appropriate values (e.g. ‘FROM 1000FT AMSL TO FL100’).

3.19.8.4 If the values specified in Items F) and G) do not cover the limits mentioned in Item E), the NOTAM Processing Unit shall:

- change the values in Item F) or in Item G) to correspond to the lowest (Item F) or the highest (Item G) value mentioned Item E); and

- the paragraph 3.12 ‘NOTAM Subject to Query’ procedure shall be used, and the Publishing NOF shall be contacted to clarify the content of the NOTAM.

- Note that the original values shall not be changed, whenever the limits in Item F) or G) are respectively lower or higher than the limits specified in Item E).

3.19.8.5 If no Item F) (Lower limit) has been specified in a NOTAM that contains an Item G), but from Items Q) or E) it is obvious that the Lower limit is sea or ground, then the term ‘SFC’ (surface) shall be inserted in Item F). ‘SFC’, will be used instead of ‘GND’ because precise topographic information concerning the area of influence of the NOTAM may not be available.

3.19.8.6 If ‘AGL’ or ‘AMSL’ is omitted and the datum cannot be determined, the NOTAM Processing Unit shall add ‘AMSL’ to the lower limit and ‘AGL’ to the upper limit.

3.20 Procedures Related to NOTAM ‘R’ Processing

3.20.1 NOTAMR should be issued in the same series as the NOTAMN or NOTAMR referred to. If this is not the case, the NOTAM Processing Unit shall verify whether the Items of the ‘to be replaced’ NOTAM correspond to the NOTAMR. If the Items correspond, the NPU shall make the NOTAM available as a NOTAMN and shall delete the ‘to be replaced’ NOTAM. The paragraph 3.12 procedure for ‘NOTAM Subject to Query’ shall be applied.

3.20.2 NOTAMR should replace only one NOTAMN or NOTAMR. If more than one NOTAM are replaced by one NOTAMR, the NOTAM Processing Unit shall change the NOTAMR to replace only the first one in the list and shall delete all the others. If it is identified that this is a recurring error, the Publishing NOF shall be requested to adhere to the published ICAO standards (ICAO Annex 15, Ref [1] §5.2.7 and Doc 8126, Ref [2] Table 6-1 refer).

3.20.3 NOTAMR should relate to the same subject (2nd and 3rd letters of the NOTAM Code) as the NOTAMN or NOTAMR referred to. If this is not the case the NOTAM Processing Unit shall compare the two NOTAM subjects, and make the potential necessary changes, when these are obvious from the message contents.

3.20.4 NOTAMR shall have the same Item A) content as the NOTAMN or NOTAMR referred to. If this is not the case, the NOTAM Processing Unit shall compare the Item A) of both NOTAM with the data in Item E) and make any necessary changes. If Item A) of the NOTAMR should be changed to the same value as the NOTAM it replaces, the change will be done in the processed NOTAMR. If however, Item A) of the NOTAMR cannot be changed (e.g. if the activity has moved to a separate FIR), this NOTAMR shall be processed as a NOTAMN and the 'to be replaced' NOTAM shall be deleted. If Item Q) ‘Scope’ contains ‘A’, the paragraph 3.12 procedure for ‘NOTAM Subject to Query’ shall be applied.

3.20.5 NOTAMR should immediately replace the NOTAMN or NOTAMR referred to. NOTAMR which are received with a future date in Item B), are made available with Item B) unchanged except in exceptional cases. The paragraph 3.12 procedure for 'NOTAM Subject to Query' shall be applied.

3.20.6 In case a NOTAMR is received that replaces only an individual part of a Multi-part NOTAM, the NOTAM Processing Unit shall amend the original Multi-part NOTAM and make all parts of it available to its Client as NOTAMR. If ambiguity is detected the paragraph 3.12 procedure for 'NOTAM Subject to Query' shall be applied.

3.20.7 In case of a NOTAMR replacing a NOTAM Class II or an AIP Supplement, the NOTAM Processing Unit shall change the original NOTAMR into a NOTAMN; and, if appropriate, issue a NOTAMC in Series 'T' to cancel any previously issued Trigger NOTAM in Series 'T'.

3.21 Procedures Related to NOTAM 'C' Processing

3.21.1 NOTAMC should be issued in the same series as the NOTAMN or NOTAMR referred to. If this is not the case, the NOTAM Processing Unit shall verify whether the Items of the 'to be cancelled' NOTAM correspond to the NOTAMC. If the Items correspond, the NPU shall make the NOTAM available as a NOTAMN and shall delete the 'to be cancelled' NOTAM.

3.21.2 NOTAMC should cancel only one NOTAMN or NOTAMR. If more than one NOTAM are cancelled by one NOTAMC, the NOTAM Processing Unit shall change the NOTAMC to cancel only the first one in the list and shall delete all the others.

3.21.3 NOTAMC should become active at the time they are issued, and immediately cancel the NOTAMN or NOTAMR referred to.

3.21.3.1 If a NOTAMC contains a future cancellation date in Item B), the NOTAM Processing Unit shall change it to a NOTAMR. This NOTAM will be identical to the NOTAMC except that Item B) will contain the current date/time and Item C) will be equal to the Item B) date time group of the wrong NOTAMC. The paragraph 3.12 procedure for 'NOTAM Subject to Query' shall be applied.

3.21.3.2 If a NOTAMC contains an Item C) entry, this Item shall be omitted. If the Item C) contains a future end of validity, the paragraph 3.12 procedure for NOTAM Subject to Query shall be applied.

3.21.4 For all NOTAMC, the text of the decoded NOTAM Code shall be inserted in Item E) together with details of the NOTAM subject. If no text is inserted by the Publishing NOF, the NOTAM Processing Unit shall add the decoded NOTAM Code, together with the necessary details.

3.21.5 If a NOTAMC contains an Item A) but does not contain Items Q), B) or E), the NOTAM Processing Unit shall fill the missing compulsory items.

- Item Q) NOTAM Code 2nd and 3rd letters shall be derived from the NOTAM to be cancelled.

- Item Q) NOTAM Code 4th and 5th letters shall be 'XX' (unless an Item E) text had been provided to confirm use of 'AK', 'AL', 'AO' or 'CC').

- Item Q) other Qualifiers shall identical to those in the cancelled NOTAM (paragraph 2.4.3.5 refers).

- Item B) shall be the date and time of filing of the NOTAMC.

- Item E) shall contain a reference to the cancelled NOTAM subject followed, in a new line, by the text 'NOTAM CANCELLED'.

Example: Incoming original NOTAM

231639 KDZZNAXX
A1326/05 NOTAMC A1324/05
A) KJFK

Corrected NOTAM

A1326/05 NOTAMC A1324/05
Q) KZNY/QMRXX/IV/NBO/A/000/999/4038N07347W005
A) KJFK B) 0507**231639**
E) RWY 13L/31R
NOTAM CANCELLED

3.21.6 In case of a NOTAMC cancelling a NOTAM Class II or an AIP Supplement, the NOTAM Processing Unit shall:

- change the original NOTAMC into a NOTAMN;

- insert an Item C) with a validity time of 24 hours;

- add the 'Purpose' Qualifier 'M';

- issue a NOTAMR or a NOTAMC in Series 'T' in accordance with the rules described in paragraph 2.7.4 to cancel the previously issued Trigger NOTAM in Series 'T'.

3.22 Checklist Processing

3.22.1 General Principles

3.22.1.1 A received Checklist shall be processed and, unless otherwise agreed, made available to all Clients by the NOTAM Processing Unit without undue delay.

3.22.1.2 NOTAM Processing Units shall advise their Clients that certain States (which shall be specified) may issue Checklists that relate to more than one NOTAM Series.

3.22.1.3 In case of any ambiguities, e.g.:

- a valid NOTAM is not included in the Checklist; or

- a NOTAM included in the Checklist is not in the database, etc.

the NOTAM Processing Unit shall request clarification from the Publishing NOF.

Text shall be added to the Checklist, starting with the statement ‘NOTAM Subject to Query’ and followed by the observed discrepancies, in order to inform the Client that processing should be delayed or done with extra caution.

3.22.1.4 When, as a result of a query, omitted NOTAM numbers are restored in the corrected version of a Checklist, the NOTAM Processing Unit shall:

make available the revised Checklist to their Client; and

on request, make available the omitted NOTAM to their Client.

3.22.1.5 Note that certain States use a CTA/TMA location indicator as a pseudo FIR. The NOTAM Processing Unit shall change it to a valid FIR or AD indicator depending on the content (Paragraph 3.22.2.3, 3.22.2.8 refers).

3.22.1.6 Note also that Checklists may be received as NOTAMN and/or without an ‘EST’ indication in Item C) (paragraphs 2.5.1.6 and 3.22.2.9 refer).

3.22.2 Checklist Received as a NOTAM

3.22.2.1 If a Checklist is received as a NOTAM, but it is not in the agreed NOTAM Checklist format (paragraph 2.5 refers), the NOTAM Processing Unit shall convert it as described hereafter:

3.22.2.2 NOTAM Series, Number and Type shall be retained.

3.22.2.3 Item Q) ‘FIR’ Qualifier shall be:

the FIR of the Publishing NOF, if responsible for only 1 FIR; or

the 2–letter country indicator of the Publishing NOF followed by ‘XX’, if the Publishing NOF is responsible for multiple FIR (in the same or in different countries).

3.22.2.4 The NOTAM Code shall always be ‘QKKKK’.

3.22.2.5 Item Q) ‘Traffic’, ‘Purpose’ and ‘Scope’ Qualifiers shall be given the artificial value ‘K’, even if another Qualifier was included by the Publishing NOF.

3.22.2.6 Item Q) ‘Lower/Upper’ Qualifiers shall be the default values ‘000/999’.

3.22.2.7 Item Q) geographical reference and radius Qualifiers are required and, if missing, they shall be entered by the NOTAM Processing Unit.

3.22.2.8 Item A) should contain the list of all valid FIR for the Publishing NOF and, if any are missing, they shall be added by the NOTAM Processing Unit.

However, for States with a NOF but no own FIR (e.g. Swaziland, Lesotho, Macao), the location indicator of the main aerodrome will be entered in Item A). Otherwise the Checklist cannot be associated to the publishing NOF (e.g. Lesotho would have a Series A Checklist with Q-FIR + Item A FAJS which is the same as for South African A series).

3.22.2.9 Item C) should indicate the estimated time of validity, usually exactly one month after the date and time of the publication of the current Checklist, followed by 'EST'. Whenever another date/time group is entered by the Publishing NOF, the NOTAM Processing Unit shall not change it.

3.22.2.10 Item E) should be divided into two parts:

NOTAM Number Part, identified by 'CHECKLIST'

Should contain a list of the valid NOTAM issued in a particular series, in a format suitable for automatic and manual processing as described in paragraph 2.5.

If necessary, the NOTAM Processing Unit shall convert the Checklist into this format.

Latest Publication Part, identified by 'LATEST PUBLICATIONS'

Should contain a list of the latest publications (Amendments, Supplements, NOTAM Class II and AIC).

This part shall be made available as received. If this part is not present in the original NOTAM, the NOTAM Processing Unit shall make the Checklist available without this Latest Publication Part.

3.22.3 Checklist Not Received as a NOTAM

3.22.3.1 If a NOTAM Checklist is not received as a NOTAM (i.e. when no NOTAM number has been allocated to the Checklist), the NOTAM Processing Unit shall adapt the received AFTN message to the 'ad-hoc' Checklist format, as described in paragraph 4.5.

3.22.3.2 The processed checklist shall also be made available as an AFTN message. The message shall start with the word 'Checklist', the 4-letter indicator of the Publishing NOF or any other location indicator to which the numbering of the NOTAM refers and the corresponding NOTAM Series. The valid NOTAM numbers shall be included in the next line(s) according to the format described in paragraph 4.5.3, but retaining the latest publication part only if included in the original message.

Example:

```
CHECKLIST ABCD A
YEAR=2005 1678 1789
YEAR=2006 0012 0022 0056 0057 0058 0073 0099 0102 0123 0124 0125
LATEST PUBLICATIONS
AIRAC AIP AMDT 005/ 06 EFF 20 APR 06
AIP SUP 001/06
AIP AMDT 413
AIC A001/06
```

3.23 Missing NOTAM

3.23.1 If NOTAM are missing, the NOTAM Processing Unit shall request them from the Publishing NOF using a Request message. Chapter 4 refers but the syntax requirements of the Publishing NOF shall be observed.

3.23.2 Time parameters for initiating the first request message and succeeding repetition of the message shall be defined by the NOTAM Processing Unit and may vary depending on the Publishing NOF.

3.24 NOTAM Deletion

3.24.1 The processing of NOTAM not adhering to the ICAO Standard may force a NOTAM Processing Unit to delete NOTAM by means other than a NOTAMR or a NOTAMC if:

a) the NOTAM is cancelled by a printed publication (AIP AMDT, AIP SUP, etc.);

b) the NOTAM is cancelled by a checklist;

c) the NOTAM is cancelled by an AFTN free text message from the Publishing NOF;

d) the NOTAM is cancelled or replaced by a NOTAMC or a NOTAMR with more than one NOTAM to be cancelled or replaced;

e) the NOTAM is deleted because an updated/corrected version of the NOTAM shall follow.

4 DATABASE COMPLETENESS AND COHERENCE MESSAGES

4.1 General Principles

4.1.1 The maintenance of dynamic data is essential for the efficient operation of a NOTAM Processing Unit, a Publishing NOF or for an aeronautical database administrator. The application of ‘query messages’ is required to ensure the database completeness and coherence. Query messages based upon the use of AFTN (but not restricted to AFTN) are described in this Chapter. They were developed so as to permit automatic and manual processing of queries.

4.1.2 The basic requirements for messages destined for the maintenance of the dynamic data are:

request for one or more NOTAM;

request for the original version of a NOTAM;

request for an intermediate Checklist of valid NOTAM.

4.1.3 In order to facilitate automatic processing, the requests and the replies to the requests are identified by means of 3–letter identifiers.

Request for NOTAM:	‘RQN’
Request for ‘original version’ NOTAM:	‘RQO’
Request for an intermediate Checklist:	‘RQL’
Reply to these requests:	‘RQR’

4.1.4 For the avoidance of network overload, the number of requested NOTAM in a single request message shall be limited in ‘RQN’ or in ‘RQO’. It is recommended that the maximum is set to 100.

4.1.5 Request shall include the 4–letter indicator of the Publishing NOF or any other location indicator to which the numbering of the required NOTAM refers (e.g. USA).

4.1.6 A reply message shall contain only one NOTAM (or several messages in case of a multi-part NOTAM), or a status text regarding the requested NOTAM, normally followed by the requested NOTAM.

4.1.7 Request shall refer to only one Publishing NOF.

4.2 Request for the Repetition of NOTAM (RQN)

4.2.1 Codes and Symbols used

4.2.1.1 Note that no brackets will be used when transmitting a 'Request NOTAM' message. The following codes and symbols are used in requests for repetition :

'RQN'	is the designator for 'Request NOTAM'.
'LFFA'	4-letter indicator of the Publishing NOF or other location indicator to which the numbering of the NOTAM refers.
'A0123/00'	NOTAM Series Identifier and NOTAM Number.
' - '	(hyphen) is used to indicate 'TO' or 'FROM-TO'.
' '	(blank) is interpreted as 'AND'.
'RQR'	is the designator for the reply.

4.2.2 Examples of the Request for NOTAM

4.2.2.1 Request of a single NOTAM

Example 1 : PARIS NOF requests from ROMA NOF the Italian NOTAM A0123/00.

Request:
ZCZC ...
GG LIIAYNYX
160830 LFFAYNYX
RQN LIIA A0123/00

Reply:
ZCZC ...
GG LFFAYNYX
160835 LIIAYNYX
RQR LIIA A0123/00
(A0123/00 NOTAMN
Q).../..../....   etc.)

Example 2 : PARIS NOF requests from FRANKFURT NOF the Polish NOTAM A1253/00.

Request:
ZCZC ...
GG EDDZYNYX
160900 LFFAYNYX
RQN EPWW A1253/00

Reply:
ZCZC ...
GG LFFAYNYX
160905 EDDZYNYX
RQR EPWW A1253/00
(A1253/00 NOTAMN
Q).../..../....   etc.)

4.2.2.2 Request of several NOTAM with continuous numbering

Example 3 : PARIS NOF requests from ROMA NOF for Cyprus NOTAM between A0199/00 and A0210/00.

Request:
```
ZCZC ...
GG LIIAYNYX
281030 LFFAYNYX
RQN LCNC A0199/00-A0210/00
```

Reply:
```
ZCZC ...
GG LFFAYNYX
281035 LIIAYNYX
RQR LCNC A0199/00
(A0199/00 NOTAMN
Q).../..../....   etc.)
```

Note: The full Reply consists of 12 messages containing one NOTAM each.

4.2.2.3 Request of several NOTAM with discontinuous numbering

Example 4: PARIS NOF requests from FRANKFURT NOF for Russian Federation NOTAM A0400/00, A0410/00 and NOTAM between A0420/00 and A0425/00.

Request:
```
ZCZC ...
GG EDDZYNYX
281530 LFFAYNYX
RQN UUUU A0400/00 A0410/00 A0420/00-A0425/00
```

Reply:
```
ZCZC ...
GG LFFAYNYX
281540 EDDZYNYX
RQR UUUU A0400/00
(A0400/00 NOTAMN
Q).../..../....   etc.)
```

Note: The full Reply consists of 8 messages containing one NOTAM each.

4.3 Request for the original version of NOTAM (RQO)

4.3.1 General Specification

4.3.1.1 A NOTAM Processing Unit will normally transmit only the processed version of NOTAM to its clients. Whenever a NPU client needs the original version of a NOTAM, it can be obtained by sending a ‘Request for Original NOTAM’ message (RQO) to the NOTAM Processing Unit.

4.3.1.2 RQO is only to be used in data exchange between NPU Client and NOTAM Processing Unit.

4.3.1.3 A reply message shall contain the ‘status line’: ‘ORIGINAL NOTAM’, followed by a single NOTAM.

4.3.1.4 The reply message of an original NOTAM shall always include the original origin line (DTG + Publishing NOF address).

4.3.2 Codes and Symbols used

4.3.2.1 The following Codes and Symbols are used in requests for the original version:

'RQO'	is the designator for 'Request Original NOTAM'.
'LFFA'	4-letter indicator of the Publishing NOF or other location indicator to which the numbering of the NOTAM refers.
'A0123/00'	NOTAM Series Identifier and NOTAM Number.
' - '	(hyphen) is used to indicate 'TO' or 'FROM-TO'.
' '	(blank) is interpreted as 'AND'.
'RQR'	is the designator for the reply.

4.3.3 Example of the Request for Original NOTAM

Example 5: PARIS NOF requests from FRANKFURT NOF the Original NOTAM KJFK A0553/00.

Request:

```
ZCZC ...
GG EDDZYNYX
160900 LFFAYNYX
RQO KJFK A0553/00
```

Reply:

```
ZCZC ...
GG LFFAYNYX
160910 EDDZYNYX
RQR KJFK A0553/00
ORIGINAL NOTAM
052255 KDCAYNYX
(A0553/00 NOTAMN
A)KJFK B)WIE C)UFN
E) ...etc.
```

4.4 Content of the Reply Messages (RQR)

4.4.1 General Specification

4.4.1.1 A Reply message to RQN and RQO contains only one NOTAM (or one part of a Multi-part NOTAM). If a request was made for multiple NOTAM it will result in multiple reply messages.

4.4.1.2 A single 'RQN' or 'RQO' request for multiple NOTAM shall result in multiple reply messages unless the requested NOTAM are not available for a reply (exception 4.4.1.7 refers).

4.4.1.3 In reply to a RQN by a NOTAM Processing Unit, if the NOTAM queried has been processed by the NPU, the reply message shall contain the code of the NPU as the originator instead of the code of the Publishing NOF.

4.4.1.4 If the queried NOTAM is 'no longer valid' or 'not available', this status will be communicated through the reply as follows:

a) if the NOTAM is no longer valid, a 'Status line' will precede the transmission of the requested NOTAM.

b) if the NOTAM is not available, only a relevant 'Status line' will be transmitted.

4.4.1.5 Only one 'Status line' shall be included in the reply and it shall contain only one status expression if the RQR contains a NOTAM, e.g. no additional line nor status expression shall be included in case of 'ORIGINAL NOTAM'.

4.4.1.6 In order to limit the number of RQR messages in reply to a RQN for more than one NOTAM, and when these NOTAM are not available in the NPU's database, the RQR shall contain all NOTAM numbers concerned by the same reply: 'NOTAM REQUESTED' or 'NOTAM NO LONGER IN DATABASE' or 'NOTAM NOT ISSUED'. For example, instead of 99 RQR messages with 'NOTAM NOT ISSUED', only one RQR shall be sent.

4.4.1.7 Database should allow repetition of no longer valid NOTAM for a period of 3 months.

4.4.1.8 NOTAM Processing Unit shall provide their NPU Client with a list of the available NOTAM series for each Publishing NOF. This list shall contain the 4-letter indicators that uniquely identify the Publishing NOF or any other location indicator to which the numbering of the NOTAM in the series refers to.

4.4.2 Standard Expressions in Reply Messages

4.4.2.1 The following mandatory statements shall be mentioned in the reply when appropriate:

'NOTAM EXPIRED'	Item C time was reached
'NOTAM REQUESTED'	The NOTAM Processing Unit has requested the requested NOTAM but not yet received it.
'NOTAM CANCELLED BY A1324/05'	NOTAM was cancelled by a NOTAMC
'NOTAM DELETED'	NOTAM was deleted by the NOTAM Processing Unit. Reasons for deletion might be for example that the NOTAM was

	omitted from Checklist, deleted by printed publication, or other information received from publishing NOF.
'NOTAM NO LONGER IN DATABASE'	NOTAM was either expired, replaced, cancelled or deleted since more than 3 months
'NOTAM NOT ISSUED'	The Publishing NOF has not issued the requested NOTAM
'NOTAM REPLACED BY C3042/00'	NOTAM was replaced by a NOTAMR
'ORIGINAL NOTAM'	Original version of the NOTAM
'NO VALID NOTAM IN DATABASE'	For reply on a RQL if no valid NOTAM is available.

4.4.3 Examples for Status of NOTAM

Example 6 : The requested Egyptian NOTAM A0400/00 is expired.

Reply:
```
ZCZC ...
GG LFFAYNYX
281600 LIIAYNYX
RQR HECA A0400/00
NOTAM EXPIRED
(A0400/00 NOTAMN
Q).../.../.... etc.)
```

Example 7 : The requested Senegal NOTAM A0213/05 was not received at the NOTAM Processing Unit.

Reply:

If a gap in the NOTAM numbers is detected :
```
ZCZC ...
GG EDDZYNYX
091430 LFFAYNYX
RQR GOOO A0213/05
NOTAM REQUESTED
```

or if the NOTAM number is greater than the last one received :
```
ZCZC ...
GG EDDZYNYX
091430 LFFAYNYX
RQR GOOO A0213/05
NOTAM NOT ISSUED
```

or if the NOTAM was cancelled, replaced or deleted

ZCZC ...
GG EDDZYNYX
091430 LFFAYNYX
RQR GOOO A0213/05
NOTAM CANCELLED BY A0222/05
or … NOTAM REPLACED BY A0233/05
or … NOTAM DELETED

Example 8 : The requested Tahiti NOTAM A0021/00 was cancelled.

Reply: ZCZC ...
GG LIIAYNYX
301235 LFFAYNYX
RQR NTAA A0021/00
NOTAM CANCELLED BY A0023/00
(A0021/00 NOTAMR A0017/00
Q).../.../.../ etc.

Example 9 : The requested Cuban NOTAM A1577/05was not issued.

Reply: ZCZC ...
GG EDDZYNYX
110925 LEANYNYX
RQR MUHA A1577/05
NOTAM NOT ISSUED

Example 10 : The requested Korean NOTAM A0449/05 was replaced.

Reply: ZCZC ...
GG LFFAYNYX
282055 LIIAYNYX
RQR RKRR A0449/05
NOTAM REPLACED BY A0452/05
(A0449/05 NOTAMN
Q)../../../ etc.)

The importance of transmitting the requested NOTAM is emphasised, even when it is already cancelled, replaced or deleted. Otherwise, there might be inconsistencies in the database, as NOTAM could not be removed then, (NOTAM A0017/00 in Example 8).

In the exceptional case that a cancelled, replaced or deleted NOTAM was not received the RQR shall contain the status line only.

Example 11 : The requested (RQO) United States NOTAM A0092/00 is an Original NOTAM.

Reply: ZCZC ...
GG LIIAYNYX
031755 EDDZYNYX
RQR KJFK A0092/00
ORIGINAL NOTAM
010025 KDCAYNYX
(A0092/00 NOTAMN
A) KJFK B)...C)... etc.)

4.5 Request for a List of valid NOTAM (RQL)

4.5.1 General Specification

4.5.1.1 The ‘List of valid NOTAM’ is a free text message. Contrary to the regular checklist, this intermediate checklist is not a NOTAM itself, as it does not receive a number of the series it refers to.

4.5.1.2 Note that the last regular checklist is a valid NOTAM and therefore, its number shall appear in the RQL.

4.5.1.3 Multiple series of the same Publishing NOF may be requested in one message.

4.5.1.4 A reply message shall contain the checklist of only one NOTAM Series.

4.5.1.5 A request for multiple NOTAM series shall result in multiple reply messages each containing one series checklist.

4.5.1.6 The reply message is identified by the unique 4-letter indicator and the NOTAM series identifier. The ‘List of valid NOTAM’ according to the NOTAM Processing Unit database content is provided in a way similar to the structure of Item E of a regular NOTAM checklist, without the latest publication part.

4.5.1.7 Whenever the regularly published NOTAM checklist is requested, the Client should use the RQN procedure, clearly indicating both NOTAM series and number.

4.5.2 Codes and Symbols used

4.5.2.1 The following Codes and Symbols are used in requests for a list of valid NOTAM:

‘RQL’	is the designator for ‘request list’.
‘LFFA’	4-letter indicator of the Publishing NOF or other location indicator to which the numbering of the NOTAM refers to.
‘A’	NOTAM Series Identifier.
‘ ‘	(blank) is interpreted as ‘AND’.
‘RQR’	is the designator for the reply.

4.5.3 Examples of the request for a List of valid NOTAM

4.5.3.1 Request of a single NOTAM Series

Example 12: PARIS NOF requests from ROMA NOF the list of valid Cyprus NOTAM in series Alpha:

Request: ZCZC ...
GG LIIAYNYX
281040 LFFAYNYX
RQL LCNC A

Reply: ZCZC ...
GG LFFAYNYX
281055 LIIAYNYX
RQR LCNC A
YEAR=1997 0322 0452
YEAR=1998 0001 0006 0010 0015 0016
0021 0035 0039

or ….. /
Reply: ZCZC ...
GG LFFAYNYX
281055 LIIAYNYX
RQR LCNC A
NO VALID NOTAM IN DATABASE

Example 13: PARIS NOF requests from ROMA NOF the list of valid Guyana NOTAM in series Alpha, but last Checklist A0011/05 is the only valid NOTAM.

Request: ZCZC ...
GG LIIAYNYX
281040 LFFAYNYX
RQL SYCJ A

Reply: ZCZC ...
GG LFFAYNYX
281055 LIIAYNYX
RQR SYCJ A
YEAR=2005 0011

4.5.3.2 Request of multiple NOTAM Series

Example 14: ROMA NOF requests from FRANKFURT NOF the list of valid NOTAM from the United Kingdom in series Bravo, Echo and Golf:

Request:
ZCZC ...
GG EDDZYNYX
310840 LIIAYNYX
RQL EGGN B E G

Reply:
ZCZC ...
GG LIIAYNYX
310850 EDDZYNYX
RQR EGGN B
YEAR=1997 1678 1789
YEAR=1998 0012 0022 0056 0057 0058
0123 0124 0125

The full Reply consists of 3 Messages containing one NOTAM Series in each.

5 PROCEDURES FOR SNOWTAM AND ASHTAM

5.1 Introduction

5.1.1 Two types of operationally relevant messages are described in ICAO documentation and distributed via the AFS. As these messages are operationally relevant, their processing is required to enable database storage and consequently further retrieval for their incorporation in PIB. The concerned messages are:

SNOWTAM and

ASHTAM

5.1.2 SNOWTAM and ASHTAM are expected to be received in their defined format. Therefore, it is anticipated that they shall neither be edited nor corrected nor summarised. If a message is detected as received obviously incorrect (e.g. garbled), a query shall be addressed to the originator for clarification. This processing can be done by individual or centralised Units.

5.2 SNOWTAM

5.2.1 Definition

5.2.1.1 'A special series NOTAM notifying the presence or removal of hazardous conditions due to snow, ice, slush or standing water associated with snow, slush and ice on the movement area by means of a specific format.'[3]

5.2.1.2 During periods when deposits of snow, ice, slush or water associated with these conditions remain on the aerodrome pavements, information on such conditions should be disseminated to all to whom the information is of direct operational significance. Use of the ICAO Doc 8400 abbreviations (Ref [3]) and plain language is also permissible.

5.2.1.3 For details of SNOWTAM Items refer to the ICAO Annex 15 (Ref. [1]), Appendix 2 and Doc 8126 (Ref [2]), Ch 6 Appendix A.

[3] source: Annex 15, 12th Edition, Chapter 2

5.2.2 Examples

Example 1: GG EFCC….

281225 EFTPZTZX
SWEF0587 EFTP 11291215
(SNOWTAM 0587
A)EFTP B)11291215 C)06 E)40
F)47/47/47 G)3/3/3 H)75/78/75 SKH N)7 R)47
T)RWY CONTAMINATION 100 PER CENT. SURFACE FRICTION: ON TWY MEDIUM TO GOOD, ON APRON MEDIUM TO POOR)

Where the header is composed of:

GG	= priority indicator.
EFCC….	= addresses.
281225	= origin time.
EFTPZTZX	= originator.
SWEF0587	= SW is the data designator for SNOWTAM; EF are the nationality letters for the state (in this case Finland); 0587 is a four digits serial number.
EFTP	= 4-letter location indicator of the aerodrome to which the SNOWTAM refers.
11291215	= date/time of observation as month, day, hour and minute in UTC, all by two digits (in this case 29th of November, 1215 UTC).

Where the message is composed of:

SNOWTAM	= designator for the SNOWTAM.
0587	= the SNOWTAM number (the same four digits serial number as in the header).
A)EFTP	= item A) aerodrome location indicator (the same as in the header).
B)11291215	= item B) date/time of observation (same as in the header section).
C)06	= item C) lower runway designator number (for RWY 06/24 the lower runway designator number is 06).
E)40	= item E) cleared runway width in metres, if less than published width (in this case, the published width is 45 metres and cleared width is 40 metres only).
F)47/47/47	= item F) deposits over the total runway length, observed on each third part of the runway starting from the threshold with lower runway designator number (in this case a combination of dry snow (4) and ice (7) on each third part).
G)3/3/3	= item G) depth of the deposit(s) in millimetres for each third of the total runway length (in this case the mean depth of the deposits is 3 millimetres on each third part).
H)75/78/75 SKH	= item H) friction measurements on each third of the runway and friction measuring device (in this case the measured friction coefficient values for each third part of the runway are 75, 78 and 75 - starting from the threshold with lower runway designator - and the measurement device used is skiddometer with high-pressure tyre)
N)7	= item N) taxiway conditions (in this case ice – deposit code for ice is 7 as described in item F of the SNOWTAM format)

R)47 = item R) apron conditions (in this case a combination of dry snow and ice – deposit codes for dry snow (4) and ice (7) as described in item F of the SNOWTAM format)

T)RWY CONTAMINATION 100 PER CENT. SURFACE FRICTION: ON TWY MEDIUM TO GOOD, ON APRON MEDIUM TO POOR
= item T) plain language field for any additional information (in this case the extent of the runway contamination (item F above) is between 51 and 100 %. The estimated surface friction for taxiways and apron are also given)

Example 2:

"When reporting on two or three runways, repeat Items C) to P) inclusive":[4]

```
GG EDZZ.... ........
300645 EDDKYDYX
SWED0012 EDDK 12300630
(SNOWTAM 0012
A) EDDK  B) 12300630
C) 14L  F) 2/2/2  G) 30/30/40  H) 5/5/5
C) 14R   F) 5/5/5  G) 30/30/40  H) 9/9/9
C) 07   F) 5/5/5  G) 40/30/30  H) 9/9/9
R) 2   S) 12300800  T) SNOW REMOVAL IN PROGRESS)
T)RWY CONTAMINATION 100 PERCENT. SNOW REMOVAL IN
          PROGRESS)
```

5.2.3 Procedures

5.2.3.1 The format detailed in Annex 15 (Ref [1]) Appendix 2 shall be strictly adhered to.

5.2.3.2 A list of aerodromes for which SNOWTAM are likely to be issued shall appear in an AIS publication (AIP, AIP SUP or AIC) together with details of the originators and of the numbering system to be used.

5.2.3.3 It is recommended to adopt a numbering sequence starting either at the beginning of the snow season or at the beginning of the year.

5.2.3.4 It will be necessary for systems to identify the latest SNOWTAM for each affected aerodrome by reference to the serial number and observation time.

5.2.3.5 Only one SNOWTAM can be valid for each affected aerodrome at any one time.

5.2.3.6 The next planned observation may be declared in Item S), but whenever a significant change of the weather condition occurs, a new SNOWTAM shall be published and will completely replace any SNOWTAM previously issued.

5.2.3.7 The maximum validity of a SNOWTAM is 24 hours.

5.2.3.8 The incorporation of SNOWTAM in PIB is highly recommended, as it improves pre-flight briefing and provides airline operators with more comprehensive information.

[4] Doc 8126 (Ref [2]) page 6-A-14 § 1.a)

5.3 ASHTAM

5.3.1 Definition

5.3.1.1 "'A special series NOTAM notifying by means of a specific format change in activity of a volcano, a volcanic eruption and/or volcanic ash cloud that is of significance to aircraft operations." [5]

5.3.1.2 When notification of such activity is made, the ASHTAM provides information on the status of activity using a 'volcano level of alert colour code'.

5.3.1.3 The ASHTAM also provides information on the location, extent and movement of the ash cloud and on the air routes and flight levels affected.

Example:

161143 WIIXYNYX
VAWA 0004 WAAZ 05161137
(ASHTAM 0004
A) WAAZ
B) 0505161137
C) AWU 0607-04
D) 0340N12530E
E) YELLOW
F) 1320M/4331FT
G)SFC/FL100 WINDS SFC/FL100 260/10KT
I) CTN ADZ OVERFLYING FOR R590 R342
J) YMMCYMYX

5.3.1.4 For details of the format refer to ICAO Annex 15 (Ref. [1]), Appendix 3.

5.3.2 Procedures

5.3.2.1 ASHTAM identification shall appear in the first line of the AFTN message text and shall start with the ASHTAM indicator 'VA' followed by the designator for the State e.g. 'LI', and a serial number in a four-figure group. The FIR to which the ASHTAM refers is indicated with its four-letter location indicator. The observation time is shown as an eight-figure group.

Example: VALI0001 LIRR 11250800

5.3.2.2 Whenever there is a change in the level of alert, a new ASHTAM shall be published and will completely replace any ASHTAM previously issued.

5.3.2.3 It will be necessary for systems to check whether an ASHTAM has been issued for the FIR concerned by reference to this serial number and observation time. ASHTAM for the same FIR issued previously (lower serial number), or with an earlier observation time will be outdated.

5.3.2.4 The maximum validity of an ASHTAM is 24 hours.

[5] source: Annex 15 (Ref [1]), 12th Edition, Chapter 2

5.3.2.5 The incorporation of ASHTAM in PIB is highly recommended, as it improves pre-flight briefing and provides airline operators with more comprehensive information.

APPENDIX A1 – SYSTEM PARAMETERS

Data Definition

In order that procedures for NOTAM Creation (Chapter 2), NOTAM Processing (Chapter 3) and NOTAM storage can be performed, the associated database must contain the necessary data.

Static Data

The data usually designated by the term ‘Static Data’ is the Data known to the aviation world and documented in publications like AIP, e.g. FIR(s), Aerodromes, Navaids, Areas, Maps, Rules, Subjects to which a NOTAM may be related and other aeronautical information like AIC etc.

and,

Data required to enable NOTAM creation and processing, e.g. reference lists, standard routes, distribution files, selection criteria, association criteria etc.

Dynamic Data

The data usually designated by the term ‘Dynamic Data’ is the data conveyed by the means of NOTAM, SNOWTAM, ASHTAM, Checklists received or coherence messages.

The list of static data which might be used for NOTAM processing is contained in Appendix C, Figure C-2, of ICAO Doc 8126 (Ref. [2]). Elements of this list will also be used for NOTAM Creation, as well as for ASHTAM and SNOWTAM.

System Parameters

NOTAM database management is governed by a certain number of system parameters.

System Parameters for Data Storage

NOTAM are stored in the database from their publication/reception until their indicated end of validity, replacement or cancellation (including. removal from the monthly checklist).

Expired, replaced or cancelled NOTAM shall no longer appear in Pre-flight Information Bulletins, nor in the checklist.

Expired, replaced or cancelled NOTAM shall remain available from the database for a period of at least 30 days after their deletion. Note that for NOTAM Processing Units this period shall be at least 60 days.

SNOWTAM and ASHTAM shall also be stored for a period of at least 30 days from their expired validity.

System Parameters for Data Archiving

When NOTAM and other Messages are no longer valid for operational database needs (e.g. Pre-flight Information Bulletin production) storage is required to comply with legal obligations.

Long-term storage is possible on various media. The duration of the storage can vary from one Administration to another, depending upon the type of data and upon national legal requirements.

It is recommended that a NOTAM Processing Unit will store NOTAM for a period of time (one to several years) to be defined, depending upon the source of information, i.e.:

- NOTAM produced by a client-NOF and retransmitted by the NPU;
- Original NOTAM received from non-client NOF;
- Processed NOTAM version from the NOTAM Processing Unit.

Processing of 'EST' NOTAM by the Publishing NOF

NOTAM that contain 'EST' in the Item C (end of validity) require an action by the Publishing NOF for their replacement or cancellation before the 'EST' time is reached.

The NOF System shall ensure that a reminder is provided before the 'estimated' end of validity, to produce a NOTAMR or a NOTAMC. Individual parameters can be installed, depending upon the type of information, and the operational possibilities of the Unit.

The following parameters are indicative, depending on the estimated validity of the NOTAM:

- up to 1 day	: 6 hours before EST time
- more than 1 day and up to 1 month	: 1 day before EST time
- more than 1 month and up to 3 months	: 3 days before EST time

Processing of 'EST' NOTAM by a NOTAM Processing Unit

See Chapter 3.

APPENDIX A2 - GLOSSARY

ACTIVE NOTAM
A NOTAM is active between the dates and times stated in Items B) and C) subject to the time schedule in Item D).

AIRAC AIP AMENDMENT
Permanent changes to operationally significant information contained in the AIP which are published in accordance with AIRAC procedures.

AIRAC AIP SUPPLEMENT
Temporary changes to operationally significant information contained in the AIP which are published by means of special pages in accordance with AIRAC procedures.

AIRSPACE RESERVATION
Term used in the NSC to define a group of Navigation Warning activities.

AIRSPACE RESTRICTION
Any changes to the limits, structure and/or availability of airspace.

AIS MESSAGE
AFTN Message composed according to the rules in Annex 10, made up of a maximum of 1800 characters and containing a single NOTAM or an ASHTAM or a SNOWTAM or an unformatted service message inherent to AIS operative requests interchanged between NOF, originators, clients and/or NPU

AUTOMATIC PROCESSING
The processing and storing of NOTAM received from Publishing NOF without any human intervention.

CANCELLED NOTAM
A NOTAM that has been deleted by another NOTAM (NOTAMC or NOTAMR) before the Item C) date and time has been reached.

CFMU
Central Flow Management Unit (Europe).

CHECKLIST
A NOTAM published regularly in each NOTAM series containing a list, grouped by year, of valid NOTAM numbers promulgated in that series.

CONVERSION
Transposition of a NOTAM received in the old format into a correctly formatted ICAO NOTAM.

DATA CORRECTION
Changing data elements where these are obviously wrong.

DEFAULT VALUES
A predetermined and agreed value to be inserted in fields that need to be filled but for which a specific value could not be defined.

EDITING
Changing the Item E) wording and/or layout of a NOTAM to make it clearer or to more explicitly express ideas that are implicit in that text.

END OF VALIDITY (NOTAM Item C)
The ten figure date-time group at which the NOTAM ceases to be in force and valid.

EST
Suffix added to the ten figure date-time group in Item C) for NOTAM with an estimated date and time of end of validity.

EXPIRED NOTAM
A NOTAM whose date and time of end of validity stated in Item C) has been reached.

GEOGRAPHICAL REFERENCE
Eighth field of the NOTAM Item Q) which contains one set of co-ordinates and a radius. Associates the NOTAM with the geographical co-ordinates of a centre point and a radius (to a precision of 1 nautical mile) that define the sphere of influence to which the NOTAM refers.

NOF
A NOTAM Office.

NOTAM CLASS II
A former classification for a NOTAM sent by postal mail which is no longer defined by ICAO and should no longer be used. NOTAM information which cannot be disseminated by electronic means should now be published in an AIP Supplement (SUP).

NOTAM CODE
A code group containing a total of five (5) letters, always starting with ‘Q’, to indicate the coding of information regarding the establishment, condition or change of radio aids, aerodrome and lighting facilities, dangers to aircraft in flight, or search and rescue facilities.

NOTAM CONDITION
Defined by the 4th and 5th letters of the NOTAM Code, which decode to describe the status of the NOTAM Subject (2nd and 3rd letters of the NOTAM Code) being reported on.

NOTAM IN FORCE
A NOTAM is in force once it has reached the date stated in Item B) and has neither been cancelled nor replaced nor reached its end of validity stated in Item C).

NOTAM PROCESSING UNIT (NPU)
Any Unit that is responsible for the reception, processing and further distribution of AIS Messages to its Clients.

Note that this Unit may perform these functions for its own purposes only or may act on behalf of one or more Client.

The EAD (European AIS Database) is an example of a NOTAM Processing Unit.

NOTAM SELECTION CRITERIA (NSC)
The basis for the assignment of NOTAM codes. The association criteria defined provide a subject related association of NOTAM with the qualifiers ‘Traffic’, ‘Purpose’ and ‘Scope’.

NOTAM SUBJECT
Defined by the 2nd and 3rd letters of the NOTAM Code, which decode to identify the facility, service or hazard being reported upon.

NOTAM SUB-NUMBER
In the case of Multi-part NOTAM, a 3-character group placed immediately behind the year of the number/year combination and composed of one letter and a number consisting of 2 digits.

NPU
See ‘NOTAM PROCESSING UNIT’.

NPU CLIENT
Any organisation which has subscribed to the services provided by a NOTAM Processing Unit.

NSC
See ‘NOTAM SELECTION CRITERIA’.

OPERATIONAL SIGNIFICANCE
Information essential for the safe and efficient conduct of a flight.

ORIGINAL NOTAM
A NOTAM as received by the NOTAM Processing Unit.

PROCESSING
The examination of NOTAM received from Publishing NOF in order to verify suitability for acceptance into an automated AIS system; undertaking conversion, translation, syntax correction, data correction, editing and/or summarising as required.

PUBLISHING NOF
The NOF (NOTAM Office) or non-governmental agency responsible for the creation of the original NOTAM.

QUALIFIER LINE (NOTAM Item Q).
This Item is divided into eight fields, each separated by a stroke, and contains the necessary qualifiers to facilitate data retrieval.

RADIUS
A three digit figure in Nautical Miles to be used in Item Q) that, together with the co-ordinates, defines a circle which encompasses the whole area of influence of the NOTAM.

SUMMARISING
Reducing text in order to make it more readable in a Pre-flight Information Bulletin (PIB).

SUPRA-NATIONAL INFORMATION
Information concerning an activity or condition which affects the airspace/FIR of two or more States.

SYNTAX CORRECTION
Changing the published format structure of the NOTAM where these are obviously wrong.

START OF VALIDITY (NOTAM Item B)
The ten figure date-time group at which the NOTAM comes into force.

TRANSLATION
Rendering the text of a NOTAM originated in French or Spanish, into the English language, while maintaining the original sense of the text.

TRIGGER NOTAM
A NOTAM alerting recipients and PIB users of the existence and subject content of AIP Amendments and Supplements.

VALID NOTAM
A NOTAM which has been published and has not yet reached the end of its validity and has neither been cancelled nor replaced.

STATE SAR AGREEMENTS

(last updated 6 July 2007)

ID NO.	DATE	STATES	REMARKS
1	14 April 1972	ASEAN States - Indonesia, Malaysia, Philippines, Singapore and Thailand	Multilateral agreement for the facilitation of search for aircraft in distress and rescue of survivors of aircraft accidents
2	March 1997	Viet Nam - ASEAN	Viet Nam signed instrument of accession to 1972 ASEAN Agreement (as above)
3	June 1982	Indonesia / Singapore	
4	September 1985	Singapore / Thailand	Updated July 1996
5	July 1996	Philippines / Singapore	
6	November 1990	Australia / Indonesia	Updated 5 April 2004
7	February 1999	Cambodia / Viet Nam	
8	9 December 1985	Malaysia / Philippines	
9	9 September 1985	Malaysia / Thailand	
10	11 August 1984	Malaysia / Singapore	
11	29 August 1985	Malaysia / Indonesia	
12	16 December 1998	Malaysia / Brunei Darussalam	
13	February 2001	Australia / Papua New Guinea	
14	September 2002	New Caledonia / New Zealand	
15	November 2002	United States / Republic of Palau	
16	2003	United States / New Zealand	
17	1988	United States / Indonesia	
18	1986	United States / Japan	
19	notified 2003	United States / Marshall Islands	
20	notified 2003	United States / Micronesia	
21	notified 2003	United States / China	
22	1998	Lao PDR / Vietnam	LOA for provision of assistance

ID NO.	DATE	STATES	REMARKS
23	June 2005	Tonga / New Zealand	
24	August 1986	Indonesia / Philippines	
25	notified July 2006	Indonesia / United States	Agreement on the Coordination of SAR Services
26	1990	Indonesia / Papua New Guinea	JBC MOU signed
27	July 1996	Viet Nam / Singapore	
28	September 1996	Viet Nam / Philippines	
29	notified 2005	New Zealand / Australia	
30	notified 2005	New Zealand / Samoa	
31	April 2006	Australia / Maldives	Letter of Arrangement
32	**notified July 2007**	**New Zealand / Cook Islands,**	
33	**notified July 2007**	**New Zealand/Chile**	**Final draft agreement being considered by authorities in Chile**
34	**notified July 2007**	**New Zealand/Niue**	**No requirement for separate SAR agreement, covered under Government to Government aid agreement**
35	**notified July 2007**	**New Zealand/Tahiti French Polynesia**	**Final draft agreement being considered by authorities in Tahiti**
36	**notified July 2007**	**New Zealand/Tokelau**	**No requirement for separate SAR agreement, covered under Government to Government aid agreement**

*updated entries by ATM/AIS/SAR/SG/17 in bold type

Analysis of SAR Capability of ICAO States in the ASIA/PAC Region

	Training	Alerting	Legislative	SAR committee	Agreements	Relationships	Communications	Quality Control	Civil/Military	Resources	SAREX	Library	Computerisation	SAR programme	Supply dropping	Special equipment	SAR aircraft	Navigation	ELTs	LUT
Australia	E	E	E	E	E	C	E	E	E	E	E	E	E	E	E	E	E	E	C	E
Bangladesh	B	C	D	A	A	C	C	A	D	A	A	C	A	A	C	C	D	A	D	C
Bhutan																				
Brunei	E	E	E	E	E	E	E	E	E	E	E	E	E	E	D	D	E	E	E	A
Cambodia	B	B	B	B	B	B	C	A	B	B	A	C	A	A	A	A	B	A	A	A
China	E	E	E	E	E	E	D	D	E	D	D	C	B	A	E	E	E	E	E	A
Cook Islands	A	B	B	A	A	C	C	C	B	A	B	A	A	A	A	B	B	A	E	A
DPR Korea	B	D	B	D	A	B	D	D	D	C	B	A	A	A	B	A	C	C	A	A
Fiji	B	C	C	C	C	C	C	B	D	C	D	C	A	C	B	A	C	C	C	A
French Polynesia	C	D	D	D	C	D	E	A	E	C	C	B	A	A	E	D	E	E	E	**A**
Hong Kong, China	E	E	E	E	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
India	D	C	C	B	B	C	C	A	C	C	C	C	C	D	D	D	C	A	B	E
Indonesia	E	D	E	E	E	D	D	D	E	D	E	D	D	D	C	D	D	D	D	E
Japan	E	E	E	E	D	E	E	E	E	E	E	E	D	E	E	E	E	E	E	E
Kiribati																				
Lao PDR	B	A	B	B	B	A	B	A	B	B	A	C	A	A	A	A	A	A	A	A
Macau, China	E					E	E				E						E			
Malaysia	E	E	C	E	D	E	E	E	E	E	E	D	E	E	E	D	E	E	E	B
Maldives	B	A	A	A	A	A	A	A	D	A	C	A	A	A	A	A	A	A	A	A
Marshall Islands																				
Micronesia	C	B		A	A	B	C					A		B	B					
Mongolia	A	C	C	A	B	B	B	A	B	B	B	C	B	B	A	A	A	A	B	A
Myanmar	B	A	B	C	A	D	C	C	D	A	A	A	A	A	C	A	D	C	A	A
Nauru																				
Nepal	D	D	C	B	A	C	C	B	D	B	A	B	A	D	D	C	D	D	D	B
New Caledonia	C	D	D	D	C	D	E	A	E	C	C	B	A	A	E	D	E	E	E	E
New Zealand	E	E	E	E	A	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Pakistan	C	C	D	D	A	D	D	C	D	C	A	A	A	A	D	A	D	D	C	E
Palau																				
Papua New Guinea	D	E	D	C	D	D	C	C	D	C	C	D	C	C	C	A	A	A	E	A
Philippines	D	C	E	D	D	C	D	D	E	C	C	C	C	C	C	B	C	E	C	A
Rep. of Korea	C	C	C	C	C	D	E	E	E	E	C	A	D	E	D	E	E	E	E	E
Samoa																				
Solomon Islands																				
Singapore	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Sri Lanka	D	A	C	D	B	C	C	D	E	D	B	C	A	A	D	D	C	A	C	A
Thailand	E	E	E	E	D	E	E	E	E	E	E	D	D	D	E	E	E	E	E	E
Timor Leste																				
Tonga	C	B	A	A	B	C	C	A	D	A	A	A	A	A	A	A	C	A	E	A
United States	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Vanuatu																				
Viet Nam	D	D	D	E	D	D	D	C	E	D	C	C	B	C	C	D	D	C	D	B

Last updated 6 July 2007

Categorisations:

A = Not implemented	D = Meets Annex 12 requirements in most areas
B = Initial implementation	E = Fully meets Annex 12 requirements
C = Meets Annex 12 requirements in some areas	Blank = No response

RECOMMENDATIONS OF THE FEBRUARY 2007 ICAO SAR WORKSHOP RELATED TO THE WORK OF APANPIRG

1. On account of the workshop being as well received as it was and as useful in transferring awareness, knowledge and motivation;

   It is recommended that ICAO should conduct such informative SAR building initiatives more regularly.

2. Because particular benefit was derived from the desk top SAR exercise (SAREX);

   It is recommended that future SAR seminars and workshops should incorporate either a desk top SAREX or, if funds permit, a live SAREX that facilitates the involvement of all participants and gives a practical context to the SAR learning process.

3. Because the participation of SAR experts from various State administrations gave opportunity for a comparison of procedures, an exchange of views and the emergence of a spirit of camaraderie and enthusiastic enquiry;

   It is recommended that future workshops should include presentations from an array of experts from various maritime and aeronautical administrations and civil and military SAR providers.

4. In consideration of the unprecedented growth in air traffic now occurring and forecast to continue throughout the Asia/Pacific region, and recognizing that, counter to popular perception, airline accidents are survived by a very high number of occupants;

   It is recommended that more attention be paid to SAR services by the ICAO Asia/Pacific Regional Office.

5. While SAR features on the agenda of some regional planning and procedures groups, it is noted that it is frequently paid little focused attention. This, it is considered, arises out of insufficient representation at such meetings by personnel aware of the need for SAR, its methodologies and its benefits.

   It is recommended that arrangements be made for more expert representation of State SAR services at influential Asia/Pacific regional air navigation meetings in order that the important role of SAR services may be better explored and further established.

6. Noting the worth of the SAR matrix and table of SAR agreements developed by the ICAO Asia/Pacific Regional Office whereby the capacity and effectiveness of various aspects of regional States' SAR systems are summarized;

   It is recommended that a State Letter be originated requesting that Asia/Pacific States provide timely and accurate data to enable the APANPIRG SAR capability matrix and table of SAR agreements to be more frequently and reliably updated by the ICAO Asia/Pacific Regional Office.

Note: *Regional Office State Letter Ref.: T3/10.1, T3/14.5 – AP040/07 (ATM), dated 10 May 2007 was subsequently transmitted in this respect*

7. Noting that the free availability to all States of the Cospas-Sarsat satellite alert and location system and the unprecedented benefit that it portends in reducing search times and costs as well as in saving lives, and noting that there are still some States not fully cognizant of its benefits or how to access them, and, further, noting that there is an urgency about making arrangements for processing 406 MHz signals because of the intention of the Cospas-Sarsat Council to terminate satellite monitoring of 121.5 MHz;

It is recommended that a State Letter be originated that draws the attention of Asia/Pacific States to the availability of the C-S system, its benefits, how they may be accessed and the critical importance of States making registration arrangements and nominating a SAR Point of Contact for receipt of alert messages.

Note: *Regional Office State Letter Ref.: T 3/11.4 – AP041/07 (ATM), dated 18 May 2007 was subsequently transmitted in this respect*

8. It is apparent that if the safety needs of aircraft operations in the region are to be properly respected and acted upon, it will require ICAO to take some further initiative in addressing SAR shortcomings and deficiencies. The evidently insufficient capacity of States to identify their SAR needs (let alone remedy them) is indicative of the need for ICAO to facilitate an effective oversight and corrective role. This would require, in the first instance, an evaluation of Pacific island State SAR systems. (This was the original task set for the 2007 ICAO SIP but was well outside the financial budget ultimately provided.)

It is recommended that a further Pacific SAR SIP or TCB project be arranged of longer duration and more substantial budget that would allow an experienced consultant to evaluate the SAR systems of Pacific island States. Upon completion of the evaluation, a further workshop should be convened at which organizational strategies should be discussed with a view to a advancing a plan for more effective regional SAR service provision through an increased sharing of resources, taking greater advantage of global SAR facilities and consolidating aspects of the system to strengthen weak links.

The agenda of the workshop should also include the development of an action plan for a more effective Preventive SAR programme for the mitigation of risk, the minimization of SAR actions and the reduced impact of SAR events when they do occur. The concept of regional SAR provision is considered to be the only feasible means whereby all Pacific island Contracting States may comply with the Annex 12 provisions, including the primary requirement to establish and maintain an effective SAR system 24/7. It is considered that facilitation of regional SAR services across State borders can only be catalysed by a credible, authoritative international organization. ICAO is the most suitable contender.

9. In recognition of the inevitable reduction in the number of SRRs throughout the region over ensuing years (or, at least, in the number of providers servicing these areas);

It is recommended that ICAO take a lead role in educating States in the continuing extent of economic pressure likely to be applied by international airlines for the reduction of air navigation charges and the necessarily rationalized areas in which SAR services will be provided as a result.

— *End* —

SUBJECT/TASKS IN THE ATM/AIS/SAR FIELDS

The priorities assigned in the list have the following connotation:

A = Tasks of a high priority on which work should be expedited;
B = Tasks of a medium priority on which work should be undertaken as soon as possible but not to the detriment of Priority "A" tasks; and
C = Tasks of a medium priority on which work should be undertaken as time and resources permit but not to the detriment of Priority "A" & "B" tasks.

(Updated 30/06/06)

No.	Reference	Subject/Task	Priority	Action Proposed / In Progress	Action By	Target Date
1	RAN/3 C 6/9 R 14/22 APANPIRG C 2/22 C 3/24 C 4/4 C 4/5 C 5/2 C 5/3	Subject: Implementation of RNP Task: Implement RNP into the Asia Pacific Region	A	a) Identify routes and areas where RNP implementation is required; and b) — monitor progress. Note: a) RNP10 (60 NM) implemented South China Sea route network November 2001; b) RNAV EMARSSH Route network implemented November 2002; c) RNP4 implemented January 2005 in Honiara FIR, Nauru FIR and portions of Brisbane FIR, Nadi FIR and Auckland Oceanic FIR; and d) RNP4 Trial in portions of Oakland FIR commenced December 2005	ATM/AIS/SAR/SG Regional Offcie	On-going
2	APANPIRG C 3/22	Subject: Traffic congestion within the region Task: Suggest ways of reducing this congestion by means of appropriate traffic management	A	a) Identify routes and areas where management of traffic congestion is required; and c) — Monitor r progress. Note: The BBACG established the ATFM/TF to address congestion in the Bay of Bengal and Indian airspace. An operational trial using an automated ATFM system to commence ~~on 22 December 2005~~ in July 2006	ATM/AIS/SAR/SG Regional Office	On-going

No.	Reference	Subject/Task	Priority	Action Proposed / In Progress	Action By	Target Date
3	RAN/3 C 13/14 APANPIRG D 2/35	Subject: AIS Automation Task: Develop a Regional AIS Automation Plan ~~Note: To progress this task, the AIS/TF/1 meeting is tentatively scheduled on 7-11 November 2005. Due to Regional Office ATM staff reduction, was unlikely to be convened ATM/AIS/SAR/SG/15 agreed (Decision15/8) that the Task Force must commence, States (Japan) would convene and run the Task Force, Regional Office to assist if able.~~		Develop AIS automation plan and introduction of AIS quality systems and AIS databases and consider issues arising from the use of public internet for AIS Note: APANPIRG Decision 14/8 reactivated the AIS Automation Task Force and changed the name and role of the task force to the AIS Implementation Task Force (AITF). First meeting expected November 2004 First meeting of the AIS Task Force and associated AIS Seminar was held 20-24 March 2006	AITF ATM/AIS/SAR/SG	On-going
~~4~~	~~APANPIRG~~ ~~C 2/31~~	~~Subject: Provision of AIS within the Region~~ ~~Task: Examine and comment on the provision of AIS and develop a programme to improve the provision of AIS within the region~~ ~~Note: AIS/MAP and one ATM Regional Officer posts removed from Regional Office establishment, effective 2005. No ability of Regional Office to assist with AIS matters. States will convene AIS Implementation Task Force in November 2005 to consider AIS matters, as described under Task list Item 3 above.~~	~~B~~	~~a) Increase AIS support from the ICAO APAC Office~~ ~~b) Regional AIS seminars to be conducted periodically~~ ~~c) Review the use of Internet for aeronautical information taking into account results of the ICAO AUPI Study Group and update Chapter 4 to the AIS Guidance Manual~~	~~APANPIRG~~ ~~ICAO~~ ~~ICAO~~ ~~AATF~~ ~~ATM/AIS/SAR/SG~~	~~On-going~~ ~~On-going~~ ~~Dec. 2002~~ ~~No update avbl to ATM/AIS/ SAR/SG/14 re internet~~
5	APANPIRG C 3/24 C 9/3 D 9/4	Subject: Implementation of RVSM in the Asia Pacific Region Task: Plan for and facilitate implementation of RVSM, as appropriate, in the Asia Pacific Region	A	a) Plan schedule and facilitate implementation of RVSM in the Asia Pacific Region b) RVSM implementation for the international airspace in the APAC Region ~~is in its final stage~~ has been completed with implementation in the Incheon, Naha and Tokyo FIRs on 29 September 2005. c) ~~Follow-up meetings required for b); 90-day review and one year review~~; 90 Day review of Japan/ Republic of Korea implementation conducted 27 Feb- 1 Mar 2006. One year review scheduled November 2006. d) The South China Sea/West Pacific RVSM FLOS review ~~to be completed and a meeting scheduled in January/February 2006.~~ was held 24-28 April 2006 however no result. ATM/AIS/SAR/SG/16 (June 2006) recommended establishing a RVSM Scrutiny Group with TOR also addressing FLOS	RVSM/TF	On-going ~~North Asia - 2005~~

No.	Reference	Subject/Task	Priority	Action Proposed / In Progress	Action By	Target Date
6	APANPIRG D 3/12 D 3/2 C 4/2	Subject: Inappropriate provision of SAR facilities, services and procedures within the Asia Pacific Region Task: a) Review SAR facilities, services and procedures in the region e) Assist States without SAR services to provide SAR coverage	A	a) Encourage States to delegate or negotiate SAR services b) Identify deficiencies Note: Future ICAO SAR activities in the APAC Region constrained due to Regional Office ATM staffing levels.	ICAO ATM/AIS/SAR/SG	On-going On-going
7	~~APANPIRG~~ ~~D 3/21~~ ~~C 9/2~~	~~Subject: Transition to WGS-84 in the Asia Pacific Region~~ ~~Task: Monitor and facilitate the transition to WGS-84~~	~~A~~	~~a) Maintain status report of WGS-84 implementation within the Asia Pacific Region~~ ~~b) Identify States requiring assistance and where possible assist those States~~ ~~c) Identify deficiencies~~ ~~Note: Substantially complete, remaining issues being managed by the APANPIRG Deficiencies List~~	~~ATM/AIS/SAR/SG~~ ~~States~~ ~~ICAO~~ ~~ATM/AIS/SAR/SG~~ ~~ATM/AIS/SAR/SG~~	~~On-going~~ ~~On-going~~ ~~On-going~~
8	RAN/3 R 14/13 APANPIRG C 5/12 D 6/21 C 9/8	Subject: Implementation of ATS route requirements	B	~~a)~~ -Identify ATS route requirements b) Monitor progress of route implementation in APAC Region c) Identify deficiencies ~~Note: APANPIRG Decision 14/4 created the ATS Route Network Review Task Force (ARNR/TF). ATM/AIS/SAR/SG/14 referred matters on the deficiencies list relating to ATS routes to the ARNR/TF for study. First meeting of ARNR/TF expected September 2004. The ARNR/TF held its first meeting on 6-10 September 2004 and completed its work at ARNR/TF/3 on 2-3 May 2005.~~ Note: Asia/Pacific ATS Route Catalogue established, maintained by Regional Office, Version 3 (June 2006) on ICAO website, ATS Routes included as standing agenda item on ATS Coordination Group agendas	ATM/AIS/SAR/SG	On-going On-going On-going

No.	Reference	Subject/Task	Priority	Action Proposed / In Progress	Action By	Target Date
9	C 11/8	**SAR Capability Matrix** That, a) the "SAR Capability Matrix" be distributed to States for information and action as appropriate; and b) States provide information to ICAO by 30 April each year to permit the periodic update of the Matrix.	C	a) The SAR Matrix is reviewed by States at all ATM/AIS/SAR/SG Meetings b) States to update the Matrix by providing information to ICAO by 30 April each year Note: Matrix routinely updated during meetings of ATM/AIS/SAR/SG	ATM/ASI/SAR/SG States ICAO	On-going On-going
10	RAN/3 R 7/18 APANPIRG C 8/9	Subject: SAR training and exercises Task: Facilitate SAR training and exercises	B	a) Co-ordinate SAR training available in the region b) Facilitate international participation in SAR exercises ~~c) Bay of Bengal Seminar and SAREX was held at Chennai on 7-11 March 2005~~ Note: APANPIRG/16 raised Conclusion 16/23 in respect of SAR SIP for Pacific Island States, SIP is approved by Council, scheduled last quarter 2006	ICAO States India	On-going ~~2003~~ On-going ~~2005 Completed~~
11	APANPIRG ~~C 6/13~~ C11/9	Subject: Appropriate SAR legislation, National SAR Plans and Amendments Task: Establish appropriate documentation and National SAR Committee	A	a) Implement appropriate legislation, establish National SAR Committees and Plans to support SAR operations b) Monitor developments of SAR Agreements between SAR organizations c) Establish and maintain a Register of SAR Agreements Note: Register of SAR Agreements routinely updated during meetings of ATM/AIS/SAR/SG	States ATM/AIS/SAR/SG ICAO	On-going On-going On-going
~~12~~	~~APANPIRG C 9/9~~	~~Subject: Lack of consideration of Human Factors in the provision of ATS~~ ~~Task: Consider ways by which Human Factors aspects in the provision of ATS within the region could be improved~~	~~B~~	~~a) States to Provide input including lessons learned (ICAO to encourage States to submit reports)~~ ~~b) ICAO to conduct seminars~~ ~~Note: ATM/AIS/SAR/SG/15 noted limited ATM resources remaining at the Regional Office and that presently ICAO Headquarters taking primary carriage of Human Factors activities.~~	~~States ICAO~~ ~~ICAO~~	~~On-going~~ ~~2004 On-going~~ ~~Closed as ICAO HQ has primary carriage of these matters~~

No.	Reference	Subject/Task	Priority	Action Proposed / In Progress	Action By	Target Date
13	APANPIRG D 8/	Subject: Maintenance of the CNS/ATM/GM for the Region	B	Note: ATM/AIS/SAR/SG/15 noted that ICAO Headquarters has taken over development of global guidance material and the status of the APAC Regional Guidance to be reviewed subsequent to provisions of global material under development. ATM/ASI/SAR/SG/16 raised draft Decision 16/3 in company with CNS/MET/SG/10 to establish APANPIRG Regional Planning Review Task Force to conduct this work	ATM/AIS/SAR/SG States	Ongoing
14	APANPIRG C 9/48 C 10/39 C 10/40	Subject: Deficiencies in the field of air navigation Task: Develop and maintain Deficiencies list	A	a) Identify unimplemented items in the BANP b) Review mission reports c) Analyze differences from SARPs d) Review accidents / incidents Note: ALLPIRG/5 (March 2006) raised Conclusion 5/15 in respect of "Last Resort" action to resolve deficiencies.	ATM/AIS/SAR/SG ICAO	On-going On-going On-going On-going
~~15~~	~~APANPIRG/12~~	~~Subject: Lateral Offset Procedures~~	~~A~~	~~a) Identify issues regarding route structures where offsets could be applied~~ ~~b) Implement 2 NM right of route offsets in accordance with ICAO guidelines~~ ~~Note: Significant implementations of 2 NM lateral offset procedures occurred on 20 January 2005 and 17 March 2005 in Asia/Pacific.~~	~~ATM/AIS/SAR/SG~~ ~~States~~	~~On-going~~ ~~2004~~ ~~2005/2006~~ ~~Completed~~

No.	Reference	Subject/Task	Priority	Action Proposed / In Progress	Action By	Target Date
16	APANPIRG/13 C12/6	Subject: Regional Contingency Planning Survey Task: That, ICAO survey States in the Asia/Pacific Region to determine the status of contingency planning and the extent to which contingency plans are exchanged between neighboring States.	C	a) States to complete their State Contingency Plans, using framework supplied in their Y2K CP b) Coordinate with neighboring States c) Send copy of their Contingency Plan to ICAO d) Regional Office initiated survey in March 2005 with results submitted by States by 30 June 2005, and results being studied Updated survey results will be reviewed by APANPIRG/17 Note: APANPIRG/16 raised Conclusion 16/15 in respect of SIP for APAC State. SIP will be conducted in Indonesia during July 2006	ICAO/States	On-going On-going On-going On-going
17	C 15/52	Review key priorities for implementation of CNS/ATM systems for the ASIA/PAC region, identify new items as required and monitor implementation	A	Review key priorities and recommend appropriate actions	ATM/AIS/SAR/SG ICAO/States	On-going
18	Decision 1/3 APANPIRG/15 C 15/49	Make recommendation aimed at improving ATM and CNS support for Terminal Area and Airport Operations, respectively.	B	a) Study operational problems being experienced; b) identify requirements/areas for improvement from States	ATM/AIS/SAR/SG States	On-going Ongoing
19	APANPIRG/15 C 15/46	That recommendations 1/1, 1/10, 1/13, 4/1, 4/2, 6/11 and 7/1 of AN-Conf/11 be studied by the ATM/AIS/SAR/SG, and action be taken to implement them.	B	Review recommendations and take appropriate action to implement	ATM/AIS/SAR/SG ICAO/States	On-going
20	APANPIRG/15 Paragraph 2.1.151	To monitor environmental issues relating to the implementation of CNS/ATM< systems, in particular the work of ICAO's Committee on Aviation Environmental Protection (CAEP), to disseminate relevant information to contracting States, and to carry out appropriate coordination with Contracting States.	B	~~Monitor the work of the ARNR/TF in this respect~~	ATM/AIS/SAR/SG ICAO/States	On-going
21	APANPIRG/15 Paragraph 2.1.151	Develop a framework for regional training plans for the introduction of CNS/ATM systems and to include this material in the "Asia/Pacific Regional Plan for the New CNS/ATM Systems".	B	Review regional training plans and requirements	ATM/AIS/SAR/SG ICAO/States	On-going

No.	Reference	Subject/Task	Priority	Action Proposed / In Progress	Action By	Target Date
22	APANPIRG/15 Paragraph 2.1.151	Develop business cases for various options of CNS/ATM implementation taking into account environmental benefits.	B	Coordinate with Regional Officer Air Transport in respect of business case activities	ATM/AIS/SAR/SG ICAO/States	On-going
16/1	ATM/AIS/SAR /SG/16 (June 2006)	Overhaul Task List of ATM/AIS/SAR Sub-Group of APANPIRG and present to ATM/AIS/SAR/SG/17 for adoption	A	ATM/AIS/SAR/SG/16 recognized that the task list was in need of a complete overhaul as it carried large number of out of date references, inappropriate task items and was not presented in a "user-friendly" format. Overhaul of Task List should ensure that all actions arising from ATM/AIS/SAR/SGs 15 & 16 and APANPIRGs 16 & 17 were captured	Regional Offcie	June/July 2007
16/2	ATM/AIS/SAR /SG/16 (June 2006) & DGCA/06	Subject to advice from ICAO Headquarters and APANPIRG, implement actions arising from the Conclusions of DGCA/06 (March 2006), including Conclusion and Recommendation 2/2 a) and b) in relation to the implementation of safety management systems by States.	A	Outcomes of DGCA/06 will be reviewed by APANPIRG/17 and subsidiary tasks for action by ATM/AIS/SAR/SG are expected to be identified	ATM/AIS/SAR/SG ICAO/States	On-going
16/3	ATM/AIS/SAR /SG/16 (June 2006) & DGCA/06	Take action in respect of APANPIRG/17 Decision 17/1 in relation to implementation of actions arising from the Conclusions of ALLPIRG/5 (March 2006)	A	APANPIRG/17 identified ALLPIRG/5 Conclusions 5/2, 5/4, 5/5, 5/7, 5/8, 5/9, 5/11 and 5/13 for study by ATM/AIS/SAR/SG.	ATM/AIS/SAR/SG ICAO/States	On-going

ATM/AIS/SAR Sub-Group of APANPIRG

SUBJECT/TASKS IN THE ATM/AIS/SAR FIELDS *(New Format)*

(last updated July 2007 – ATM/AIS/SAR/SG/17)

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/1	RNP/South East Asia Implementation	A - Safety D - Efficiency GPI-5 Performance based navigation GPI-8 Collaborative airspace design and management	Develop strategic, benefits-driven implementation plans in collaboration with stakeholders, to improve en-route airspace efficiency by means of reduced horizontal separation based on RNP operations within the Southeast Asia area, ensuring inter-regional harmonization.	Reduced longitudinal separation on RNAV routes from 80 NM to 50 NM based on RNP 10	Develop a Task List for the Task Force, with a view to implementing separation minima based on RNP 10 in Southeast Asia.	On-going (The first RNP-SEA/TF was held between 13-15 March 2006)	Chairman Mr. vPeter Rabot (Singapore) Members of RNP-SEA/TF	
17/2	Air Traffic Flow Management Implementation	A - Safety C - Environmental Protection D - Efficiency GPI-6 Air traffic flow management GPI-8 Collaborative airspace design and development GPI-16 Decision support and alerting system	States to consider and implement aspects of air traffic flow management (ATFM) including: a) centralized ATFM b) inter-regional cooperative ATFM; c) establishment of ATFM databases; d) application of strategic ATFM planning; and e) application of tactical ATFM planning f) assessment of economic and environmental impact of the implementation of the ATFM system.	Reduced ground and enroute delays; Enhanced traffic flows; Reduced reroutes and unplanned diversions; Fuel saving	ATFM Operational Trials in the Bay of Bengal and South Asia commenced July 2006, permanent implementation July 2007	ATFM system will be permanently implemented in BOB and South Asia from 5 July 2007	Members of ATFM/TF	

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/3	AIS Implementation Task Force	A - Safety D - Efficiency GPI-18 Aeronautical information	Develop AIS implementations plans for introduction of AIS quality systems and AIS databases and consider issues arising from the use of public internet for AIS Study means of aeronautical data management by civil aviation authorities and/or ATS providers in other regions including the aeronautical information exchange model (AIXM) and the electronic AIP (eAIP), and consider the feasibility in making use of these methods/models in the Asia/Pacific Region;	Assisting States in AIS matters to consistently provide products that meet customer and applicable regulatory requirements	Develop Regional AIS Automation Plan, training material and conduct workshops on the Guidance Manual for AIS in the Asia/Pacific Region	On -going	Chairman Mr. Peter Hobson, (Australia) Members of AITF	
17/4	RVSM Implementation	C - Environmental Protection D - Efficiency GPI-2 Reduced vertical separation minima	Plan for and facilitate implementation of RVSM, as appropriate, in the Asia/Pacific Region Assist China in implementing 300 metre metric RVSM in their airspace as requested at 43rd DGCA Conference Address concerns in relation to the modified single alternate FLOS in the SCS and interfaces with surrounding single alternate FLOS.	Increased airspace capacity; Reduced enroute delays; Enhanced fuel efficiency	RVSM implementation for the international airspace in the APAC Region has been completed –with implementation in the Incheon, Naha and Tokyo FIRs on 29 September 2005. China metric RVSM programme, proposed implementation on 22 November 2007 Scenario 3 FLOS agreed in-principle at WPAC/SCS RSG/2 June 2007	On -going	Mr. Kuah Kong Beng (Singapore) Members of RVSM/TF Mr David Maynard (USA) Members of WPAC/SCS RSG	

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/5	Ensure appropriate provision of SAR facilities, services and procedures within the Asia Pacific Region SAR Capability Matrix	A - Safety GPI- None applicable	An Asia/Pacific "SAR Capability Matrix" be established, kept up to date and distributed to States for information and action as appropriate Review SAR facilities, services and procedures in the region Assist States without SAR services to provide SAR coverage Facilitate SAR training and exercises including international participation in SAR exercises	Evaluate States' ability to provide SAR services Encourage States to delegate or negotiate SAR services Co-ordinate SAR training available in the region	States provide information to ATM/AIS/SAR/SG each year to permit the periodic update of the Matrix.	On-Going	States Regional Office ATM/AIS/SAR/SG	
17/6	Implementation of ATS route requirements	C - Environmental Protection D - Efficiency GPI- 8 Collaborative airspace design and management	Identify ATS route requirements Monitor progress of route implementation in APAC Region Maintain Asia/Pacific ATS Route Catalogue on ICAO Regional Office website ATS Routes included as standing agenda item on ATS Coordination Group agendas	Implementation of new ATS routes in accordance with the requirements of both users and ANSPs	Regular review of requirements and implementation of ATS routes	On-Going	States Regional Office IATA	
17/7	Identify Deficiencies in the fields of air navigation	A - Safety D - Efficiency GPI – None applicable	Develop and maintain Deficiencies list, Identify unimplemented items in the BANP	Promote timely resolution of safety-critical items identified by APANPIRG	Deficiencies list, Analyze differences from SARPs	On-Going	States ATM/AIS/SAR/SG APANPIRG	ALLPIRG/5 (March 2006) raised Conclusion 5/15 in respect of "Last Resort" action to resolve deficiencies

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/8	Regional ATM Contingency Planning	A - Safety D - Efficiency GPI- None applicable	Prepare ATM Contingency Plans based on model (Indonesia) adopted by APANPIRG/17 a) Coordinate with neighboring States to prepare plans b) Send copy of ATM Contingency Plan to ICAO	Determine the status of contingency planning and the extent to which contingency plans are exchanged between neighboring States	APANPIRG17 raised Conclusion 17/11 as the results of the survey, adopting the National ATM Contingency Plans of Jakarta and Ujung Pandang FIRs as a model for Asia/Pacific States in the preparation of national ATM contingency plans.	On-Going	States Regional Office	
17/9	Environmental issues relating to the implementation of CNS/ATM systems	C - Environmental Protection GPI- None applicable	To monitor environmental issues relating to the implementation of CNS/ATM systems, in particular the work of ICAO's Committee on Aviation Environmental Protection (CAEP),	Raise States' level of Environmental Protection Awareness	Disseminate relevant information to contracting States, and to carry out appropriate coordination between Contracting States.	On-Going	States Regional Office ATM/AIS/SAR/SG	

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/10	Develop business cases for various options of CNS/ATM implementation taking into account environmental benefits.	C - Environmental Protection D - Efficiency GPI- None applicable	Coordinate with Regional Officer Air Transport in respect of business case activities		Guidance Document	On-Going	States Regional Office	Regional Office Air Transport position vacant since Feb 2007
17/11	Review key priorities for implementation of CNS/ATM systems for the ASIA/PAC region, identify new items as required and monitor implementation	A - Safety C - Environmental Protection D- Efficiency GPI- - All	Review key priorities and recommend appropriate actions	Identify areas within the Region where CNS/ATM Implementation would be of immediate benefit	Recommendation on CNS/ATM implementation	On-going	States Regional Office ATM/AIS/SAR/SG IATA	

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/12	Operation of Unmanned Aircraft Systems (UASs)	A - Safety D- Efficiency GPI – None applicable	Study the operation of UASs and their impact on safety especially in mixed environments. States to provide information on UAS activities that impact on safety concerns Provide information to the ICAO Study Group on UASs (UASSG)	Raise States' and Operators' awareness of the UASs operations and the regulatory development	Information to States in regard to ICAO developments to regulate UAV activities	On-going	States Regional Office ATM/AIS/SAR/SG	
17/13	Follow up relevant Action Items from annual conference of Asia/Pacific Directors General	All Strategic Objectives, All GPIs	Review List of Action Items from annual DGCA Conference and assist implementation where appropriate	Accelerated implementation of DGCA action items	Implementation activities in support of DGCA action items	On-going	States Regional Office ATM/AIS/SAR/SG	
17/14	Follow up action on the Conclusions of ALLPIRG/5 (March 2006)	All Strategic Objectives, All GPIs	Take action in respect of APANPIRG/17 Decision 17/1 in relation to implementation of actions arising from the Conclusions of ALLPIRG/5	Accelerated implementation of ALLPIRG/5 Conclusions	Study and take appropriate action on ALLPIRG/5 Conclusions 5/2, 5/4, 5/5, 5/7, 5/8, 5/9, 5/11 and 5/13.	On-going	States Regional Office ATM/AIS/SAR/SG	
17/15	Follow up action on the Conclusions of AN_Conf11 (2003)	All Strategic Objectives, All GPIs	Take action in respect to implementation of actions arising from the Recommendations of AN_Conf11	Accelerated implementation of AN_Conf11 recommendation s	To study and implement recommendations 1/1, 1/10, 1/13, 4/1, 4/2, 6/11 and 7/1 of AN-Conf/11	On-going	States Regional Office ATM/AIS/SAR/SG	

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/16	ATM and CNS support for Terminal Area and Airport Operations	A - Safety D - Efficiency GPI-8 Collaborative airspace design and management GPI-10 Terminal area design and management, GPI-11 RNP and RNAV Standard Instrument Departures (SIDs) and Standard Terminal Arrivals (STARs) GPI-12 Flight Management System (FMS) – based arrival procedures GPI-14 Runway operations	Make recommendation aimed at improving ATM and CNS support for Terminal Area and Airport Operations Study operational problems being experienced Identify requirements/areas for improvement from States	Implementation of ICAO Performance Based Navigation (PBN) provisions		On-going	States Regional Office ATM/AIS/SAR/SG	

No.	Contributing Task	ICAO Strategic Objective & Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader& Supporting Members	Remarks
17/17	Framework for regional training plans for the introduction of CNS/ATM systems		Develop a framework for regional training plans for the introduction of CNS/ATM systems and to include this material in the "Asia/Pacific Regional Plan for the New CNS/ATM Systems".		Review regional training plans and requirements Update the "Asia/Pacific Regional Plan for the New CNS/ATM System" to include regional training plans and requirements	On-going	States Regional Office ATM/AIS/SAR/SG	

ACTION LIST OF THE TRANS-REGIONAL AIRSPACE AND SUPPORTING ATM SYSTEMS STEERING GROUP (TRASAS)

Task No.	Task Description	Action by	Target Date	Progress / Remarks
1/1	Opening of new routes and improved efficiency of the current routes	PIRGs, CPWG, CMRI, States, IOs	2007-2010 onwards	On-going
1/2	Improvement of the air navigation services coverage and hours of operations	States	2007-2010	
1/3	ACC consolidation	States	RF – 2007-2015	On-going
1/4	Implementation of RVSM in China, Russian Federation (RF) and other States	China, RF, States, PIRGs, ICAO	22 Nov 2007 (China) RF (TBD)	On-going
1/5	Develop improved ATFM tools to be shared amongst States concerned until target capacity is met	PIRGs, States, ANSPs, CPWG, TRASAS	2007-2010	On-going
1/6	Ensure improved surveillance and communications in the Northern Airspace	PIRGs, States, ANSPs, TRASAS	2007-2015	ADS, VHF, HF, Datalink, SATCOM
1/7	Ensure airport availability for ETOPS aircraft/operations	States, IOs, Manufacturers, TRASAS	2007-2012	
1/8	Ensure suitable airport availability for new very large aircraft/operations	States, IOs, Manufacturers, TRASAS	2007-2012	
1/9	Ensure improved access to China and Russian Federation airspace	China, RF, TRASAS	2007-2010	On-going

**TERMS OF REFERENCE OF THE
TRANS-REGIONAL AIRSPACE AND SUPPORTING ATM SYSTEMS STEERING GROUP
(TRASAS)**

1. Introduction

1.1 In order to continue work already done concerning the traffic in the Northern area and to respond to the new requirements for increased efficiency and further developments, co-ordinated efforts of the international civil aviation community is required. It would involve States and Organisations from five of the ICAO Regions: EUR, ASIA, NAM, NAT and PAC. A Trans-Regional Airspace and Supporting ATM Systems Steering (TRASAS) Group shall respond to these requirements under the following Terms of Reference.

2. Purpose and objectives

2.1 The ICAO Trans-Regional Airspace and Supporting ATM Systems Steering (TRASAS) Group shall co-ordinate the requirements of international civil aviation for a coherent and economically viable and operationally optimal structure of ATS routes, linking city-pairs in Europe and Asia, Europe and North America and Asia and North America. The route network shall have sufficient flexibility to plan different flight paths, day-by-day, to take advantage of prevailing upper winds.

2.2 The Group shall work in close co-operation with aircraft operators' international organisations in order to ensure that known and expected requirements for international and domestic routings and cost-effective implementation are taken into account. The Group will also take account of the requirements for adequate feeder and connection routings to enable optimal access to the route network from points of departure and points of destination, upstream, downstream and from within its vicinity. The scope of the work will respond to the global objectives of the ICAO operational concept and support the new ICAO Global Air Navigation Plan Initiatives: GPI-1 (flexible use of airspace), GPI-2 (reduced vertical separation minima), GPI-3 (harmonised level system), GPI-5 (performance-based navigation), GPI-6 (air traffic flow management), GPI-7 (dynamic and flexible ATS route management), GPI-8 (collaborative airspace design and management), GPI-17 (implementation of data-link applications), GPI-20 (WGS-84 implementation), GPI-21 (navigation systems) and GPI-22 (communication network infrastructure).

3. Scope of work

3.1 The TRASAS Group shall make proposals and promote improvements for the safety and efficiency of the Northern area route structure and the supporting ATM systems within the States affected by such proposals. It shall base its work on aircraft operators' requirements, which may be expanded and complemented, as necessary.

3.2 The Group shall take into account modern space based technology (GPS/GLONASS/GNSS and ADS) in accordance with the ICAO CNS/ATM system concept and plan for an orderly transition period. This transition period should enable a seamless migration of current aircraft fleets to full CNS/ATM compliance on such routes in the future. TRASAS shall consider an equitable cost recovery scheme for the established route system in accordance with ICAO provisions in line with Article 15 of the Chicago Convention.

3.3 The Group shall not substitute itself for other existing bodies which are active under the auspices of ICAO (e.g. European Air Navigation Planning Group (EANPG), North Atlantic Systems Planning Group (NAT SPG), ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG), etc.) or bodies operating as bilateral/multilateral State initiatives. It may provide guidance as well as a co-ordinating function for these Groups working on the various technical and operational aspects related to the intended transit route network and to combine the results into one coherent overall plan. This will lead to the amendment, if and when required, of the ICAO Regional Air Navigation Plan (ANP) in accordance with procedures established by the ICAO Council.

3.4 In addition to its technical work on the newly established route system, the TRASAS Group shall explore proposals for financing and cost recovery for this system.

4. Activities

a) To promote a modern, efficient and cost-effective international ATS route network linking city-pairs in Europe, Asia and North America, taking into account the recognized requirements of the airspace users, taking advantage of seasonal wind patterns, and making use of space-based technology in accordance with the ICAO CNS/ATM system concept.

b) To promote efficient air traffic management and associated systems to improve safety, increase capacity and enhance operational and economic efficiency.

c) To promote the provision of sufficient capacity so as to avoid the need for air traffic flow management (ATFM).

d) To develop a coherent transition plan enabling a seamless migration of current aircraft fleets to full CNS/ATM compliance on such routes in the future.

e) To promote the establishment of a minimum number of suitably equipped Area Control Centres (ACC) and an infrastructure adequate to provide the required air traffic services along the proposed ATS route structure.

f) To promote suitable financing and cost recovery mechanisms for the newly established route system in accordance with the applicable ICAO provisions and in line with Article 15 of the Convention on International Civil Aviation (Chicago, 1944).

g) To analyse the costs and benefits achieved by individual ATS routes of the newly established route system to determine their eligibility for inclusion into the ICAO Regional Air Navigation Plan.

4.1 TRASAS will closely cooperate with existing bodies working on relevant tasks and may also establish Contributory Working Bodies (CWB) that shall work on its behalf on specific expert issues (route network developments, RVSM implementation, communications, airport issues etc).

5. Composition

5.1 The TRASAS Group shall be composed of representatives with operational and technical, expertise from Canada, China, Democratic People's Rep. of Korea, Denmark, Finland, Iceland, Japan, Kazakhstan, Mongolia, Norway, Republic of Korea, Russian Federation, United States, Uzbekistan and from international organisations representing aircraft operators' (e.g. IACA, IATA, IBAC) and pilot associations (IFALPA).

5.2 The TRASAS Group shall work under the auspices of ICAO. The EUR/NAT Office shall provide full secretarial support to the Group.

5.3 The Group may invite participation from other States which may be concerned during the progress of its work (e.g. States in Central Asia, in the South Caucasus area, and others) and international organizations which may provide useful input during its deliberations.

6. Reporting

6.1 Reports of the TRASAS shall be prepared by the ICAO Secretariat in the usual standard fashion. As reports of an informal group, this documentation will be made available to participating States and international organization(s) and shall be distributed to the Regional Planning Groups [in particular, the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), the European Air Navigation Planning Group (EANPG) and North Atlantic Systems Planning Group (NAT SPG)] for their information and to facilitate co-ordination which may be required within their respective work programmes.

7. Communication

7.1 As far as possible, members and participants in the work of TRASAS shall correspond by electronic mail. Their communications should be as informal as possible to ensure rapid progress of the work programme.

8. Target dates and deliverables

8.1 TRASAS shall establish a comprehensive work programme containing target dates and milestones to be achieved. It should strive to complete its tasks in the shortest possible time.

Agenda 3.3: CNS/MET

Agenda Item 3: Regional air navigation planning and implementation issues

3.3 <u>CNS/MET matters</u>

3.3.1 The meeting carried out a review of the Eleventh Meeting of Communications, Navigation and Surveillance/Meteorology Sub-Group (CNS/MET SG/11) held in Bangkok from 16 to 20 July 2007. The meeting noted with appreciation the work done by the Sub-group. The meeting took the following actions on the report of the CNS/MET SG/11.

<u>Global Air Navigation Plan</u>

3.3.2 The meeting noted the second amendment to the Global Air Navigation Plan for CNS/ATM Systems was accepted by the Council in November 2006 and noted the significant features of the revised plan. The meeting also noted that the plan had been renamed as the Global Air Navigation Plan (Doc 9750 – the Third Edition – 2007). Noting the importance of the human resource development and training identified in the plan, the meeting encouraged States to conduct Foundation Training and Training for Implementation Planners in the areas recommended in the Global Air Navigation Plan. Accordingly the meeting adopted the following Conclusion:

Conclusion 18/22 - Foundation Training and Training for Implementation Planners

That, States be encouraged to undertake Foundation Training and Training for Implementation Planners in the areas recommend in the Global Air Navigation Plan.

3.3.3 IATA was of the view that some States may not have the resources to conduct the foregoing training. The requirement would be met as long as such States could get the relevant personnel trained as per the Plan guidelines.

<u>Discontinuation of Asia/Pacific Regional Plan for the New CNS/ATM Systems</u>

3.3.4 In light of the revised Global Air Navigation Plan, the requirement for continuing the Asia/Pacific Regional Plan for the New CNS/ATM Systems was discussed. The meeting noted that some planning information provided in the Asia/Pacific Regional Plan for the New CNS/ATM system was similar to those contained in the FASID. It was envisaged that the relevant regional planning and implementation material contained in the Regional Plan for New CNS/ATM Systems will be progressively incorporated in the Asia and Pacific Basic ANP and FASID. The need to harmonize the regional planning process with the global plan was identified. The meeting agreed to discontinue the Asia/Pacific Regional Plan for the New CNS/ATM systems and adopted the following Conclusion.

Conclusion 18/23 - Discontinuation of Asia/Pacific Regional Plan for New CNS/ATM Systems

That,

a) in order to harmonize regional planning process with the Global Air Navigation Plan, the Asia/Pacific Regional Plan for New CNS/ATM Systems be discontinued; and

b) ICAO be invited to develop detailed proposals for incorporating the useful information contained in the Regional Plan for the CNS/ATM Systems into the Asia Pacific Air Navigation Plan (Doc 9673) by 2009.

Aeronautical Fixed Service

Review Report of the Second Meeting of the ATN Implementation Coordination Group

3.3.5 The meeting noted with appreciation the tasks accomplished by the Second ATNICG Meeting held in Hong Kong China from 28 May to 1 June 2007.

3.3.6 The meeting reviewed the TOR of ATNICG and did not consider any change was needed. The meeting noted the Subject/Tasks List updated by ATNICG/2 based on the progress made and adopted the following Decision:

Decision 18/24 - Revision to the Terms of Reference and the Subject/Tasks List of ATNICG

That, the Revised Subject/Tasks List of the ATNICG provided in **Appendix A** to the Report on Agenda Item 3.3 be adopted.

Use of IPv4 and IPv6 for AMHS Implementation

3.3.7 The Meeting noted a strategy for implementation of AMHS over TCP/IP utilizing IPv4 to replace the Aeronautical Fixed Telecommunications Network (AFTN) switches in other regions. IPv6 was recommended for inter-regional connectivity. Concerns for the implementation of IPS using IPv6 in the near term were noted. Additional guidelines on the use of IPS are required to be further developed for regional implementation. It was noted that AMHS Products capable of supporting IPv6 were very limited and implementation of IPv6 in the near term was not considered practical in the ASIA/PAC Region.

Cost of Leasing Low Speed Circuit

3.3.8 The meeting noted that the costs of keeping the low speed circuits would be same or even higher than leasing 64 Kbps or higher signaling speed circuits in the Region. Therefore, States had been encouraged to upgrade the signaling speed to increase the channel capacity to support ATSMHS. However, it was also noted that some AFTN switches used by States were able to support maximum channel speed up to 19.2 Kbps only.

Interregional Connection

3.3.9 The meeting noted that the interregional connection between Chile and New Zealand is specified in the AMHS transition plan of the CAR/SAM Region. However, there is no such link that has been planned in the ASIA/PAC FASID Table CNS-1B. The traffic to/from CAR/SAM region from/to ASIA/PAC Region will be via USA. Therefore, interregional connection with CAR/SAM Region using IPv6 would only be required for consideration by the USA and the CAR/SAM Region. The Secretariat was requested to contact CAR/SAM region to coordinate the issue of inconsistency in the planning of interregional connection for ATN/AMHS implementation.

First Meeting of Aeronautical Communication Panel (ACP/1)

3.3.10 The meeting noted the outcome of ACP/1 which was held in Montréal, from 10-18 May 2007. One of the effects on ATN/AMHS implementation includes amendment to Annex 10 Vol. III, Part I, Chapters 1 and 3 to introduce SARPs on IPS. Such introduction would need to take place such that on-going ATN/OSI implementations, both ground-ground and air-ground, would not become obsolete. Technical material for the ATN/IPS would use standards developed by the Internet Society (ISOC) and the Internet Engineering Task Force (IETF).

3.3.11 The meeting noted the ongoing updating of the Manual of Technical Provisions of the ATN and its publication in several parts of the Manual on Detailed Technical Specifications of the ATN/OSI Doc9880. Further work in the particular with regard to the air-ground part of the ATN including the future use of CPDLC application over the ATN/IPS was identified. Further work on security of ATN particularly in air-ground data links was identified. It was noted that the use of IPS to support air/ground communication was desirable and feasible. However, it is not clear at this stage whether IP can be supported over VDLM2.

Guidance Document for AMHS Conformance Testing

3.3.12 The meeting noted the final draft of AMHS Conformance Document provided by Singapore on behalf of a group of States established by ATNICG consisting of China, Hong Kong China, Indonesia, Singapore, Republic of Korea and United States. The ATN/AMHS Conformance document describes requirements to ensure interconnectivity and interoperability. The document was adapted with a baseline from the Eurocontrol Conformance Document. The adaptation of the Eurocontrol Manual focuses on the use of AMHS with an additional ATN router testing procedure which was developed based on the router testing and trials conducted between Hong Kong China and Japan. In view of the foregoing, the meeting adopted the following Conclusion:

Conclusion 18/25 - Guidance Document for AMHS Conformance Testing

That, the Guidance Document for AMHS Conformance Testing as provided in **Appendix B** to the Report on Agenda Item 3.3 be adopted and published as First Edition for use in the Asia and Pacific Region.

ATN/AMHS Implementation Planning Status

3.3.13 The meeting noted the ATN/AMHS implementation and planning progress in Australia, Bangladesh, China, Hong Kong China, Fiji, India, Indonesia, Japan, Republic of Korea, Singapore, Sri Lanka, Thailand and USA. The updated status of implementation and planning for ATN/AMHS is provided at a web based database in the ICAO APAC website where information on focal contact point, planning and implementation status and link data is provided in an ATN Connection Chart. The meeting was encouraged by the progress with implementation of ATN/AMHS by States in the region. An implementation forum has also been created in the same ICAO APAC web page under the Regional Planning Projects: http://www.icao.or.th/apac_projects/atn_amhs.html

Use of Internet for ATN/AMHS Functional and Interoperability Testing

3.3.14 The meeting noted the experience gained by Hong Kong, China in the use of the Internet as an alternative communications means for ATN/AMHS functional and interoperability testing at reduced costs. It was concluded that the public Internet is a flexible means for conducting short-term ATN and AMHS technical trials to verify functionality and interoperability of systems from different equipment manufacturers. Use of the Internet for ATN/AMHS trials also supports multi-partite trials on the message relaying functions and ATN link changeover/re-routing trials that cannot be practically/effectively achieved by using public X.25 PSDN, leased circuits and/or IDD connections. Using public internet for testing was further confirmed and supported by China, Japan, Thailand and USA. The only concern expressed was in relation to security if it is made available for operational use.

Interregional Coordination and AMC Coordination Meeting

3.3.15 The meeting noted that as a follow-up action to the ATNICG WG/1 meeting, the ATS Messaging Co-ordination Meeting was held in Brussels from 27 to 29 March 2007. The main objective of the meeting was to evaluate the capability and functions of the AMC and to analyze the possibilities for the establishment of similar functions in the ASIA/PAC region during the short and the medium terms. Representative from China, Hong Kong-China, Singapore, Thailand and USA visited the ATS Messaging Management Centre at Eurocontrol and attended the coordination meeting. The meeting recognized that common procedures and co-ordination should be formulated globally as a matter of urgency for harmonized implementation, especially when most of the States will implement the ATN infrastructure and AMHS in the 2007/2008 timeframe.

ASIA/PAC Interim AMHS Address Management Database

3.3.16 The meeting noted the offer made by Eurocontrol for a global database service to be provided to all ICAO Regions. It had been agreed by APANPIRG that the work on the proposed establishment of ASIA/PAC database in Bangkok should progress. The ASIA/PAC database could share data and synchronize data between databases.

Using European AMC Database in the short term

3.3.17 Considering that many States in the region plan to implement AMHS by 2008, the AMHS address registration and other related information is needed before the end of 2008. The meeting agreed that, in the short term the AMC database is the only one that can be made available in the Asia/Pacific region. It was recognized that data should be submitted by operational staff at the COM centres. Therefore, it was considered logical to have one focal point for consolidation of information within the region. AEROTHAI was requested to act as an information consolidator for the Asia/Pacific Region and for coordination with EUR region, until the AMHS coordination and management centre (ACMC) in the ASIA/PAC Region is established. The meeting agreed that as an interim arrangement, AEROTHAI will act as External COM Center for the Asia/Pacific region and relay AMHS information to the AMC following the AMC AIRAC updating cycle.

ATSMHS Coordination and Management Centre

3.3.18 The meeting noted the medium term solution proposed by ATNICG for AMHS address management. Medium-term target is to continue the effort for establishment of a regional AMHS Coordination and Management Centre (ACMC) in the Asia and Pacific Region that can automatically exchange data with the AMC.

ATS Inter-facility Data Communication Plan

3.3.19 The meeting reviewed the FASID Table for AIDC CNS-1D updated by the CNS/MET Sub-group. The meeting also noted that the Table would be renamed as FASID Table CNS-1E - ATS Inter-Facility Data Communication (AIDC) Implementation Plan. Accordingly the meeting adopted the following Conclusion.

Conclusion 18/26 - Amendment to FASID Table CNS-1E

That, FASID Table CNS-1E, ATS Inter-facility Data Communication (AIDC) Implementation Plan, be replaced with the updated Table in accordance with the established procedure.

ATN/AMHS Seminar/Workshop

3.3.20 The meeting considered that technical and operational training on AMHS is very important for the smooth implementation of ATN/AMHS in the Asia/Pacific Region. The meeting recalled that the ATN Seminars were hosted by Aerothai once every two years on a regular basis. The next seminar should be conducted in early 2008 to exchange lesson learnt and experience gained. Accordingly, the meeting adopted the following Conclusion.

Conclusion 18/27 - ATN/AMHS Implementation Seminar/Workshop

That, ICAO be invited to coordinate with the State concerned to conduct an ATN/AMHS Seminar/Workshop to address implementation issues in early 2008.

Revised ICD for AMHS

3.3.21 The meeting noted that the AMHS Interface Control Document (ICD) was updated to include the use of the CAAS addressing scheme and IPM-88. The meeting agreed with the proposed changes and adopted the following Conclusion.

Conclusion 18/28 - Amendment to AMHS ICD

That, the revised AMHS ICD provided in the **Appendix C** to the Report on Agenda Item 3.3 be adopted as the Second Edition of ASIA/PAC AMHS ICD.

TCP/IP and OSI Gateway and IP Development in USA

3.3.22 The meeting noted the development of the national network on convergence over TCP/IP using the RFC 1006 technique in the United States. The FAA has developed an RFC-1006 Gateway which resides in their ATN router. The RFC 1006 gateway translates from TCP/IP to OSI and vice versa. The meeting further noted FAA's planned redundancy approach for the initial Salt Lake City configuration and the planned approach once Atlanta is upgraded with an AFTN/AMHS Gateway. For the combined Salt Lake City and Atlanta configuration, redundancy using Manual procedures to redirect the RFC-1006 Gateway connections or X.25 circuits was introduced. The FAA domestic telecommunication network migrates from the X.25 network protocol to the Internet Protocol (IP) network to reduce the long term cost and to reduce the variety of interfaces. Methods have been adopted to overcome the issue of message assurance inherent in the IP protocol. The FAA still supports the AMHS service based on the X.25 subnet as specified in ICAO Doc 9705.

Upgrade of AFS between the USA and Australia

3.3.23 The meeting noted that the channel speed of the fixed circuit between Oakland, California, USA and Brisbane, Australia had been increased from 2.4 Kbps to 64 Kbps as the previous bandwidth was insufficient to handle all message traffic. This improvement supports the Air Traffic System (ATS) Message Handling System (AMHS) and the Aeronautical Telecommunications Network (ATN). It was further noted that the entire circuit between the United States and Australia is now provided by a single service provider. The use of a single service provider for the entire end-to-end circuit will reduce the repair, restoration, and coordination problems.

<u>Aeronautical Mobile Service (AMS)</u>

<u>Development of Data Link Harmonization Strategy</u>

3.3.24 The meeting noted that a draft strategy for data-link harmonization and issues and resolutions associated with providing data-link services to ATN equipped aircraft in an FANS-1/A environment being developed in ICAO Europe and North Atlantic Region. The overall idea is to produce a next generation CPDLC and ADS that allow migration of both FANS 1/A and ATN to a single standard. It was noted that in the Asia/Pacific Region FANS 1/A requirements are being implemented in accordance with the decisions of APANPIRG. IFALPA was of the view that harmonization was a very important issue. The meeting generally supported the draft strategy for data link harmonization to create a single next step rather than additional and divergent interim steps. The meeting agreed that issues and resolutions associated with data link services should be appropriately addressed.

<u>Aeronautical Mobile Service (AMS) – Strategy</u>

3.3.25 The meeting endorsed a draft Aeronautical Mobile Service (AMS) Strategy formulated by the CNS/MET Sub-group. The strategy was developed based on the outcome of APANPIRG discussions at its Fourteenth Meeting in 2003 and the outcome of ITU World Administrative Radio Conference regarding the allocation and utilization of frequency band 136 – 137 MHz. APAPNPIRG/14 had recognized some guidelines which would serve the States in their preparations for AN Conf/11 to deal with Agenda Item 7 from the Asia/Pacific perspective. It was also noted that the 136 – 137 MHz frequency band has been reserved exclusively for VHF data-link applications in the Asia/Pacific Region to meet the data link requirement. In view of the foregoing, the meeting adopted the following Conclusion:

Conclusion 18/29 - Aeronautical Mobile (R) Service Strategy

That, the Strategy for Aeronautical Mobile (R) Service in the Asia/Pacific Region shown in **Appendix D** to the Report on Agenda Item 3.3 be adopted and published.

<u>Navigation Systems</u>

<u>Strategies in the Global Air Navigation Plan on Navigation</u>

3.3.26 The meeting noted that the navigation related strategies identified in the Global Air Navigation Plan (Doc9750) as accepted by the ICAO Council, include implementation of Performance Based Navigation (PBN). The introduction of PBN must be supported by an appropriate navigation infrastructure consisting of an appropriate combination of Global Navigation Satellite System (GNSS), self-contained navigation system (inertial navigation system) and conventional ground-based navigation aids. References were also made to the guidance material from the Navigation Systems Panel (NSP) on Ionospheric Effect on GNSS Operations and Conclusion of the study on the GNSS cost allocation issued by ICAO on 11 May 2007.

<u>APEC GIT/11</u>

3.3.27 The meeting noted GNSS implementation activities and initiatives taken by each of the Economies represented at the Eleventh Meeting of the Asia Pacific Economic Cooperation (APEC) GNSS Implementation Team (GIT/11) which was held in Tokyo, Japan in June 2007. Augmentation systems being developed and implemented within the Economies are Space Based

Augmentation System (SBAS), Ground Based Augmentation System (GBAS) and Ground-based Regional Augmentation Systems (GRAS). Many Economies have implemented GPS RNAV procedures and others are continuing to work towards implementation. The automatic reporting of GNSS derived position information through ADS-B technology was also identified by some Economies as an innovation.

Updates on WAAS and LAAS

3.3.28 The meeting noted that the USA continues to aggressively work towards the operational implementation of GPS Wide Area Augmentation System (WAAS) and Local Area Augmentation System (LAAS) to complete the transition to satellite-based navigation.

3.3.29 The FAA is working to increase the performance of the WAAS service/system by the addition of ground reference stations in Alaska, Canada, and Mexico. Once these sites become operational, it will have the effect of expanding the WAAS coverage in the north-eastern and the entire southern United States, much of Mexico and a majority of the Canadian airspace. Additional GEO satellite services are being acquired to assure service and improve overall system coverage through more optimized GEO orbital locations. Regulatory approval support is being provided for the GBAS CAT-I being developed to be SARPs -compliant by Honeywell and Airservices Australia. The system will be implemented in Sydney and also by Honeywell and FedEx in Memphis under FAA Non-Fed Approval process (FAR Part 171) for privately installed, owned and operated navigation systems. The FAA anticipates that the Memphis LAAS will be commissioned into the National Airspace System (NAS) at the end of the year 2008. Research was also being conducted on Terminal Area Procedures (TAP) to develop complex approaches to a precision approach in VFR conditions. TAP includes curved path, leading to a straight-in final for a precision approach and landing.

3.3.30 The meeting was informed about the United States Space-Based positioning, navigation and timing (PNT) policy and its implementation. This policy is applicable to all United States providers and users of space-based PNT, not only aviation. The policy is managed by the National Space Based PNT Executive Committee co-chaired by the Deputy Secretaries of the U.S. Departments of Defense and Transportation. An advisory board which includes international representatives supports the Executive Committee. Compatibility, interoperability and meeting user needs are the goals of the policy.

Australian GNSS Implementation

3.3.31 Australia is engaged in a programme to introduce ICAO SARPs compliant Ground Based Augmentation Systems (GBAS) for Category I operations and also to develop and certify a Ground-based Regional Augmentation System (GRAS). Activities are being led by Airservices Australia with the Civil Aviation Safety Authority (CASA) as the independent regulatory authority. Airservices in collaboration with Honeywell International, Sydney Airport Corporation Limited and Qantas commenced an operational trial of a GBAS at Sydney on 23 November 2006. The ground system installed is the Honeywell SLS 3000. The system provides precision approach guidance to the six runway ends at Sydney using one GBAS ground station. Qantas, operating Boeing 737-800 GNSS Landing System (GLS) capable aircraft have conducted 300 GLS approaches to Sydney during revenue services and have trained almost 600 flight crew to fly the approaches. Flight crew reports have been extremely positive and enthusiastic. In June 2007, the A380 flew a successful GLS approach during its visit to Sydney as part of its operational maturity campaign.

3.3.32 It was noted that Airservices and Honeywell are working together to finalise a certified Cat I GBAS, designated as the SLS 4000. The SLS 4000 is being designed in full compliance with the ICAO SARPs and United States Federal Aviation Administration Non-Fed Specification FAA-E-AJW44-2937A. The FAA will, if satisfied, complete a System Design Approval for the SLS-4000. Airservices will complete an installation at Sydney and seek approval from CASA to add the installed system to Airservices CASR 171 Certification. When added to the 171 Certificate, the system will have achieved full certification and will be available for unrestricted operation. As an interim step the initial production of SLS-4000 will be installed at lead sites whilst certification is being completed. These will be designated as “Red Label” systems. The Red Label systems are expected to be installed in mid 2008. Once certification is complete these systems will transition to “Black Label” systems. Commercially designated “Black Label” systems will be available in early 2009.

3.3.33 Ground-based Regional Augmentation System (GRAS) is a long baseline augmentation system that provides integrity, differential correction and approach procedure definition to aircraft using a network of VHF ground based data broadcast stations. GRAS is described in ICAO Annex 10 SARPs. Airservices is again working with Honeywell to produce the GRAS. Commonality of architecture between GBAS and GRAS and the use of proven commercial-off-the-shelf (COTS) components is minimising the development effort and ensuring through-life supportability. GRAS like other long baseline systems such as SBAS provides augmentation throughout a wide service volume supporting enroute and approach with vertical guidance (APV). The use of the VHF broadcast stations allows the air navigation service provider to tailor coverage to economically service desired airspace. The first commercial installation of GRAS will be in northern Australia where Airservices will be installing a GRAS to complete certification and provide a demonstration facility. The first signal-in-space is expected in mid 2008 with certification completed in 2009.

3.3.34 The Civil Aviation Safety Authority Australia (CASA) as part of their industry information service and pilot training activities have issued a GNSS Booklet with accompanying DVD that provides information on the science behind the technology, human factors, GNSS IFR navigation approvals, GNSS operation and requirements, warnings and messages.

MTSAT Satellite-based Augmentation System (MSAS)

3.3.35 The meeting noted that the initial phase of MSAS will be commissioned on 27 September 2007. Initial operational capability (IOC) of MSAS will be from en-route to NPA in Japan. Software modifications and additional monitoring stations are planned to achieve APV capability. Integrity of the MSAS has be assured commencing in the design phase and assessed through a test program with the operational tests not showing any major problems. MSAS capability of accuracy was less than 1 metre on en-route and on NPA at Naha located in the southern part of Japan; the accuracy was more than 2 meters. The Naha performance was attributed to severe ionospheric activity.

Regional Strategies for Navigation Service and GNSS Implementation

3.3.36 The regional strategies for implementation of GNSS air navigation capability and the provision of precision approach and landing guidance systems were reviewed based on new information available and the continuing adoption of the PBN concept.

3.3.37 The Regional Strategy for the Provision of Approach, Landing and Departure Guidance Systems was considered and re-titled as the Strategy for the Provision of Navigation Services. The strategy was revised to include the new performance based navigation concept and recognized the value of departure guidance. The Strategy for the Implementation of GNSS Navigation Capability in the ASIA/PAC Region was also revised based on new development. Accordingly, the meeting adopted the following Conclusion:

Conclusion 18/30 - Strategies for the Provision of Navigation Services and GNSS Navigation Capability in the Asia/Pacific Region

That, the Strategies for the provision of navigation services and GNSS Navigation Capability provided in **Appendix E and Appendix F** to the Report on Agenda Item 3.3 be adopted and published.

Flight Inspection Catalogue

3.3.38 The meeting recalled the requirements stated in Standard 2.7.1 Annex 10 Volume 1 for ground and flight inspections of navigation aids and the guidance provide in the Manual of Testing of Radio Navigation Aids (Doc 8071). To assist States in meeting this obligation, ICAO publishes the Flight Inspection Catalogue for the Asia and Pacific Regions. The catalogue contains information on available flight inspection units of States in the region. This exchange of information seeks to ensure quality and economic provision of the flight inspection services through the sharing of resources. The Eighth Edition of the catalogue was published by the ICAO Asia/Pacific Regional Office on 2 July 2007 and also posted on the ICAO website. States that do not have their own Flight Calibration Facilities were encouraged to consider using the services of other States for the calibration of their navigation aids.

Surveillance Systems

Review Report of the Sixth Meeting of ADS-B Study and Implementation Task Force

3.3.39 The meeting reviewed the outcome of the Sixth Meeting of ADS-B Study and Implementation Task Force. An ADS-B Seminar and the Sixth Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force (ADS-B SITF/6) were held in Seoul, Republic of Korea from 23-27 April 2007. The report of both the meeting and the Seminar is posted at the following ICAO webpage: http://www.bangkok.icao.int/Meetings/meetings.html

3.3.40 The meeting noted the following major achievements by the ADS-B SITF/6:

- The guidance material on comparison of the various surveillance technologies
- Second amendment to the ADS-B Implementation and Operations Guidance Document
- The concept of use for Multilateration
- Guidelines of performance parameters for using ADS-B managed serviced.
- Benefits of a mandate for aircraft to be equipped with ADS-B OUT.

ADS-B Related Developments by ICAO Panels

3.3.41 The meeting noted the 22 November 2007 is the effective date of amendments to PANS-ATM (including ADS-B based separation, etc.) as proposed by the first meeting of OPLINK Panel. The work by the ANC Panel support 5 NM separations with ADS-B had been completed and had been published as Circular 311. The meeting also noted that the Aeronautical Surveillance Panel (ASP) had developed SARPs and supporting technical specifications for a new version of extended squitter messages (named as Version 1) in support of ADS-B which has improved elaboration of navigation and surveillance accuracy. The new and amended SARPs will be a part of Amendment 82 to Annex 10. Associated technical specifications will be published as Technical Provisions for Mode S and Extended Squitter (Doc 9871) later 2007.

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

3.3.42 In light of the progress achieved by the Task Force and information presented by the Chairman of the ADS-B SITF, the meeting adopted a revised Terms of Reference and the updated Subject/Tasks List. It was agreed that the exchange of information on lessons learnt and experiences gained during the trial and implementation of ADS-B should be further encouraged.

Decision 18/31 - Revised Terms of Reference and Subject/Tasks List of ADS-B Study and Implementation Task Force

That, the revised Terms of Reference (TOR) and Subject/Tasks List of ADS-B Study and Implementation Task Force provided in **Appendix G** to the Report on Agenda Item 3.3 be adopted.

The guidance material on comparison of various surveillance technologies

3.3.43 To meet one of the objectives specified in the revised TOR of the ADS-B Study and Implementation Task Force, the ADS-B SITF/6 developed a draft Guidance Material on comparison of the various surveillance technologies (GMST). The material was considered to be a very useful document for planning surveillance infrastructure by States. Accordingly the meeting adopted the following Conclusion.

Conclusion 18/32 - The guidance material on comparison of various surveillance technologies

That, the guidance material on comparison of various surveillance technologies (GMST) provided in the **Appendix H** to the Report on Agenda Item 3.3 be adopted.

Amendment of ADS-B Implementation and Operations Guidance Document (AIGD)

3.3.44 In order for air traffic controller and pilots to be aware of different airborne ADS-B installations, their operation/limitations, including handling in exceptional cases and the impact these different installations can have on air traffic services, it was considered necessary to provide training to controllers on such issues. The meeting agreed to add the examples of radio telephony and/or CPDLC phraseology as recommended in the proposed amendment. IATA confirmed that despite the desirability of such functionality, no separate ADS-B switch-off option exists in the transponder control panels of most aircraft. Therefore, if ADS-B is switched off, the TCAS protection function could be disabled. It was recognized that crews need to be educated to respond UNABLE when requested to switch off ADS-B. It was also agreed to add additional text into paragraph 5.9.2.1 of AIGD regarding the explanation of flight plan and flight planning requirements. In light of the foregoing, the meeting adopted the following Conclusion.

Conclusion 18/33 - The Second Amendment to the AIGD

That, the ADS-B Implementation and Operations Guidance Document (AIGD) be amended as shown in the **Appendix I** to the Report on Agenda Item 3.3.

Guidelines on performance parameters

3.3.45 The meeting recalled that the ADS-B managed service concept as developed by the Air services Australia and SITA Alliance was noted by APANPIRG/17. In order to provide guidelines for consideration and reference by States, the meeting endorsed the performance parameters as developed by the Task Force and adopted the following Conclusion:

Conclusion 18/34 - Guidelines on performance parameters for using ADS-B managed service

That, States consider the performance parameters contained in **Appendix J** to the Report on the Agenda Item 3.3 as service performance guidelines while finalizing acquisition of an ADS-B managed service agreement with a service provider

3.3.46 The meeting noted the need and benefits of a mandate for aircraft to be equipped with ADS-B OUT. The proposal was strongly supported by IATA. IATA also pointed out that currently no DO260A compliant avionics are in use and implementation and protection of DO260 avionics should seriously be considered. Taking into account the outcomes of the CNS/MET and ATM/AIS/SAR Sub-groups and the following considerations, the meeting developed a revised Conclusion based on the result of discussions by an ad hoc group established during the meeting:

- Traffic is growing in Asia Pacific Regions at a rate higher than any other regions in the world and flight safety needs to be maintained during the traffic increasing;
- IATA supports an ADS-B mandate commencing in 2010 in Asia and Pacific Regions;
- There is a need for early clear indications to avionics vendors, airframe OEMs, ANSPs, airlines, operators and regulators regarding the future of ADS-B;
- ATC surveillance is not available in many parts of the Region;
- States would invest in ADS-B ground infrastructure and ATC automation system integration of ADS-B if there was high expectation of avionics fitment;
- The availability of technical standards for 1090ES ADS-B OUT including Annex 10, RTCA DO260, DO260A, DO303 and EUROCAE ED126;
- The progress made by European in developing the draft NPA, the Australian NPRM and AC and the soon to be released FAA NPRM;
- The safety benefits that are expected to flow from fitment of ADS-B OUT;
- That 30% of flights by international aircraft in a number of states are already equipped; and
- Additional benefits accrue to those aircraft, which are already fitted if fitment rates rise.

Conclusion 18/35 - Mandate Regional ADS-B Out implementation

That, States planning to deliver ADS-B based ATS services, implement requirements for ADS-B Out avionics equipage for aircraft operating in their airspace with a target date of 2010

Note: The implementation would require aircraft equipped with avionics compliant with either

a) *Version 0 ES as specified in Annex 10, Volume IV, Chapter 3, Paragraph 3.1.2.8.6 (up to and including Amendment 82 to Annex 10) and Chapter 2 of draft* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260) to be used till at least 2020.*

or

b) *Version 1 ES as specified in Chapter 3 of draft* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260A)*

<u>*Concept of Use for Multilateration*</u>

3.3.47 The meeting noted that the Concept of Use of Multilateration developed by ADS-B SITF in accordance with TOR was reviewed by the CNS/MET Sub-group. Accordingly, the meeting adopted the following Conclusion:

Conclusion 18/36 - Concept of Use for Multilateration

That, the Concept of Use of Multilateration provided in **Appendix K** to the Report on Agenda Item 3.3 be adopted as Version 1 for use as regional guidance material.

3.3.48 The meeting also noted the result of a survey on the readiness of the ADS-B service for ATS providers conducted by the ADS-B Study and Implementation Task Force.

<u>*States' activities and interregional issues on trials and implementation of ADS-B*</u>

3.3.49 The meeting noted the progress made in implementation of ADS-B and the information on the recent trials and planning activities provided by Australia, China, Hong Kong Chin, Fiji, Indonesia, Republic of Korea and Singapore. The meeting appreciated the information provided to the ADS-B Study and Implementation Task Force on ADS-B Implementation Policy for Europe as defined by the Eurocontrol CASCADE programme. The meeting also noted IATA's policy on ADS-B presented to the Task Force.

<u>*Security Concern*</u>

3.3.50 The meeting noted the concerns indicated in the report regarding perceived security issues with ADS-B. The meeting noted that this issue had been included in the Tasks List of the ADS-B SITF.

Regional Surveillance Strategy for Asia/Pacific Region

3.3.51 The meeting reviewed and adopted a revised Surveillance Strategy for Asia/Pacific Region developed by the CNS/MET Sub-group in accordance with the APANPIRG Decision 17/27.

Conclusion 18/37 - Surveillance Strategy for Asia/Pacific Region

That, the Surveillance Strategy for Asia/Pacific Region provided in **Appendix L** to the Report on Agenda Item 3.3 be adopted and published.

3.3.52 The meeting reviewed a proposal by Indonesia, Malaysia, Singapore and Thailand to establish a Working Group for a sub-regional cooperation programme in South-East Asia area to implement ADS-B and share the data across FIR boundaries. Australia, Philippines and IATA expressed their interest to participate in the Working Group. Vietnam will consider joining the Working Group as well. Singapore volunteered to host the first Working Group meeting during the middle of November 2007. The letter of invitation will be issued by Singapore to States concerned and relevant International Organizations in due course. The outcome of the ADS-B Working Group will report to APANPIRG through the ADS-B Study and Implementation Task Force. In view of the foregoing, the meeting developed the following Conclusion:

Conclusion 18/38 - Establishment of a sub-regional ADS-B implementation Working Group in the South-East Asia area (SEA ADS-B WG)

That, a South-East Asia Sub-regional ADS-B Implementation Working Group be established by the end 2007 to develop the terms of cooperation and an implementation plan for near-term ADS-B applications in the sub-region.

Automatic Dependent Surveillance – Broadcast (ADS-B) USA Roadmap

3.3.53 United States informed the meeting of the Programming Plan for the deployment of Automatic Dependent Surveillance – Broadcast (ADS-B) across U.S. National Airspace System (NAS). ADS-B has been identified as the surveillance solution which can increase safety, capacity and efficiency of air travel in the USA. The presentation included the schedule for implementation of ADS-B in the USA. It was indicated that the schedule had been worked out such that the implementation of the ground segment, the air segment and regulatory frame work are all synchronized. The meeting noted the concept of ADS-B implementation through a service contract and a window of 10 years for compliance of avionics equipage, commencing 2010.

Aeronautical electromagnetic spectrum utilization

Regional Preparatory Activities for WRC-2007

3.3.54 The meeting recalled that the protection of aeronautical electromagnetic spectrum is one of the key priorities identified by APANPIRG and noted that the next International Telecommunication Union (ITU) World Radiocommunication Conferences (WRC) is scheduled to be held in Geneva from 22 October to 16 November, 2007. The meeting reviewed the regional preparatory activities for WRC-2007.

Asia-Pacific Telecommunity

3.3.55 Asia-Pacific Telecommunity (APT) is developing the Regional Common Position on WRC-2007 agenda items and has conducted four meetings so far. The ICAO position supporting the interests of civil aviation was presented to the APT Conference Preparatory Group (APG) Meeting for WRC2007 held in November 2003, February/March 2005 and February 2006. The fourth meeting was held from 9 to 12 January 2007. The meeting was attended by 308 participants which included 15 participants from civil aviation, representing 7 civil aviation administrations. The ICAO observer in the meeting presented 7 information papers defending the civil aviation interests and notifying the ICAO position on various WRC-2007 agenda items. The outcome of APT APG/4 was very positive in support of most ICAO positions. The fifth and the last APG 2007-5 meeting was held in the Republic of Korea from 16 to 21 July 2007. However, according to the new procedure adopted by APT, the preliminary APT common proposals (PACP) need to be sent to APT administrations for endorsement. As a result of the common efforts by civil aviation administrations and the ICAO Secretariat, most of ICAO positions for WRC-2007 are supported or partially supported in the PACP.

Regional Preparatory Group Meeting

3.3.56 In line with the APANPIRG Conclusion 17/30, the Second ICAO Regional Preparatory Group (RPG) meeting was held in Bangkok from 15 to 17 January, 2007 to develop an action plan to support the ICAO position on the agenda points for WRC 2007. The objective of the meeting was to provide necessary support to aviation experts in the Asia/Pacific Region in preparation for the fifth APT Preparatory Group Meeting for WRC–2007 (APG-2007-5) and also to finalize preparation for WRC– 2007. The meeting was attended by 20 participants from 13 States. In addition to reviewing the ICAO position on individual agenda items, the meeting developed materials in support of ICAO positions with respect to the APG 2007-4, CITEL, CEPT and positions related to different methods suggested for allocation of frequency bands. The meeting developed this proposal for submission by Aviation Administrations to the Regional Telecommunication Organizations on various agenda items. The RPG/2 recommendations encouraged Aviation Administrations to make arrangements to participate in APT APG 2007-5 and the WRC-2007 Conference and to utilize the RPG/2 developed proposal during consultations with the respective Radio Regulators for inclusion of such materials in support of ICAO position in the States' proposal.

3.3.57 The meeting noted the updated ICAO position approved by the ICAO Council on WRC-2007 agenda items. It was informed that at the time when ICAO position on WRC-2007 Agenda Items was approved by the Council on 14 June 2005, studies were going on in the Navigation Systems Panel (NSP) and Aeronautical Communication Panel (ACP), in ITU and in regional telecommunication organizations, in particular on the protection of the microwave landing system (MLS) from interference, as well as assessment of spectrum required for future communication systems. The ICAO studies were completed by the end of 2006 and the position was updated accordingly. This updated position was reviewed by ANC on 20 February 2007 and approved by Council on 28 May 2007.

Implementation of the World Area Forecast System (WAFS)

Review the status of implementation of SADIS and ISCS/2

3.3.58 The meeting noted the developments of the SADIS which were highlighted as follows:

a) Approved SADIS users who have internet capabilities, but do not have an active SADIS FTP account, were invited to contact the SADIS Provider State seeking access to the service;

b) All approved SADIS workstation vendors have software that can visualize the PNG formatted SIGWX charts and BUFR encoded SIGWX data, including the revised BUFR depiction scenario for jetstream depth;

c) The SADIS Provider State, on behalf of ICAO, has completed a second evaluation of WAFS/SADIS workstation software in 2006. Eight WAFS visualization systems can now be considered compliant to the SADISOPSG software criteria; and

d) A Trust Fund was established by WMO to assist Least Developed Country (LDC) Members to ensure that their NMHS has sustainable access to WAFS products by the most appropriate means.

3.3.59 Based on the findings of the annual ASIA/PAC survey of the operational efficacy of ISCS/2, the ISCS broadcast in the ASIA/PAC Region was considered generally meeting the operational requirements during the period under review. To improve the communication with the users and thus enhance the future surveys, the meeting agreed that the ISCS user States should be invited to validate the operational points of contact for ISCS. It was also suggested that a list of the ISCS focal points should be maintained on the Internet. In view of the foregoing, the meeting adopted the following Conclusion:

Conclusion 18/39 – Update of ISCS Operational Focal Points

That,

a) ICAO Regional Office request ASIA/PAC ISCS user States to update the list of ISCS operational focal points shown in **Appendix M** to the Report on Agenda Item 3.3; and

b) the ISCS provider State maintain the list of ISCS operational focal points on the ISCS website.

Note: The ISCS webpage is accessible at: http://www.weather.gov/iscs/

3.3.60 A summary of recent and forthcoming developments to the WAFS was noted as follows:

a) Users were encouraged to regularly review the performance indicator information on the Internet, to access the WAFS Change Notice Board and information on the backup test schedule and chronology of recent events on a regular basis;

b) Users should contact their workstation supplier to identify whether an update/upgrade of the visualization software and/or changes in working practices would be required to accommodate the upcoming changes in relation to: (i) update to the depiction of features on WAFS SIGWX tests (7 November 2007), (ii) Amendment 74 changes to ICAO Annex 3 (7 November 2007); and (iii) the advancement of the lead time of issuance of WAFS SIGWX forecasts (February 2008);

c) Users were advised to adopt the use of the BUFR encoded SIGWX data at the earliest opportunity, and utilize the PNG SIGWX charts as a backup to BUFR, noting in particular that the PNGs might not be available after 2010; and

d) Users were also encouraged to monitor the transition plan from GRIB1 to GRIB2 WAFS data, the development of the new gridded products, including the proposed establishment of regional seminars, and the progress of high-resolution data, through the WAFSOPSG.

3.3.61 The meeting reviewed the progress of WAFS implementation in the Asia/Pacific Region against the "Indicative Timetable for Implementation of WAFS" given in the "ASIA/PAC WAFS Implementation Plan and Procedures". As regards the transition to BUFR coded SIGWX forecasts by States and removal of T4 facsimile SIGWX products from the satellite broadcast, the meeting considered that these tasks have been completed but the status of States' use of BUFR encoded SIGWX forecasts would need to be monitored.

3.3.62 The meeting also reviewed the information on the status of migration from SADIS 1G to SADIS 2G receiving system in the Region. As the CNS/MET SG meeting next year would only be several months away from the transition deadline of 1 January 2009, the Secretariat and WAFS/I TF should repeat these efforts to provide an update of the status for CNS/MET SG/12.

3.3.63 The meeting considered that the Tropical Cyclone Advisory Centres (TCAC) should be encouraged to monitor the WAFS SIGWX forecasts that cover their areas of responsibility and advise the appropriate WAFC to ensure the accurate inclusion of the tropical cyclone symbol. In order to foster the coordination between the TCACs and WAFCs, the meeting adopted the following Conclusion:

Conclusion 18/40 – Co-ordination between WAFCs and TCACs

That, the WAFSOPSG be invited to consider including a provision in Annex 3 requiring the WAFCs to establish and maintain contact with the TCACs in order to harmonize the information on tropical cyclones in the WAFS SIGWX forecasts and the TCAC advisories.

3.3.64 User's feedback by a major airline operating polar flights regarding the accuracy of the WAFS temperature forecast over the polar region of the northern hemisphere was presented. A case of a sudden increase in temperature, and a corresponding loss in aircraft performance, over the polar region had been analyzed. The finding indicated that even if the model was perfect and was able to forecast the strong temperature inversion, the sharp change in temperature (which might occur over a vertical scale of only a few hundred feet) was unlikely to be identifiable from the WAFS GRIB forecasts due to the coarse vertical resolution. Additional vertical levels in the WAFS GRIB forecasts near the tropopause would help reveal the sharp temperature gradient if the numerical model forecasts were accurate. The meeting therefore adopted the following Conclusion to address the issue.

Conclusion 18/41 – Improvements of WAFS temperature forecasts near the tropopause over the Polar Regions

That, the WAFSOPSG be invited to consider ways to improve the provision of WAFS temperature forecasts near the tropopause over the Polar Regions.

Exchange of OPMET Information

3.3.65 The meeting reviewed the outcome of the fifth meeting Fifth Meeting of the ASIA/PAC OPMET Management Task Force (OPMET/M TF/5) held in Bangkok, Thailand from 6 to 8 June 2007. The most important developments were outlined below.

3.3.66 The group noted with concern that, in spite of the overall improvement of OPMET data availability from the States in the Region, some METAR and TAF shortfalls persisted. Problems have been identified with the bulletins from the South-West Pacific Island States which were compiled by Nadi RODB. Other problems were identified, such as, missing METAR from a number of AOP aerodromes in Indonesia, irregular OPMET data from Cambodia and Myanmar during night time.

3.3.67 Noting the importance of the regular provision of METAR and TAF for safety and efficiency, the group agreed that the lack of OPMET information from AOP aerodromes should be included in the APANPIRG List of Deficiencies and adopted the conclusion as follows:

Conclusion 18/42 - MET Deficiencies Related to OPMET Data Shortfalls

Recognizing the importance of regular provision of OPMET data for the safety and efficiency of the air transport operations, systematic data shortfall identified by the OPMET Management Task Force through its monitoring procedure be considered as deficiencies and added to the APANPIRG list of deficiencies in accordance with the established procedure.

3.3.68 The meeting noted a plan for introducing a new service – web access to the RODB by Singapore. This came in addition to the ftp service which had been introduced after the OPMET/M TF/5 meeting. The web access will be through a new user-friendly interface; access would be provided through on-line registration. It was clarified that the procedures for granting access to this new service would follow the same rules as for the access through AFTN. The plan was to start the new service in September 2007.

3.3.69 The meeting recognized that the OPMET data disseminated through the two satellite broadcasts, SADIS and ISCS, were different. A number of ASIA/PAC bulletins have been recompiled at Washington and distributed on the ISCS under different WMO header and different bulletin content. As a result, not all ASIA/PAC OPMET information sent to Washington was available on ISCS. It was recalled that Annex 3 requirements related to the two satellite broadcasts were identical and it was expected that the same global OPMET data sets should be available on both SADIS and ISCS.

3.3.70 The meeting agreed that ISCS Provider State should examine the existing formatting discrepancies and ensure dissemination on ISCS of all ASIA/PAC OPMET bulletins through coordination with RODB Tokyo and Singapore. The following Conclusion was adopted in this regard.

Conclusion 18/43 – Harmonization of the content and format of Asia/Pacific OPMET data on the ISCS broadcast

That, the ISCS Provider State, in coordination with RODB Tokyo and RODB Singapore, be invited to consider harmonizing the bulletin format and the content of the OPMET information on the ISCS broadcast in order to ensure that all ASIA/PAC OPMET data relayed to Washington Data Bank is disseminated by the ISCS broadcast.

3.3.71 The meeting noted that the necessary preparations to be carried out by the ROBEX centres and RODBs had been discussed to ensure timely implementation of the changes in Amendment 74 to Annex 3. It was realized that the changes to the provisions related to TAF would affect the current ROBEX bulletins and related procedures. It was clarified in this regard that all changes related to the TAF would become applicable on 5 November 2008 and by that time the corresponding changes to the TAF code in the WMO Manual on Codes would be introduced.

3.3.72 The meeting agreed that the preparations for the forthcoming changes in the TAF provisions should be initiated as soon as possible. The other organizations involved in the process, WMO and IATA, should assist in this process in order to ensure timely implementation of these provisions. The meeting noted that coordination with WMO had been completed for the adoption of necessary changes to TAF code. In view of this development item b) of the draft Conclusion formulated by the CNS/MET SG/11 was deleted and renumbered accordingly. The meeting adopted the following Conclusion.

Conclusion 18/44 – Implementation of Changes to TAF Provisions in Amendment 74 to Annex 3

Recognizing that changes to the provisions for TAF in Amendment 74 to Annex 3, which will become applicable on 5 November 2008, will require significant changes to the States' national practices and to the ROBEX TAF exchange:

a) the OPMET Management Task Force conduct a regional study to identify the States' plans for implementation in order to ensure timely update of the related ROBEX TAF procedures; and

b) IATA be requested to provide the new users' requirements for the TAF period of validity for all aerodromes in FASID Table MET 1A as soon as possible but not later than end of December 2007.

Note: The regional study to be conducted by the OPMET/M TF should include identification of the requirements for TAF in the VOLMET broadcasts.

3.3.73 The meeting noted that the revised version of the ROBEX Handbook dated January 2007, which included the changes introduced by the OPMET/M TF/4 (February 2006), was posted on the web site.

3.3.74 The meeting noted the results of OPMET monitoring exercises carried out during the first half of 2007 by the RODB Singapore and by the EUR BMG and the SADIS Gateway. The results of both monitoring exercises were quite similar and indicated that the achieved performance levels for the Asia/Pacific OPMET data were not yet satisfactory, in particular, for the METAR bulletins.

3.3.75 The existing discrepancies from the standard formats and persisting syntax errors in the OPMET data was addressed. It was recognized that erroneous messages were causing serious problems at the RODBs and user's processing systems and resulted in discarding of OPMET information which could have negative effect on flight safety and efficiency. Therefore, the meeting felt that States should be reminded their obligations of implementing systematic quality control on the OPMET information promulgated to international exchange as specified in Annex 3, 2.2.4 and 2.2.5. Accordingly, the meeting adopted the following Conclusion:

Conclusion 18/45 – Enhancing Quality Control on OPMET Information by States

That, States be urged to undertake systematic monitoring and quality control of the OPMET information promulgated for international exchange in accordance with Annex 3, 2.2.4 and 2.2.5, to ensure full compliance with specified formats and contents of the messages, as well as, with the prescribed filing and transmission schedules.

Binary Universal Form for the Representation of meteorological data (BUFR)

3.3.76 The meeting noted that the WMO Commission for Basic Systems (CBS) Expert Team (ET) on data representation and codes recently had concluded that only the aviation community could evaluate the capability of its information technology (IT) infrastructure and its own ability to support BUFR code changes. The meeting recalled that ATNICG/1 had confirmed AMHS would be able to support the requirements for BUFR coded messages through a File Transfer Body Part (FTBP) solution. The group was informed that the outstanding issues related to the migration to BUFR-coded OPMET information have been referred to the WMO. The migration to BUFR code has been discussed recently at two meetings: an ad-hoc WMO/ICAO meeting on the planned migration of OPMET data to table-driven code forms (Geneva, 13 April 2007), and the meeting of the WMO CBS Expert Team (ET) on Data Representation and Codes (Darmstadt, April 2007). Alternative solutions, i.e. the use of an industry standard (e.g. XML code form), in lieu of the BUFR code form, were currently being considered. The ICAO position was that a major change like this should be subject to a business case. It appeared that the introduction of an industry standard format, such as the XML, would be cost-efficient when combined with the increased use of the Internet.

3.3.77 A CBS Expert Team would set up a pilot project for an end-to-end exchange of METAR/SPECI and TAF in XML format from an aerodrome MET office to an aviation end user to evaluate the feasibility and efficiency of the XML code in an operational environment. This task should be carried out in 2008. Consequently, the regional planning for the transition to BUFR-coded OPMET information, which has been pursued by the OPMET/M TF since 2005, should be put on stand-by until further advice from ICAO and WMO.

Implementation of the ICAO Advisory & Warning Systems

3.3.78 The meeting reviewed the results of the third series of regional SIGMET tests conducted in January and February 2007 by the Task Force on Implementation of VA/TC advisories and warnings and the OPMET/M Task Force in coordination with the Regional Office. The overall results were very similar to those of the test conducted in 2006 without significant improvement in terms of availability, which varied from 50 to 60% for the different type of SIGMET. It was recalled in this regard that the CNS/MET SG/10 meeting proposed a regional performance objective of 95% availability of the test SIGMET. Considering that this target level was yet to be achieved, the meeting agreed that the periodic SIGMET tests should continue in accordance with the developed regional procedures in the ASIA/PAC SIGMET Guide.

3.3.79 The meeting was informed of the follow-up action on APANPIRG Conclusion 17/42 on the development of a web page for monitoring SIGMET availability in the ROBEX Scheme. The web page has been developed by the Hong Kong Observatory (HKO) in coordination with the Singapore RODB. The access to the webpage would be through a digital certificate and username/password issued by the HKO on request by the MWOs and ROBEX centres. A State letter had been circulated to the Asia/Pacific States providing information on the webpage and the access procedures. The meeting commended Hong Kong, China for developing an excellent tool for monitoring of SIGMET and advisories in the Region. It was expected that the webpage would be a very useful tool and would contribute to improving the issuance of SIGMET by the MWOs.

3.3.80 A SIGMET Seminar was held at the ICAO Regional Office from 11 to 13 July 2007. It was attended by 26 participants from 16 Asia/Pacific States and IATA. Representatives of three VAACs (Darwin, Tokyo and Wellington) and four TCACs (Darwin, Nadi, New Delhi and Tokyo) attended the Seminar. The WMO also participated through an on-line presentation from Geneva via Internet. The objective of the Seminar was to assist in improving the availability and quality of SIGMET information in ASIA/PAC Region, through:

- Enhancing the participants' awareness of the ICAO SIGMET provisions;
- Enhancing the knowledge of modern observing and forecasting techniques used in the SIGMET issuance;
- Receiving feed-back from States and discussing common issues identified; and
- Strengthening the system of MWO focal points.

3.3.81 All presentations were made available on the ICAO APAC website to allow all States in the Region to benefit from this training event. The participants in the Seminar expressed their strong wish that such training events should be organized regularly to enhance the capacity of the States and assist in implementing the ICAO provisions on aeronautical meteorology.

3.3.82 The Seminar helped in receiving important feedback from States on common implementation problems which need to be addressed by ICAO. The list of identified issues is in **Appendix N** to the Report. The meeting agreed that these issues should be brought to the attention of the new Meteorological Warnings Study Group (METWSG) under the Air Navigation Commission and adopted the following Conclusion:

Conclusion 18/46 – Issues related to Implementation Improvement of the SIGMET Provisions

That, the implementation issues identified by the ASIA/PAC SIGMET Seminar, listed in **Appendix N** to the Report on Agenda Item 3.3, be brought to the attention of the Meteorological Warnings Study Group (METWSG) for further study and development of additional guidance to improve the implementation.

3.3.83 The meeting noted the final drafts of the three SIGMET posters, which had been prepared by Hong Kong China, Australia and New Zealand as a follow-up of APANPIRG Conclusion 16/47. It was informed that further coordination would be carried out between the authors of the posters in order to harmonize the content and the graphic design and after a final review by the ICAO and WMO the posters would be produced and circulated to all States with MWO responsibilities.

3.3.84 Following the adoption of Amendment 74 to Annex 3 by the ICAO Council, a new draft edition of the ASIA/PAC SIGMET Guide prepared by the ICAO Regional Office was note by the meeting. The meeting agreed that the new edition of the ASIA/PAC SIGMET Guide should be published on the ICAO APAC web site as soon as possible to allow the MWOs in the Region to prepare in time for the implementation of the new and amended provision. In view of the foregoing, the meeting adopted the following Conclusion:

Conclusion 18/47 – New edition of the ASIA/PAC SIGMET Guide

That, the Fourth edition of the ASIA/PAC SIGMET Guide, as shown in **Appendix O** to the Report on Agenda Item 3.3, be published on the ICAO APAC website according to established procedures and the Regional Office urges States to implement the amended SIGMET provisions in time for the applicability date of Amendment 74 to Annex 3 (7 November 2007).

Amendment to MET part of the Asia and Pacific Regional ANP (Doc 9673)

3.3.85 The meeting noted that the changes to SIGMET and advisory provisions in Amendment 74 to Annex 3 would require changes to related regional procedures in the ASIA/PAC Basic ANP and FASID (Doc 9673). A draft amendment proposal prepared by Secretariat was reviewed in this regard. The participants provided updates to the FASID Tables and agreed that the amendment proposals should be processed by the Regional Office. The following Conclusion was adopted:

Conclusion 18/48 – Amendment to the MET part of the ASIA/PAC Basic ANP and FASID (Doc 9673)

That, the amendment proposal to Part VI, Meteorology (MET) of the ASIA/PAC Basic ANP and FASID shown in **Appendix P** to the Report on the Agenda Item 3.3, be processed in accordance with the established procedure.

<u>Other MET issues</u>

3.3.86 As follow-up to the MET/ATM Coordination Seminar (2006) and subsequent Conclusion 17/43 of APANPIRG/17 the Task Force had focused on the development of a regional survey to help establish the requirements for meteorological information and services in support of air traffic management. A survey questionnaire has been developed by the Task Force with input from Air Traffic Management Authorities in Australia. The questionnaire was presented for review at the ATM/AIS/SAR SG/17 meeting, Bangkok, Thailand, 2 – 6 July 2007 and it was expected that the ATM experts would provide some inputs to improve the survey.

3.3.87 The survey questionnaire has been designed to include many open questions in an attempt to get the ATM experts thinking broadly about which meteorological elements were currently used, how they were used and what could be done to improve on them, as well as identifying meteorological information currently not available which would be required for future initiatives. The meeting agreed to the format of the survey subject to the inclusion of further background and guidance to respondents. The survey is planned to be conducted prior to APANPIRG/18 meeting.

3.3.88 The meeting recognized that many meteorological services were lacking knowledge of the new ATM concepts and related new expectations for improved MET facilities and services. Further guidance and education was considered essential for the MET stakeholders in order to be a vital part of the new developments. It was suggested in this regard, that such guidance should be developed by ICAO and the following Conclusion was adopted.

Conclusion 18/49 – Developing guidance on the ATM requirements for MET services and facilities

That, ICAO be invited to extend the guidance material in Doc 9377, *Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical meteorological Services*, to cover new requirements for MET services and facilities emerging from the *Global ATM Operational Concept*, Doc 9854 and the *Global Air Navigation Plan,* Doc 9750.

3.3.89 A proposal for the use of the “metre per second” as a unit of wind speed in aeronautical meteorological service has been considered. It was pointed out that while WMO-No. 306 “Manual on Codes” specified three units (“km/h”, “m/s” and “kt”) for encoding wind speed in METAR/SPECI and TAF, the unit ‘m/s’ was not included in ICAO Annexes 3 and 5. Enabling the use of ‘m/s’, which was an SI coherent derived unit, would bring the following benefits: (a) consistency between ICAO and WMO standards; (b) eliminate the need for unit conversion for wind measuring equipment that already provides raw wind speed data in ‘m/s’; and (c) precise wind speed thresholds of operational significance given in ‘m/s’ in ICAO Annex 3 to ensure accurate interpretation of wind speed data already available in ‘m/s’. IFALPA, however, expressed concerns on the adoption of “m/s” as a generally accepted unit of wind speed in addition to “km/h” and “knot”. IFALPA's position is shown in Appendix A5 to the report of CNS/MET SG/11, available at: http://www.bangkok.icao.int/meetings/2007/cnsmet_sg11/cnsmet_sg11rpt.pdf. The meeting was informed that the use of "knot" will not be affected.

3.3.90 It was pointed out that currently there were several States using "m/s" as a unit of wind speed but none was using "km/h". It was noted that while the WMO codes provide for the use of m/s as may be determined by national decision, the current user requirement reflected in Annex 3 and Annex 5 is for wind speed to be indicated either in km/h or in kt. In this connection, China put forward an alternative proposal to replace "km/h" with "m/s" as the SI unit of measurement of wind speed in ICAO Annexes 3 and 5. Noting that this proposal would not affect the current use of "knot" as the alternative unit of measurement of wind speed, the following Conclusion was adopted:

Conclusion 18/50 - Replacing "km/h" with "m/s" as the SI unit of measurement of wind speed in ICAO Annexes

That, ICAO, in consultation with users, be invited to consider replacing "km/h" with "m/s" as the SI unit of measurement of wind speed in ICAO Annexes.

Review CNS/ATM systems planning and implementation

CNS/ATM Implementation and Planning Matrix

3.3.91 The meeting noted that the CNS/ATM Implementation Planning Matrix was developed in accordance with the Conclusion 11/37 of APANPIRG and is regularly updated. CNS/ATM Implementation Matrix reflects the status of implementation of major CNS/ATM elements in the region and includes ATN, AIDC, CPDLC, GNSS, ADS-C and ADS-B. The meeting noted that some States had taken up implementation of Multilateration systems for terminal or area surveillance. It was therefore felt that the status of implementation of Multilateration in the region should also be reflected in the Matrix. The meeting decided to adopt the option of grouping ADS-B and Multilateration in the seventh column of the Matrix. The meeting noted the updated Matrix as provided in **Appendix Q** to the Report on Agenda Item 3.3.

Key Priorities and performance objective

3.3.92 The meeting noted that the List of Key Priorities for the CNS/ATM Implementation in the Asia/Pacific Region was updated by the CNS/MET Sub-group. It was considered that the Key Priorities would be subsumed into the regional performance objectives and related projects. The List of Key Priorities for the CNS/ATM Implementation in the Asia/Pacific Region is considered as a baseline for transition to the new planning approach. It was noted that in the item 4 – preparation for WRC-2007 is replaced with preparation for WRC-2011. Performance Based Navigation is added to the Item 1 - RNP/RNAV Implementation. The updated List of Key Priorities for the CNS/ATM Implementation is at **Appendix R** to the report on Agenda Item 3.3.

Uplink and downlink of meteorological information

3.3.93 The meeting noted the latest development of uplink and downlink of meteorological information provided by Hong Kong China. It was informed that the TWIP uplink trials carried out in Hong Kong had successfully demonstrated the capability and potential benefits of weather information uplink, especially in windshear applications. While the trial would likely be extended at the request of the participating airline, the current bandwidth limitations of ACARS prevented real-time uplinking of graphical information which would fully realize the benefits to airlines and pilots. In this connection, the meeting noted that the completion of APANPIRG 16/52 "Air-Ground Data Link Supporting Graphical Meteorological Information Uplink" would allow wide implementation of the real-time uplink of weather information benefiting the aviation community. As regards downlink of MET information, the meeting was informed that Hong Kong, China had successfully implemented windshear reporting based on high-resolution ascent data from the Aircraft Meteorological Data Relay (AMDAR) equipped aircraft in 2006. The meeting also noted that the eventual implementation of automatic air-reporting by the Mode S datalink (APANPIRG Conclusion 14/44) and/or ADS-B 1090 MHz extended squitter (APANPIRG Conclusion 17/49) would bring significant enhancements in the provision of automated aircraft reports in support of more frequent updating of high-resolution wind and temperature data in the terminal area.

Vision of the Next Generation Air Transportation System

3.3.94 The meeting noted information provided by the United States on the Next Gen System, the American vision of how the management of air traffic and airports with greater level of safety and efficiency will be achieved in the timeframe 2025 and beyond. At the heart of the Next Gen concept is the information sharing component, known as net centric infrastructure, which will provide to the users, the information (on demand) they require to take a decision and at the same time ensuring that the same information is available to all the users. Concept of Operations or ConOps version 2.0, released on 13 June 2007 identifies eight goals. The system envisaged for 2025, will be net-centric with identical information provided to all the users and it will also be possible to tailor the information for the specific user.

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

3.3.95 The meeting reviewed the Terms of Reference of the CNS/MET Sub-group and agreed that they should be aligned with the proposed discontinuation of the ASIA/PAC Regional Plan for the new CNS/ATM Systems. The meeting noted the updated the Subject/Tasks List. The new tasks added into the list include implementation of Performance Based Navigation and updating of FASID Table CNS-1E. The status of on-going tasks was also updated as necessary. Accordingly, the meeting adopted the following decision on the TORs and the Subject/Tasks List:

Decision 18/51 - Updated Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group

That, the Terms of Reference and the Subject/Tasks List of the CNS/MET Sub-group presented in **Appendix S** and **Appendix T** to the Report on Agenda Item 3.3 respectively, be adopted.

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TITLE AND TERMS OF REFERENCE

Title:	**AERONAUTICAL TELECOMMUNICATION NETWORK IMPLEMENTATION CO- ORDINATION GROUP (ATNICG)**
Terms of Reference:	Coordinate implementation of ATN in the Asia and Pacific Regions to satisfy performance requirements and address relevant implementation issues.
Composition:	The Group will be composed of experts nominated by: Australia, China, Hong Kong-China, Fiji, India, Indonesia, Japan, New Zealand, Republic of Korea, Singapore, Thailand and United States
Reporting:	The Group will present its report to APANPIRG through the CNS/MET Sub-group.
Remarks:	The ATNICG, while undertaking the tasks, should take into account the work being undertaken by Aeronautical Communication Panel and other related regional groups in other ICAO regions with a view to avoid duplication.

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No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/2 Update
1	ATN Implementation Coordination	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Review of implementation problems and develop co-ordinated solutions	Expedite implementation activities, ensure system campatibility through out the region	Co-ordination Report	Ongoing/Semi-anually until (2010)	Ken Morris (Australia)	All members	Updated the FASID CNS 1D. Coordinate the intra regional interface. Planning and Implemenation Status are updated at ICAO APAC website.
2	ATN Operational Procedures	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Development of Interim Database for Directory Services (2) Develop the operational database management procedures	Make available real time and quality assurance addresses for ATN message delivery	(1) Interim Database (2) Operational Procedures	(1) (2007) (2) (2007)	Robert Hallman (USA)	Thailand, Hong Kong China, Japan	The database was demonstrated. Aerothai will maintain the database on behalf of the regional ICAO. Aerothai is designated as focal point for accessing AMC at short term. Intiated by Aerothai
3	ATN Certification & Validation Process	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Develop conformance procedures and checklist for AMHS and ATN routers (2) Develop validation process document	Expedite implementation activities, ensure global system compatibility	(1) Checklist (2) Conformance Document	(1) (2007) (2) 2007	Victor, Lee (Singapore)	China, Hong Kong China, Indonesia,ROK, USA,	Update distributed to member States for comment Deadline by CNS/MET in July by Victor same as above

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/2 Update
4	ATN Documentation	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Study DIR objects/attributes proposed in ACP and follow development within other groups	Expedite implementation activities, ensure global system compatibility	(1) Directory Report	(1) Annually until (2010)	Chonlawit B.	Thailand	Develop the database and review proposal from Eurocontrol. Will present the procedure for coordination. Further consequential changes needs to be made and additional annex needs to be added.

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/2 Update
				(2) Development AIDC documentation (including ICD) and follow development within other groups		(2) AIDC ICD	(2) 2007 (ACP-dependent)	(Thailand)	Thailand	Status reported to ATNICG/2 indicating the operation of AFTN based AIDC; Postpone development of ATN based AIDC ICD as experience gained by the implementors.
				(3) Update of AMHS ICD to comply with SARPs 3rd Edtion		(3) Updated AMHS ICD	(3) (2007)		Japan	Completed. Provided to ATNICG/2 for endorsement
5	ATN Performance	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Develop/establish/adapt/monitor/identify/analyse performance indicators	Assure QOS, service continuity, timely delivery of services	(1) AMHS performance report	(1) Annually until (2010)	Japan	Republic of Korea, India	On-going and challenging. Proposed to further study how to measure the erformance
6	ATN Service Enhancements	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Review the impact of the implementation of Directory Services in the Region	Enhancing the service	(1) Report on directory	(1) Annually until (2010)	Fiji	USA, Thailand, New Zealand, Japan, Australia	Review the database developed by Aerothai for the Regional ICAO office.
				(2) Development of profiles for the directory access and exchange protocols (Ref. Decision 7/9)	Enhancing the operation	(2) Report on profiles	(2) (2008)	Fiji		
				(3) Study the use of IP	Lowering the operating cost	(3) Report on the use of IP	(3) (2008)	Singapore	China	Will develop a Working Paper to ATNICG/3
				(4) Study for transition to BUFR code	Enhancing the service	(4) Report on the impact of BUFR code to ATN	(4) (2007)	Japan	New Zeland, USA,	Analysis was presented by Hong Kong, China. No progress subject to discussion at CNS/MET/11
				(5) Study for transition of AFTN-based AIDC to ATN environment	Improving the service and lowering the operating cost	(5) Report on the impact of transition of AFTN-AIDC to ATN-AIDC	(5) (2008)	Thailand	India,Indonesia, New Zealand, USA,	A report will be presented by Aerothai to indicate the operation of AFTN based AIDC version 2.0

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/2 Update
7	Security	B. Security	GPI-17, GPI-19, GPI-22	(1) Develop Information Security policy	Safe and Secure Inter and Intra Regional Communication and service infrastructure	(1) Policy Document	(1) Annually until (2010)	Vidyut Patel (USA)	Australia, Hong Kong China	USA made a presentation at ATNICG/2. High level guidance document needs to be presented to WG/2
				(2) Develop Information Security Guidance		(2) Guidance Document	(2) (2008)			
				(3) Develop Information Security Solution for Initial and Enhanced Services		(3) Security, Technical, Management and Operational Control	(3) (2008)			
				(4) Co-ordinate and monitor ACP working group and other regions		(4) Report	(4) Semi-Annually until (2010)		Thailand	
8	ATN Service Enhancements	D. Efficiency	GPI-17, GPI-19, GPI-22	Analyze Common Address Prefix Proposal	Improving the service and routing efficiency	Report on common prefix based analysis conduced	End of 2007	Mark Brown [Japan]	Australia, Fiji, HongKong China, New Zealand and USA	Action Items developed at ATNICG/2 for follow-up at WG/2 meeting

No.	PERFORMANCE OBJECTIVE	ICAO Srategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/2 Update

The ATN PERFORMANCE OBJECTIVE

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

(GPI-22) COMMUNICATION NETWORK INFRASTRUCTURE

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

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

(GPI-19) METEOROLOGICAL SYSTEMS

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

(GPI-17) IMPLEMENTATION OF DATA LINK APPLICATIONS

Scope: Increase the use of data link applications

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

International Civil Aviation Organization
Asia and Pacific Office

The Guidance Document for AMHS Conformance Testing (AMHS Manual)

Version 1.0 – September 2007

Scope of the Document

This document has been developed by ATN ICG in order to present a comprehensive collection of test and checklist required to ensure conformance and compatibility pertaining to the implementation of AMHS facilities in the Asia and the Pacific Region.

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Document Control Log

Edition	Date	Comments	section/pages affected
0.11	30/03/2007	Creation of the document.	all

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1. Structure of the Asia and the Pacific AMHS Conformance Manual

1.1. The Asia and the Pacific AMHS Manual consists of 2 parts. The “Main Part” and the Appendices.

The main part will introduce and provide general guidance and detailed information on requirements concerning AMHS implementation in the Asia and the Pacific Region. They consist of:

1. Structure of the Asia and the Pacific AMHS Conformance Manual
2. Introduction
3. Asia and the Pacific AMHS Requirements
4. System implementation - Guidelines for system requirements
5. Tests and validation of systems
6. Miscellaneous

For better presentation and management, detailed documents, which have been produced on particular subjects initially addressed in the main body of the Manual, have been included as Appendices to the Manual.

1.2. The following Annexes to the Asia and the Pacific AMHS Manual have been produced:

- Annex A: Guidelines on Quality of Service (QOS)
- Annex B: AMHS Conformance Tests
- Annex C: ATN Router

2. Introduction

2.1 Background Information

2.1.1 AFS

The Aeronautical Fixed Service provides, among other things, for the exchange of messages pertaining to the safety of air navigation and the regular, efficient and economical operation of air services.

The following categories of message are handled by the AFS:

- distress and urgency messages
- flight safety messages
- meteorological messages
- flight regularity messages
- aeronautical information services messages
- administrative messages
- service messages

The principal users of messages in the above categories are ATS and the AIS, ATFM, MET and SAR Services which support and complement the ATS.

2.1.2 AFTN/X.25

Initially, the operational requirements for such an information exchange were met by the development of the Aeronautical Fixed Telecommunications Network. The AFTN provides astore-and-forward messaging service for the conveyance of text messages in ITA-2 or IA-5 format, using character-oriented procedures. Although AFTN served its purpose well for many years, AFTN technology has become outdated due to the fact that is remains bound to its telex/telegraphic origins.

The X.25 network provides a common transport service for the conveyance of binary or text application messages in an expeditious and reliable manner.

In the Asia and the Pacific Region, the X.25 provides the reliable backbone data communications infrastructure for the AFTN and a general data communications service to non-AFTN applications such as OPMET.

2.1.3 AMHS

The most recent development with regard to messaging in the ATS environment is the AMHS. The AMHS is a natural evolution from AFTN/X.25, replacing the telegraphic style of working with a modern Message Handling System based on international Standards.

It is presumed that the ATSMHS, being an ATN application, utilises the infrastructure of the ATN internetwork. However this is not a prerequisite for the initial deployment of the ATSMHS.

There are several advantages of AMHS over AFTN/X.25 including:

- increased speed, capacity and throughput
- enhanced reliability
- extended functionality
- interoperability with other global messaging services
- security capabilities
- use of COTS equipment and services

The provisions pertaining to ATSMHS, such as SARPs and general guidance material, are contained in the following ICAO documents, which constitute the main references for this Manual.

- Annex 10, Volume II, Chapter 4 [1]
- Annex 10, Volume III, Part I, Chapter 3 [1]
- Doc 9705 Sub-Volume III [3]
- Doc 9739 Part III, Chapter 6 [4]
- ICAO Asia and Pacific Regions BASIC ANP
- ICAO Asia and Pacific Regions ANP (FASID)

2.1. ATSMHS Overview

2.2.1 General

The ATN SARPs for the Air Traffic Services Message-Handling Service (ATSMHS) define the ICAO store and forward messaging service used to exchange ATS messages between users over the ATN internet.

The set of computing and communication resources implemented by ATS organisations to provide the ATS Message Handling Service is commonly referred to as AMHS (ATS Message Handling System). The ATS Message Handling System SARPs are compliant with mature message handling systems standards such as ISO/IEC 10021 [20] and ITU-T X.400.

2.2.2 Functional Components

In terms of functionality, the ATSMHS comprises the following components:

(a) the Message Transfer Agent (MTA) which performs the function of the Message switch,

(b) the User Agent (UA) which performs the user access to the MTA and provides an appropriate user interface,

(c) the Message Store (MS) which provides the intermediary storage between MTA and UA and is usually co-located with the MTA, and

(d) the Access Unit (AU) which provides for intercommunication with other Messaging Systems.

(e) the ATN router (Optional)

2.2.3 End systems

Three categories of ATN end systems are defined for the support of the ATS Message Handling Service:

- the ATS message server
- the ATS message user agent
- the AFTN/AMHS gateway

Together, these systems provide connectivity between users at ATN end systems and users at AFTN Stations in three different end-to-end configurations:

a) from an AFTN/X.25 Station to another AFTN Station over the ATN

b) from an AFTN/X.25 Station to an ATN End System, and vice versa

c) from an ATN End System to another ATN End System with ATN routers

2.2.4 Levels of service

Two levels of service are defined within the ATS Message Handling Service:

a) The Basic ATS Message Handling Service

b) The Extended ATS Message Handling Service

The Basic ATS Message Handling Service meets the basic requirements of the MHS Profiles published by ISO as International Standardized Profiles (ISPs), and it incorporates additional features to support the service offered by the AFTN.

Compared to the service of the AFTN, the Basic ATS Message Handling Service offers some significant improvements such as:

- practically unlimited message length
- virtually no limit on the number of addressees of a message
- provision of non-delivery reports
- indication of the subject of a message

The Extended ATS Message Handling Service provides functionality in addition to those of the Basic ATS Message Handling Service such as the introduction of directory services and security mechanisms. Furthermore, in addition to IA-5 text, the extended service allows for the transfer of binary coded data, files etc.

The Extended ATS Message Handling Service is backwards compatible with the Basic ATS Message Handling Service.

2.2.5 Inter-operability

During the transition phase from the AFTN or the X.25 network to the AMHS the interoperability between systems is achieved by the use of the AFTN/AMHS and X.25/AMHS gateways respectively.

The SARPs for the AFTN/AMHS gateways have been defined by ICAO.

3. AMHS Requirements

3.1. Quality of Service Requirements

The purpose of this section is to define quality of service (QoS) requirements and set target performance objectives for the AMHS. The performance requirements dealt with in this section are the common understanding on what the applications will get in terms of performance and what level of performance the network has to provide. The performance parameters are therefore necessary for designing applications as well as the network itself.

It is also a very subjective matter. So the detail of this section is only include in the appendix for reference. It is not a requirement but just a guideline for those who interests.

3.2. AMHS Addressing

3.2.1. Introduction

This section aims at the production of the AMHS Addressing Plan for all the Potential AMHS users in the Asia and the Pacific Region. This Plan should define the AMHS users addressing in an intuitive way and it should be comprehensible and meaningful to the human user and independent of the use (or not) of any type of Directory service such as X.500.

The Addressing Plan should also provide the rules to extend the addressing defined to other ATSOs (or not yet identified users).

3.2.2. Requirements

The AMHS addressing scheme should meet all of the following requirements:

- The addressing scheme should be as uniform as possible across all AMHS implementations in different Regions (as it is currently the case for AFTN addresses);
- The same addressing scheme should be maintained when indirect AMHS users (i.e. AFTN users or X.25 network users) migrate to AMHS. This implies that the AMHS addressing scheme is pre-defined and published before actual operation of the newly implemented AMHS;
- The addressing scheme should be independent of any constraints that may be imposed by Management Domains (MDs) in the Global MHS (i.e. the non-AMHS services operating globally as commercial services) or by national regulations that may vary from Region to Region; and
- The addressing scheme should allow for the interchange messages with MDs in the Global MHS.

3.2.3. MHS Addressing structure

Each MHS address consists of a set of MHS standard components referred to as address attributes.

3.2.3.1. High level MHS address attributes

The high level MHS attributes identify an MHS Management Domain as specified in ISO/IEC 10021-2, Section 18.3 [19]. They are determined by the structuring of Management Domains of the MHS Region / organisation to which the address belongs. Each attribute must be registered with an appropriate registration authority to ensure that all addresses remain unambiguous. They are as follows:

- **Country (C) Name:**
  This is mandatory, and the possible range of values of the attribute is drawn from the ISO 3166 register of country names. The register contains a special value 'XX', allocated for the purposes of international organisations (i.e. those that are established by international treaty) which do not ‘reside’ within any particular country;

- **Administrative Management Domain (ADMD) Name:**
  This is mandatory, and its value is the name of an MHS Service provider in the context of a particular country. ADMD Names must be registered by a national registration authority. ADMDs registered under the 'XX' country must obtain that registration from the Telecommunication Standardisation Sector of the International Telecommunication Union (ITU-T).

- **Private Management Domain (PRMD) Name:**
  This is optional, and its value is the name of an MHS service usually operated by a private organisation. PRMD names must be registered either with their respective ADMDs, or with a national register of PRMDs.

3.2.3.2. Low level MHS address attributes

They are as follows:

- **Organisation name:**
  The organisation name is the most significant naming ttribute of the O/R address. Many organisations will operate as sub-naming authorities, allocating name space below their organisation name attribute. The function of the domain names, both Administrative and Private, is to provide a relaying mechanism for delivery of the message to the intended destination. Relaying to the intended destination is made easier by the combination of a unique Organisation Name within a unique PRMD

- **Organisational unit name:**
  The organisational unit (OU) names are used within the context of a hierarchical addressing structure as identified by the organisation name attribute, and should be used to identify meaningful subdivisions of that namespace. The X.400 O/R address allows for up to 4 specified, each up to 32 characters in length, in descending order of significance within the organisational hierarchy.

  The other *OU name* (*OU2-4*) attributes can be used to further subdivide the namespace represented by the *OU1* attribute if necessary. Subordinate OU names should only be used if all superior OU names are in use.

- **Common Name:**
  The common name attribute is the preferred way of Identifying distribution lists and computer applications, avoiding the (mis)use of the personal name attribute. The common name attribute can be up to 64 characters in length.

3.2.3.3. List of Attributes

A complete list of attributes with different information concerning on the Maximum length and type of allowed characters for each attribute type is provided in the following Table:

MNEMONIC FORM ADDRESS ATTRIBUTE	**CHARACTERISTICS**
Country name	2 alpha or 3 numeric
ADMD name	24 Printable String
PRMD name	24 Printable String
Organisation name	64 Printable String
Organisational unit name	32 Printable String
Common name	64 Printable String

Table 2: Mnemonic O/R address attributes maximum length and types

3.2.4. AMHS Addressing Schemes

3.2.4.1. XF-Addressing Scheme

The AMHS SARPs describe a potential AMHS addressing scheme, the XF- Address (translated), composed of the following:

a) an AMHS Management Domain identifier;

b) an organisation-name attribute:

   (1) as specified in ISO/IEC 10021-2, Section 18.3,

   (2) taking the 4-character value “AFTN”, and

   (3) encoded as a Printable String;

c) an organisational-unit-names attribute:

   (1) as specified in ISO/IEC 10021-2, Section 18.3,

   (2) comprising a sequence of one single element, which takes the 8-character Alphabetical value of the AF-Address (AFTN-form address) of the user; and

   (3) encoded as a Printable String.

Note 1. – An XF-Address is a particular MF-Address whose attributes identifying the User within an AMHS Management Domain (i.e. those attributes other than country-name, administration-domain-name and private-domain-name) may be converted by an algorithmic method to and from an AF-Address. The algorithmic method requires the additional use of look-up tables which are limited, i.e. which include only a list of AMHS Management Domains rather than a list of individual users, to determine the full MF-address of the user.

Note 2. – An MF-Address (MHS-form address) is the address of an AMHS user.

A summary of XF-Addressing Scheme can be found in the following table:

Attribute	Attribute value	Remarks
Country-name ©	C = “XX”, as already obtained by ICAO from ITU-T	
ADMD-name (A)	A = “ICAO”, as already registered by ICAO at ITU-T	
PRMD-name (P)	P = private-domain-name, taking the value of the one or two-letter ICAO Nationality Letters as specified in Document 7910.	Default value will be used to ensure that the attribute value is always defined (see [10]).
Organization name (O)	O = “AFTN”, taking the 4-character value “AFTN” encoded as a Printable String	
Organizational unit-Name (OU1)	OU1 = the 8-letter AF-address (or AFTN indicator) of the considered user	

Table 3: XF-Addressing Scheme

3.2.4.2. CAAS Addressing Scheme

(a) High-level attributes

The following preferred high-level MD and address structure that meets all of the requirements outlined in paragraph 3.2.1 above:

• Country Name = 'XX';

• ADMD Name = ‘ICAO’;

• PRMD Name = preferred operating name assigned by each ATSO or group of ATSOs.

In this way, ICAO creates an international ADMD without addressing constraints Imposed from outside ICAO and its members.

This scheme has placed two requirements on ICAO:

- To obtain from the ITU-T the registration of the name ‘ICAO’ (or some other suitable acronym agreed between ICAO/ANC and ITU-T); and
- To establish and maintain a register of PRMDs established by ATSOs that operate using the 'XX' + ‘ICAO’ address structure, in a way similar to Doc. 7910 [5]and Doc 8585 [6].

  Note. – This scheme does ***not*** *require ICAO itself to operate the ADMD systems since this should be delegated to the participating ATSOs.*

This registration will enable the establishment of regional AMHS services and their later interconnection, and it will provide ATSOs with a good deal of stability within which they can develop their AMHS plans.

(b) Low level attributes

The CAAS addressing scheme includes the following attributes:

- Organisation name (O) = Region,
- Organisational unit 1 (OU1) = Location,
- Common name (CN) = User

Consequences:

- Each ATSO will define the values for the Organization-Name attribute (O) in its Management Domain. The character set to be used for this attribute will be the set of characters allowed by the ASN.1 type "Printable String".
- Organisational Unit 1 (OU1) will be the 4-character ICAO location indicator (as specified in ICAO Doc 7910 [5]) of the user.
- Common Name (CN) will either include the 8-character AFTN address for AFTN users, or the X.25 users (OPMET, AFTN Operator messages). It should be noted that this is partly redundant with the definition of OU1, however it is considered as unavoidable due to the evolutionary nature of the move from AFTN to AMHS.

3.2.5. Asia and the Pacific AMHS Addressing Plan

3.2.5.1. Asia and the Pacific AMHS Addressing Scheme

Major concepts of this AMHS Addressing Plan are shown as follows:

Attribute	Attribute value	Remarks
Country-name (C)	C = “XX”, as already obtained by ICAO from ITU-T	
ADMD-name (A)	A = “ICAO”, as already registered by ICAO at ITU-T	
PRMD-name (P)	P = a name to be defined by each ATSO and registered by ICAO. Such a name will identify a State, an Organization, or an organization within a State. .	In the absence of such a name being registered by the ATSO at ICAO, a default value will be used to ensure that the attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be foundin Doc 7910.
Organization name (O)	O = a value corresponding to local/national geographical information, e.g. a region or a geographical area within a State where the user is located.	The syntax and value are to be defined by the considered ATSO. The table associating such an organization-name to each ICAO location indicator (4 characters) needs to be registered and published by ICAO.
Organizational unit-name (OU1)	OU1 = the ICAO location indicator (4 characters) of the considered user;	

Table 4: AMHS Addressing Plan

Example: MF AMHS Address of Singapore Com center:
/C=XX/A=ICAO/P=Singapore/O=CAASG/OU=WSSS/CN=WSSSYFYX

3.2.5.2. Distribution lists.

The scheme to be used for the identification of AMHS Distribution Lists is the same as for potential AMHS users. The O and OU attributes would then represent the expansion point of the Distribution list.

3.2.6. Guidelines on PRMD Name assignment

3.2.6.1. Purpose

A PRMD-name attribute shall be formulated and assigned by each ATSO in order to uniquely identify the AMHS Management Domain of which the considered ATSO is in charge. Practically, the PRMD-name attribute identifies that part of the AMHS for which an ATSO is responsible.

3.2.6.2. Assignment rules

When assigning a value to the PRMD-name attribute the following rules should be considered:

1) It should be representative of the whole AMHS Management Domain for which the ATSO is responsible;

2) It should be as short as possible, an acronym would be sufficient;

Note. – The use of the two-letter ISO 3166 country codes (e.g. SG for Singapore, AU for Australia, US for the United States, etc.) is not advisable, as these codes are used as values of the Country-name attribute and not the PRMD-name attribute. This may confuse the operators.

3) It should be stable and not subject to changes unless there are duly justified Technical and/or operational reasons;

4) It should be unique and unambiguous;

Note. – Care should be taken not to use a name or an acronym such as "civil aviation", "ATSO", "DGAC".

5) A default value has been reserved in order to ensure that this attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910 [5].

6) It should only comprise standard characters, e.g. no accented letters or letters that are only used in specific geographical areas;

7) The use of figures is not advisable.

3.2.6.3. Registration

Once assigned by the concerned ATSO, the PRMD-name value(s) shall be registered and published by ICAO after checking its uniqueness, as described in paragraph 3.2.6.2.

Note. – ICAO being the naming authority for AMHS addresses, there is no requirement to register the PRMD-name value(s) with a national authority.

3.2.7. Guidelines on Organization Name assignment

3.2.7.1. Purpose

The purpose of the Organization-name attribute is to allow each ATSO to split, if needed, the AMHS Management Domain (MD) for which it is responsible in distinct geographical areas.

Within a given AMHS Management Domain (identified by the "C", "A" and "P" attributes) two potential AMHS network architectures are possible:

a) Centralised architecture, with one single ATS message server; and

b) Geographically distributed architecture, with several regional ATS message servers.

It is to be noted that architectural aspects and addressing aspects are not completely linked together; in effect the agreed addressing scheme does not place any constraints on the AMHS network deployment plan.

3.2.7.2. Assignment rules

Before assigning a value to the Organisation-name attribute, each ATSO
Should follow the following 3-step process:

1) Develop the general architecture of the AMHS to be implemented;

2) Define the location and the number of sites at which ATS Message Server could be installed within a foreseeable time frame (e.g. 5, 10 or 15 years); and

3) Chose and assign a name to each one of these sites.

A specific case is the situation where a single ATS Message Server is implemented in an AMHS MD, providing services to AMHS users that are all directly attached to this server (centralized architecture). For simplification, it was suggested that a single organization name (O) value be allocated to all location indicators in the AMHS MD.

Potential criteria for the selection of sites include:

- Geographic divisions, such as: North, South, East, West, etc.;

- Administrative divisions of the concerned ATSO, such as ATS, Meteorological, etc.;

- Operational divisions centred around the ACCs (if more than one ACCs exist);

- Operational divisions centred around the main airports;
- Mapping of the AMHS architecture on the existing AFTN / architecture;
- A mixture of the above criteria; and
- Other.

Note. – Care should be taken not to define too many geographical areas within a given AMHS MD as this may lead to less efficient message routing.

When assigning a value to the Organisation-name attribute, the following rules should be considered:

1. It should be as short as possible;
2. It should only comprise standard characters, i.e. no accented letters or letters only used in specific geographical areas;
3. The use of figures is not advisable.

Note. – An ATSO should define different values for the Organization-name attribute only if it plans to implement a distributed AMHS architecture in the short, medium or long term future. ATSOs not planning to implement a distributed AMHS architecture should allocate a single value for this attribute.

3.2.7.3. Registration

Once assigned by the concerned ATSO, the Organization-name values shall be registered and published by ICAO, as described in paragraph 3.2.8.3.

Note. – ICAO being the registration authority for AMHS addresses, there is no requirement to register the Organization-name value(s) with a national authority.

3.2.8. Address conversion

3.2.8.1. Addressing Plans requirements

The selected address conversion strategy must take into account the following principles:

- The selected address conversion solution shall be able to support any X.400 addressing plan making use of any address form.
- The AFTN address of an AFTN or AMHS user is unambiguous, internationally recognized and shall not be replaced by another value.

The addresses to be considered are: AFTN, XF-form, CAAS and MF (non- CAAS). It can be concluded that:

- All Asia and the Pacific AFTN/AMHS gateways shall implement the conversions AFTN<=>XF;
- All Asia and the Pacific AFTN/AMHS gateways shall implement the conversions AFTN<=>ATSOs;

- All Asia and the Pacific ATSOs gateways should implement the conversions AFTN<=>ATSOs, together with an ATSOs address space within their remit (SARPs recommendation);

- To deal with the arrival of spurious XF addresses at Asia and the Pacific ATSOs MDs from the global AMHS, the redirection XF=> ATSOs could be supported by all ATSOs;

- If an ATSO defined an MF (non-ATSO) address space, then all gateways would have to support the conversion AFTN<=> MF (non-ATSO). This is an undesirable alternative since a global and common CAAS has been recommended by ICAO.

3.2.8.2. Address Conversion Scenarios and Criteria

The identified scenarios are the following: single conversion, AMHS transit conversion, AFTN transit conversion and multiple transit conversion.

Once the scenarios have been established, the following considerations for the address conversion have to be performed:

- The result of the address conversion performed in an AFTN/AMHS gateway shall depend only on the pre-defined pair of unambiguously associated AFTN and AMHS addresses, and not on the gateway itself, according to the form published by ICAO and defined by the delivering MD.

- It is recommended that each gateway performing address conversion should have access to the minimal necessary information to perform mappings between AFTN addresses and AMHS addresses and vice-versa. The complete mappings between AFTN addresses and their AMHS equivalents should be published (in electronic form) and made available to all gateways that support address translations.

- The conversion process shall be easy to use and manage, and efficient.

As a conclusion, a compromise solution combining the use of algorithmic tables and X.500 directory is preferred for the address conversion.

3.2.8.3. General model for address distribution and gateway address conversion

A model of address distribution and gateway address conversion is depicted in Figure 1 below. The figure represents information exchanges between ICAO and three ATSOs implementing AMHS Gateways, concerning address conversion. ATSO1 and ATSO2 implement a distributed address publishing service (APS), e.g. by means of ATN X.500 Directory Services. This allows electronic distribution. ATSO3 provides this information to ICAO for manual collation and distribution (e.g. on paper, electronic database), and does not support a directory.

The dotted arrows represent exchanges that are performed in a non-electronic way, e.g. through "paper" procedural exchanges. The full arrows represent exchanges that are performed electronically using appropriate communication protocols.

The model identifies a number of components that are necessary for address conversion:

(1) Collection and distribution of the basic addressing information that establishes equivalence between the different addresses identifying each MHS/AFTN/X.25

user; the content of this information **must** be standardised and made available to all AMHS/AFTN/X.25 Gateways;

(2) Access to, and/or import of the basic addressing information into AFTN/AMHS gateways. This depends on the particular gateway implementation;

(3) Re-structuring the basic addressing information into a format suitable for use by each gateway's internal address conversion procedures (AMI). This is again Gateway implementation specific;

(4) The internal procedures and data structures of the gateway (AMP and AMT) that make use of the re-structured addressing information. This is gateway implementation specific.

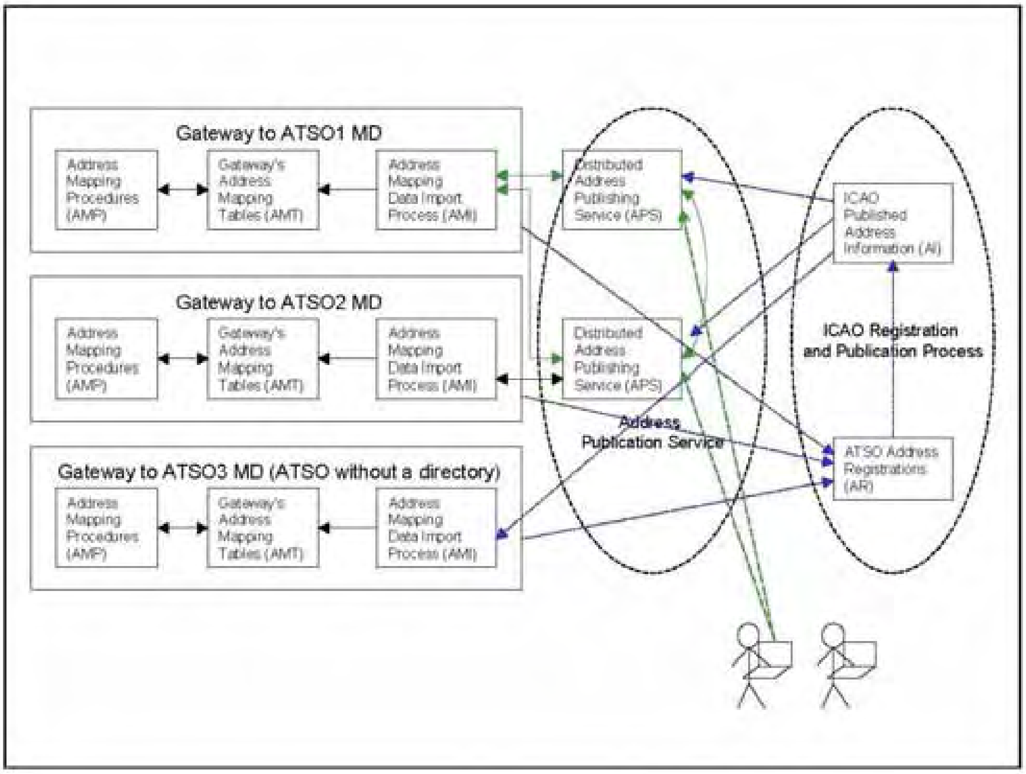


Figure 1: General model for gateway address conversion

The address mapping information content held in AMT and distributed through APS is identical in nature.

The structure of APS must be compatible with many different systems (e.g Different ATSO's Gateways), and must therefore be standardised. There are a number of possibilities for structuring APS:

- As an X.500 Directory Information Tree, thereby enabling implementation of a Distributed APS;

- By some other electronic means (e.g. CSV files);

- On paper.

3.2.8.4. The impact of different paths through the AFTN and AMHS

There is also a potential need for messages to undergo multiple address conversions. In order to minimise message rejection and to regulate the responsibilities for conversions, the following rules should apply:

- Originating MDs (for originator's addresses) shall generate addresses according to the form published by ICAO and defined by the delivering MD (for recipient addresses);

- Delivering MDs shall be authorized to reject messages received with recipient addresses which do not comply with the address form published by ICAO and defined by the delivering MD.

- Delivering MDs should have the capability of redirecting potential internal XF addresses to the corresponding MF(S) form addresses for use within their delivering MD, for a transition period of at least 6 months after publication of the appropriate ICAO documentation.

- Transit domains should not attempt to perform any AMHS <-> AMHS Mapping unless a specific bilateral agreement has been established with the delivering MD (for recipient's addresses) or the originating MD (for originator addresses). Transit MD should only use the attributes C, A, P (which are invariant and predetermined for all AMHS address forms in the ATS) in selecting a message route.

3.2.8.5. Recommended AMHS Address Conversion Strategy

The recommended AMHS address conversion strategy is the means by which the general model represented in Figure 2 should be realized by States in the Asia and the Pacific Region. It is also applicable on a worldwide basis and has been presented and adopted by the ICAO ATNP as the general AMHS address conversion strategy[1]. This strategy is made of the following elements:

a) the establishment, by an appropriate ICAO body or entity, of an ICAO Registration and Publication process as a set of procedures for collecting and publishing AMHS address conversion information on a periodic basis (e.g. twice yearly). This will include:

    i) the MD information included in the ICAO Registry of AMHS Management Domains, i.e. the MD identifier and the corresponding ICAO State/territory two letter identifier, together with the specification of the type of implemented addressing scheme.

    ii) for those MDs having implemented the ATSOs, the mapping information providing the organization-name address attribute for each ICAO location indicator;

b) A Distributed Address Publishing Service (APS), based on ATN Directory Services, that allows publication of real-time AMHS address conversion information. This is to

[1] This will result in the corresponding guidance material being included in Edition 2 of ICAO Document 9739 (Comprehensive ATN Manual).

be implemented at the earliest opportunity upon ATSOs initiative, with the following principles:

i) use of the directory scheme;

ii) initial population of the Directory Information Base with the information distributed through the ICAO Registration and Publication process;

iii) implementation of a single Directory System Agent (DSA) per ATSO to hold the MD Registry sub-tree, the world-wide ATSO information distributed through the ICAO Registration and Publication process, and the local AMHS MD address conversion information sub-tree; and

c) in co-existence with the use of Address Mapping Tables (AMT) directly derived from the information published through the ICAO Registration and Publication process, for ATSOs that choose to defer the implementation of ATN Directory Services.

As a local implementation matter, ATSOs that envisage implementation of Directory Services for the purpose of the Distributed address publication service (APS) at the same time as they implement AMHS, should also consider the use of directory solutions as a technical option for the gateway's Address Mapping Tables (AMT).

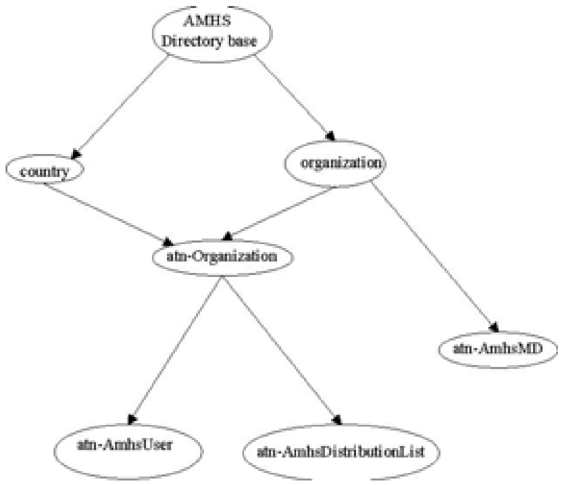


Figure 2: DIT structure for AMHS address conversion

3.2.8.6. Regional provisions

The strategy above is complemented by the following transitional provisions which may apply regionally.

In case the first element in the above strategy is not implemented by ICAO in a timeframe compatible with early AMHS implementations, an equivalent process may be set up on an ad-hoc basis among ATSOs forming an AMHS island. This is particularly applicable to any countries ATSOs being early AMHS implementers.

In case of ATSOs implementing the second element in the above strategy that initially prefer to group together for the implementation of a single ICAO Regional DSA, the following should apply:

- the MD Registry sub-tree,

- a local AMHS MD ATSOs information sub-tree for each of the ATSOs in the group; and

- the world-wide ATSOs information distributed through the ICAO Registration and Publication process.

The Regional DSA thereby becomes an aggregation of the local DSAs envisaged in the principle strategy.

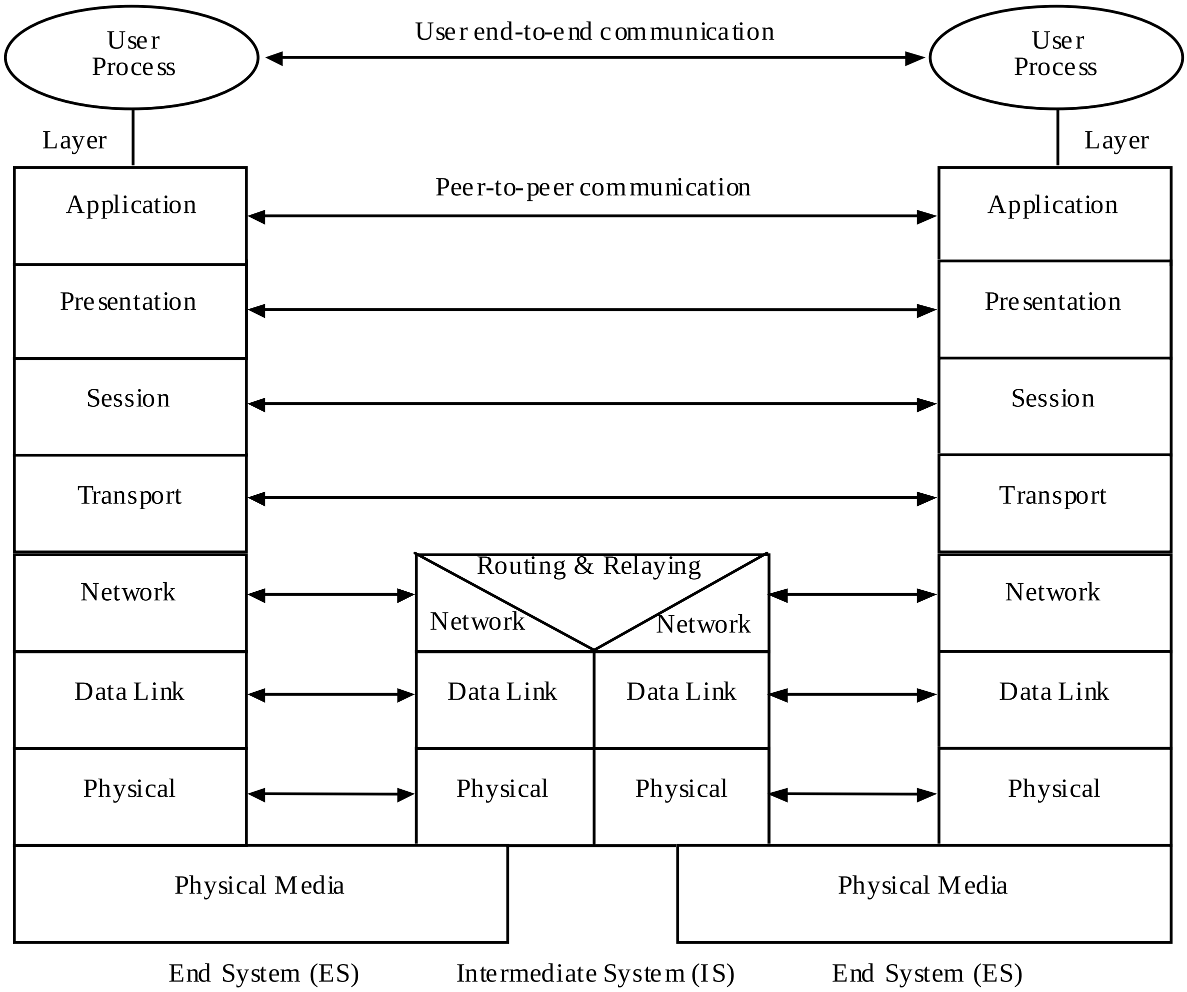
In the Asia and the Pacific Region, the creation of an Offline Management Centre is recommended to consolidate, co-ordinate and distribute AMHS user address changes across the Region. This Offline Management Centre should implement such a Regional DSA in support of its address management activities.

3.3. AMHS router topology

3.3.1. OSI Model for ATN Router

This section addresses the lower three layers of the OSI seven-layer model for the ATN Ground-Ground (G/G) routers in the Asia/Pacific regional ATN network. The three layers are Network, Data Link and Physical layer.

The ATN uses the ISO/IEC8473 Connectionless Network Protocol (CLNP) as the network protocol. Data are transferred in the CLNP Protocol Data Units (PDUs) over sub-networks such as ISO/IEC 8802 Local Area Network (LAN) and ISO/IEC 8208 (“X.25”) point-to-point connections or packet switched networks. ATN routers bridge these sun-networks together to form an integrated ATN network, relaying data packets between LAN and WAN, and WAN and WAN.



Open System Interconnection reference model

a. Network Layer

The network layer includes three sub-layers:

Sub-network Independent Function (SNICF)

The SNICF **shall** include the following routing and routed protocol:
1. ISO/IEC 10747 — the Inter-Domain Routing Protocol (IDRP); and
2. ISO/IEC 8473-1 — the Connectionless Network Protocol (CLNP).

The SNICF may support the following two optional routing protocols:
1. ISO/IEC 9542 — the End-System to Intermediate-System (ES-IS) protocol; and
2. ISO/IEC 10589 — the Intermediate-System to Intermediate-System (IS-IS) Intra-domain routing information exchange protocol.

Sub-network Dependent Convergence Function (SNDCF)

The proper SNDCF **shall** be implemented for underlying sub-network(s). The most commonly implemented SNDCFs are the following:

1. ISO/IEC 8473-2 — Sub-network Dependent Convergence Function (SNDCF) for Local Area Network (LAN); and
2. ISO/IEC 8473-3 — Sub-network Dependent Convergence Function (SNDCF) for X.25 network.

Sub-network Sub-layer

The sub-network sub-layer is determined by the underlying sub-network. When the data are communicated over X.25 sub-network, the sub-network **shall** include X.25 Packet Layer Protocol (PLP) as specified in ISO/IEC 8208.

b. Data Link Layer

The ATN G/G router Data Link Layer for use within States is a local matter and could be X.25, LAN, etc.

The Data Link Layer used between States is subject to bilateral agreement. To ensure regional interoperability, however, the data link layer requirements for ATN routers that connect to the Asia/Pacific ATN regional network are specified in the Asia/Pacific regional ATN router ICD.

c. Physical Layer

The ATN G/G router Physical Layer is a local or bilateral matter and could use the Physical Layer of X.25, LAN, etc.

3.3.2. Routing and Routed Protocols

Class 4 routers support dynamic routing using the following routing protocols:

1) End system to Intermediate System (ES-IS) routing protocol;

According to ICAO Doc 9705, the ES-IS routing protocol is an optional protocol for ATN G/G routers. However, if ES-IS is supported, it is recommended that to ensure interoperability with End Systems, ATN G/G routers **should** comply with the requirements of ISO/IEC 9542 (ES-IS).

2) Intermediate System to Intermediate System (IS-IS) routing protocol; and

According to ICAO Doc 9705, the IS-IS routing protocol is an optional protocol for ATN G/G routers. However, if IS-IS is supported, it is recommended that to ensure interoperability with IS routers. ATN G/G routers **should** comply with the requirements of ISO/IEC 10589 (IS-IS).

3) Inter-domain Routing Protocol (IDRP).

The ATN G/G router **shall** comply with the requirements in ISO/IEC 10747 (IDRP), section 5.8.3 of ICAO Doc 9705, and the IDRP APRLs specified in the Asia/Pacific regional Ground/Ground router ICD.

4) Connectionless Network Protocol (CLNP)

The ATN G/G router **shall** comply with the requirements in ISO/IEC 8374-1, sections 5.6.2 and 5.6.3 of ICAO Doc 9705, and the CLNP APRLs specified in the Asia/Pacific regional Ground/Ground router ICD.

4. AMHS Protocol Scenarios

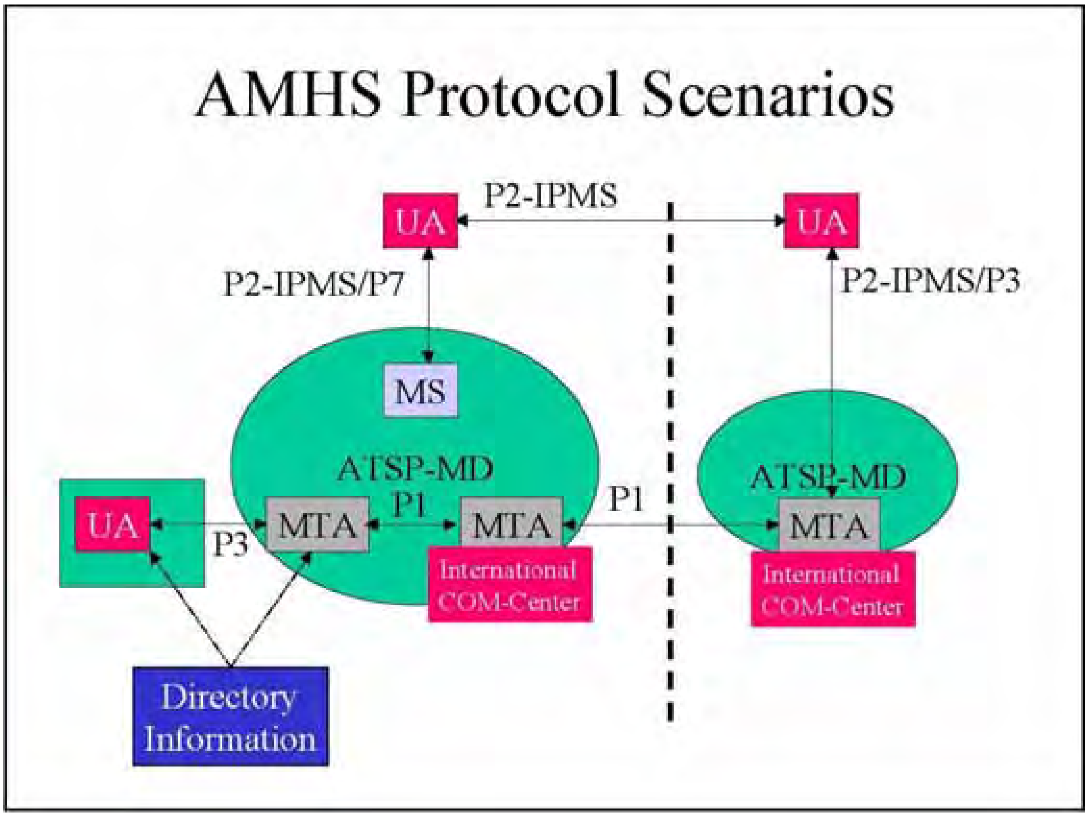


Figure 3: AMHS Systems and interconnecting Protocols

4.1 Applicable Profile

The Profile applies to the following AMHS system components:

a) UA - User Agents

b) MTA - Message Transfer Agents

c) MS - Message Stores

The Profile applies to the following AMHS protocols:

a) P1 - Message Transfer

b) P2 - IPM Content

c) P3 - Message Submission/Delivery

d) P7 - Message Retrieval

The Profile specifies a profile of ATS Message Handling Service conformance called the Asia and the Pacific-AMHS Profile. It is based on the requirements of following:

a) The Basic ATS Message Handling Service (Bas), introduced in the Doc. 9705 Ed. 3, para. 3.1.1 Note 2;

b) A number of further Functional Groups and options selected from the Extended ATS Message Handling Service (Ext), introduced in the Doc. 9705 Ed.3, para 3.1.1 Note 2;

The resulting scope is sufficient to ensure inter-State message interchange using AMHS according to the Basic AMHS requirements stated in Doc. 9705, which covers Basic Message Transfer Capabilities, Distribution Lists, appropriate message size capability and Legal Recording.

Security requirements are not a mandatory part of the Asia and the Pacific-ATSMHS Profile. However, the Profile mandates IP address validation and the protocol includes system identification following transport connection establishment. It must be pointed out that certain Messaging Application Security functions are also mandated in the MHS.

6.1 Use of the Directory

Use of Directory is not mandated in the Profile due to the following reasons:

- There are other ways to implement the distribution of the necessary directory information which are viable at least in the early phases of AMHS implementation;

- Some States will not implement the directory (nor access it) in the first Implementation of AMHS. Some of the reasons for this are that they want to implement AMHS first before taking the next step to the Directory. Also, some currently available AMHS products do not support access to the Directory;

- Some States foresee that Directory Access as specified in Doc. 9705 using X.500 DAP is too costly in terms of software purchase, and they would like to be able to use LDAP (a more cost effective RFC-based equivalent). However, there are no currently available LDAP schema standards covering some of the ATN Directory-specific requirements (and some aspects of X.400 support). There are also no suitable standard LDAP products available;

- In some cases, it is not quite clear what elements of the ATN-Directory Schema are required to support different AMHS functions (e.g. in terms of directory information). These issues need to be resolved by further guidance material on the use of the ATN/AMHS Directory by the ACP. Currently, work is ongoing to fulfill this requirement.

5 System implementation -Guidelines for system requirements

5.1. Introduction

5.1.1. This section is intended to deal with technical and operational requirements for a COM system replacing the AFTN/X.25 system by an AMHS or adding the ATSMHS capability. As indicated by its title, this section covers guidelines for requirements not specified in the AMHS SARPs, but considered by the Group important enough for being included in a Call For Tender for the procurement of an AMHS system.

5.1.2. The main input of this section was a subset of the specifications of an actual Call For Tender issued by one of the Group members, adapted and modified in order to have a 'template' able to be used by any ATSO who intends to procure an AMHS system.

5.1.3. The section covers technical and operational requirements like:

- General facilities
- Addressing - mapping table facilities
- Queue management facilities
- Message repetition facilities
- Tracing facilities
- Sizing
- Availability and reliability

5.1.4. For such a COM system in the following paragraphs the term "**AMHS System**" will be used.

5.1.5. Due to the character of this section (as guidelines for system requirements) the Term "**should**" is used. In a specific Call For Tender this term can be replaced by shall.

5.2. General requirements

5.2.1. The AMHS System should implement the ATSMHS and AFTN/AMHS Gateway facilities in accordance to the specifications defined in the latest approved ATN SARPs for Basic Services, but supporting AFTN messages with a message length up to 64 Kbytes.

Note. – This requirement is not covered by the SARPs, which mandate support of Standard AFTN message length only.

5.2.2. The AMHS System should support several simultaneous associations with an MTA partner (at least, up to 5).

5.2.3. The AMHS System should support simultaneous associations with several MTA partners (one or several associations with each MTA partner) with the same or different “transport” protocols (e.g. TCP/IP to be used within EUR, ATN between ICAO Regions).

5.2.4. The AMHS System should support the total number of simultaneous Associations (sum of all associations) without any restrictions caused by inherent limitations of the system (memory, interfaces, etc).

5.2.5. The AMHS System should allow control of establishment of associations with MTA partners via on-line operator commands; i.e., it should be able to:

- Prevent/allow the establishment of associations with a given MTA partner by AMHS System (local MTA), by MTA partner only or by both partners.
- Prevent/allow the establishment of associations with all configured MTA partners by AMHS System (local MTA), by all MTA partners only or by all partners.
- Force the termination of associations already established with a given MTA partner.
- Force the termination of associations already established with all configured MTA partners.

Note. – The number of actual simultaneous associations to be supported will depend on:

- *the target 'logical' AMHS network topology: for example each centre establishes direct associations with all the other centres or each centres establishes associations with adjacent centres only (as in AFTN);*
- *whether permanent or dynamic connections will be established. Such distinction is only applicable in case there is no requirement for continuous traffic exchange.*

5.2.6. The AMHS System should implement MTA queues. These queues will keep the AMHS messages that:

a) either are pending to be sent; or

b) have been transmitted but for which a delivery report is expected.

Note 1. – The queue referred to in ” item a” should be implemented in the MTA.

Note 2. – The queue of messages for which a DR is expected should be implemented in the User Agents and MTCUs of the AFTN/AMHS gateways. The reaction of an AMHS System in case of loss of a DR should be fixed (implementation matter): E.g., would it have to resend the message after timeout? How many attempts to resend the message should be made? A DR or NDR is addressed to the originator of the message, therefore it should be left to the originator to react upon non-arrival of a DR as it is his task to react upon reception of a NDR. If the originator is an indirect (AFTN) user, the AFTN/AMHS gateway has to perform this task on his behalf. Furthermore, a report may take another route than the message it refers to, that means it does not necessarily pass through the same MTAs as the original message.

5.2.7. There should be a logical MTA queue per configured MTA partner. Management of these queues is specified in section 5.4).

5.2.8. The configuration of an MTA partner (via on-line commands) should provide flexibility for each of its parameters. For example:

a) It should be possible to configure the “transport” protocol (e.g. ATN, TCP/IP, TP0/X.25, TP4/X.25) to be used per each MTA partner.

b) In case of selection of TP4/X.25, it should be allowed to configure at least two local X.25 attachments to be used for the connections, several calling – called addresses to be used for initiating a call or acceptance of an incoming call, etc.

c) It should be possible to configure the maximum number of simultaneous associations with each MTA partner.

d) It should be possible to configure whether the associations have to be left permanently established or whether they have to be established and closed depending on traffic.

5.2.9. The AMHS System should allow configuration of all profile items if possible.

5.2.10. The AMHS System should allow configuration of the following profile items, at least:

a) Mapping between AFTN priorities and AMHS Message Transfer Envelope priorities.

b) Values of “rn” and “rnr” in the notification-requests element in the recipient fields in the IPM heading. These values should depend on the value of the AFTN priority.

Note 1. – Both functions should be implemented in the UAs and MTCUs of the AFTN/AMHS gateway since the MTA does not deal with the ATS Message Priority (or AFTN priority) which is contained in the ATS Message Header as part of the IPM body.

Note 2. – The SARPs specify the values of these profile items. It is considered that the implementation should allow the possibility to change them just by configuration in case operational experience recommended other settings. The processing is implementation matter.

5.3. Addressing – mapping tables requirements

5.3.1. The AMHS System should support the CAAS (see section 3.2)

5.3.2. The AMHS System should process and manage AMHS messages received with the O/R name in the XF Addressing Scheme also, even if the ATSO has chosen the CAAS for its internal users.

5.3.3. The AMHS System should provide mechanisms to import mapping tables needed in the AFTN/AMHS Gateway. The tables to be imported will be downloadable from the AMC system.

5.3.4. The implemented facilities in the AFTN/AMHS Gateway which map an AFTN address to an O/R name should be flexible enough to accommodate different O/R structures (Addressing Schemes) and use the minimum number of configuration / lookup tables with the minimum number of entries. As an example for the implementation of the mapping of an AFTN address to an O/R name, the following information should be entered in configuration tables:

i) Attributes and associated values that are fixed for each State. E.g. in the case of States using the address scheme described in section 3.2 the attributes and associated values to be entered should be Country, ADMD and PRMD. Each entry will be indexed by the ICAO routing area or State/territory identifying letters (1 or 2 first characters of the AFTN address).

ii) Attributes whose values can be determined directly from the AFTN address. e.g. in the case of States using the CAAS described in section 3.2, the Organization Unit 1 attribute (first to fourth characters in the AFTN address) and the Common Name (all characters in the AFTN address) should be declared here for them.

iii) Attributes whose values depend on a mapping table. For each such attribute for each State, the following should be specified: the name of the mapping table and the subset of the AFTN address (e.g. one to four first characters, the complete AFTN address, wild characters could be used to define the subset...) that gives the index to the mapping table. The mapping table itself should also be provided. E.g. in the case of countries using the CAAS address scheme described in section 3.2.4.2, the value for the Organization attribute should be defined this way.

5.3.5. The possibility to use a directory should also be contemplated, even if this is not part of the Basic Services.

5.4. Queue management requirements

5.4.1. The AMHS System should provide, in addition to a pure diversion facility of outgoing queues, a reprocessing of messages in X.400 (outgoing) queues in case of longer outages of adjacent MTAs (non-reachability).

Note. – Such reprocessing facilities will be very important during the time period when both AMHS and AFTN/X.25 centres coexist in the Asia Region.

5.4.2. Two types of reprocessing should be envisaged at:

a) the pure X.400 level

b) the AFTN level (in the case of AFTN/AMHS Gateways)

5.4.3. Reprocessing at the pure X.400 level

5.4.3.1. The reprocessing at pure X.400 level should allow :

a) To extract messages waiting in an X.400 queue from this queue,

b) To process these messages again by the X.400 routing software and

c) To route according to possible new or temporarily modified X.400 routing tables.

5.4.3.2. Such a mechanism would allow to extract the messages from the queue associated to a non reachable MTA. The messages could be routed through another centre (MTA) and forwarded through the alternate route only for those recipient addresses for which alternate routes have been activated. For all other recipients addresses the messages remain in the queue. This prevents a general forwarding of messages to an other centre (MTA) with recipient addresses not intended to reroute.

5.4.3.3. The reprocessing at the pure X.400 level should be present in the ATS Message Servers, in AFTN/AMHS Gateways and (in the future) in X.25/AMHS Gateways.

5.4.4. Reprocessing at the AFTN level

5.4.4.1. The reprocessing at AFTN level should allow:

a) To extract messages waiting in an X.400 queue,

b) To re-process them by the AFTN layer, and

c) To route them according to the current AFTN, X.25 and X.400 routing tables respecting the updated route availability information (predefined alternate routing).

This reprocessing would solve the problem of non-reachability due to outages, in a heterogeneous AFTN/ X.25/AMHS environment.

5.4.4.2. An X.400 queue can contain messages, reports and probes. The AFTN Reprocessing function should only concern the messages. These messages can be of different 'types,
e.g. i) messages from AFTN/AMHS gateways,
ii) messages from X.25-OPMET/AMHS gateways,
iii) 'pure' UA to UA exchanges, etc.

All these messages will be IPM messages, so there is no way to distinguish them at the X.400 (envelope) protocol level.

5.4.4.3. The reprocessing should be restricted to messages generated by an AFTN/AMHS gateway.

5.5. Message repetition requirements

5.5.1. The AMHS System should provide powerful message repetition facilities in the AFTN, X.25 and AMHS subsystems implementation.

5.5.2. The repetition facilities should be able to repeat messages as they were originally transmitted i.e. sent to all recipients following the same transmission paths.

5.5.3. Additionally, the repetition facilities should be able to specify (with the use of wildcards) 'detailed' or 'generic' destinations. Such destinations can be an AFTN address, an O/R name, all AFTN addresses mapped to a given Ax, all O/R names of a given PRMD, etc.

5.5.4. The AMHS System should find all the messages that were transmitted to such specified 'generic' destinations within a specified time interval and retransmit them only to pending destinations and following the current routing. To avoid a transmission to other destinations originally contained in the message the addresses not matched by the 'generic' destination should be suppressed (address stripping).

5.6 Tracing facilities requirements

5.6.1 The AMHS System should provide a facility to allow generation of X.400 probes.

5.6.2 The user interface of the facility should allow entering of the priority, the O/R name of the originator / destinations and the message length.

5.6.3 The AMHS System should send the reports regarding the probes (delivery, non-delivery) to a configurable instance (e.g. the rejection queue).

Note. – This requirement relates to a user interface requirement. The user should get some notification when the delivery report related to the probe has been received. It is an implementation matter to decide whether this is performed just by allocating a fixed originator O/R name to one of the queues of the system or by another way.

The contents of such reports should be decoded and presented in a 'human' readable and understandable format.

5.6.4 The AMHS System should provide association-tracing facilities to monitor in real time the establishment, interruption and finalization of associations related to adjacent MTAs.

5.7 Sizing requirements

The sizing of the AMHS System operational platform should support the traffic during peak hour situations with:

a) Average peak hour total CPU usage at 30% maximum.

b) Communication adapters loaded at a maximum 30% of their real bandwidth capacity (not the theoretical one) and excluding the redundancy needs.

Note. – The previous values have to be reconsidered by each ATSO depending on the expected lifetime of the AMHS System. As e.g., if the lifetime is expected to be 10 years and the traffic estimates for the peak hour relate to the end of the lifetime, the usage requirements for the CPU and the communication adapters should be greater than 30% (if not, the purchased system will be oversized during quite a number of years)

c) Processing time of a message (High QoS flow type class, see section 3.1) at least less than 1.5 seconds. The processing time is defined as the difference between the moment the latest character of the message enters into the AMHS System and the moment the first character of the message is sent out. This applies for all implemented in / out protocol combinations. For messages of other flow types, the processing time should be less than 3 seconds.

Note. – This value, especially for AMHS, has significant implications in the platform sizing and total network transit time if the value is too low, a very powerful platform isrequired; If the value is too high, it could introduce a significant delay in the overall message transmission (specially if the other centres also have high values).

d) Response time to configuration / management on-line commands less than 3 seconds. This response time is related to requests from a management position for actions which do not require a query / browsing of a log (e.g. closing a PVC, create an Ax, etc).

e) At least sufficient disk space remaining available after:

1. all the standard and specific developed software versions (including the possibility of more than one software versions and two configurations per version) are present on disk,

2. all logs and archive folders corresponding to the number of days to be kept on-line in the system are present on disk.

Note.1 – The precise number of days will depend on the particular policy of each ATSO to comply with the ICAO Legal Requirements

If its policy indicates that all the data has to be kept on the AMHS System, the system should support at least 30 days. If the policy indicates that the data are saved for such purpose somewhere else (e.g. in another system, in an external media like CD-ROM, DAT, cartridge, etc), data concerning fewer days needs to be kept on-line (e.g. three days, one week, etc.).

Note.2 – As for the CPU and communication adapter usage, the value for disk Space shall be reconsidered by each ATSO depending on the expected lifetime of the AMHS System and the traffic estimates related to.

5.8 Availability and reliability requirements

5.8.1 The AMHS System should operate 24 hours per day and 365 days per year.

Note. – The values provided below should be considered as 'minimum' requirements. Each ATSO should reconsider them according to its own policy and internal SLAs with its internal users.

5.8.2 Interruptions for system maintenance and installation should be limited to the Strict minimum and should be less than 60 minutes.

5.8.3 After power is switched on, the AMHS System should be fully operational after a maximum of 15 minutes.

5.8.4 The AMHS System should auto monitor:

- the state of its application processes.
- the state of its system processes.
- the state of its system components (hardware).

5.8.5 The AMHS System should generate an SNMP MIB of the states monitored (see above).

5.8.6 The AMHS System should automatically try to recover from failure conditions in its application processes. If it is not possible to recover without impacting the service, the AMHS System should terminate all its application processes in an orderly manner and restart them afterwards automatically.

5.8.7 The AMHS System should allow an operator to:

a) Stop the AMHS application gracefully (with automatic restart).

b) Stop the AMHS application gracefully (with no automatic restart).

c) Force the AMHS application to stop (with no automatic restart).

d) Start the AMHS application with message recovery (messages that were in queue when the system was stopped are processed and forwarded).

e) Start the AMHS application without message recovery (messages that were in queue when the system was stopped are discarded).

5.8.8 The AMHS System should lose no message that has been acknowledged by it (according to the respective messaging protocol), unless an operator explicitly requests to drop the messages.

5.8.9 The AMHS System should lose no message because of its load.

5.8.10 In case of a switchover (cluster, master/standby) configuration the following requirements apply:

a) After detection of failure of the primary system unit or after an operator command, the switchover process should last less than five minutes. The duration of the switchover is counted as the time from the failure detection (or operator command) until the time the AMHS restarts forwarding messages again (assuming there are messages in queue or there are new incoming messages).

b) The time needed for the standby unit to detect failure of the primary one should be less than three minutes.

c) The switchover process should be completely automatically without requiring any plugging / unplugging of any type of cables (communications, disks ...). A matrix switch action (if a matrix switch is proposed) is not considered as a cable plug / unplug.

5.8.11 Any period of time longer than one minute, during which the AMHS System does not perform message switching (in a total or partial manner) due to software or hardware problems, should be considered as an interruption of service.

5.8.12 An interruption of service of a AMHS System should be less than 10 minutes when the recovery is automatic. The duration of an interruption is calculated as the time from the moment the last received message was forwarded until the moment the AMHS System starts forwarding messages again (assuming there are messages in queue or there are new incoming messages).

5.8.13 There should be no more than one interruption of service without automatic recovery in a sliding window of six months.

5.8.14 There should be no more than one interruption of service with automatic recovery per day.

5.8.15 There should be no more than two interruptions of service with automatic recovery per month.

5.8.16 There should be no more than three interruptions of service with automatic recovery in a sliding window of three months.

5.8.17 The MTBF of the AMHS System hardware should be higher than 52 weeks.

6 Requirements for statistics

The AMHS System should monitor and produce statistics per direct MTA partner as follows:

a) Number of data messages transmitted
b) Average size of the data messages transmitted
c) Maximum size of the data messages transmitted
d) Average number of destination addresses per message transmitted
e) Number of data messages received
f) Average size of the data messages received
g) Maximum size of the data messages received
h) Average transfer time
i) Number of delivery reports transmitted
j) Number of non-delivery reports transmitted
k) Number of delivery reports received
l) Number of non-delivery reports received
m) Minimum size of data messages received
n) Minimum size of data messages transmitted
o) Maximum, mean and minimum response time
p) Number of recipients processed
q) Number of messages deferred (the criterion for a deferred message should be specified by a configurable system parameter)
r) Number of messages redirected
s) Number of messages rejected
t) Number of loops detected

Additionally the AMHS System should produce the information specified in

The AMHS System should be able to generate the above statistics in at least the following intervals: 1 day interval, 1 hour interval, 30 minutes interval or better.

The AMHS System should be flexible in configuring other intervals for application statistics generation.

The AMHS System should be flexible in generating statistics at a more detailed level, as e.g., MTA route entries, particular O/R attributes, individual O/R names (to be discussed).

Note. – Each ATSO shall consider what requirements on statistics are put on the AMHS System in accordance with its requirements (national and international) and its policy for statistics production. E.g., there can be ATSOs which transfer the traffic logs to another system which will produce all required statistics; in such a case, the AMHS System should be the Asia and the Pacific AMHS Manual ICAO AFSG PG relieved of too many statistics requirements. If an ATSO does not have such other system, the AMHS System shall produce all statistics needed

The AMHS System should be able to export a specific monthly statistic file. Such a statistic file should contain daily as well as peak hour statistical data in a standard format. Detailed specifications are provided in the ATS Messaging Management Manual.

7 Tests and validation of AMHS systems

7.1 Objective

Experience has shown that, although it is claimed that systems have been implemented according to the one set of protocol specifications, they are often not capable of inter-working. This is due to errors in implementation or to different interpretations of the specifications (SARPs). Testing and validation of systems according to the same set of principles, aims at the detection of such errors and the prevention of incompatibility instances.

The primary objective of this chapter is to formulate recommendations for testing the ability of a given AMHS implementation to function as required at the level of an International Communication Centre within the AFTN/ X.25/AMHS network environment.

This chapter provides general information on the AMHS testing concept. The actual testing methodologies, configurations and procedures are defined in Annex B and Annex C. In these Annexes, tests are described in sufficient detail to give an appreciation of the variety of functions that are covered, the facilities required and the expected results.

7.2 General Principles

The creation of standards for testing is subject to consideration by a number of standardization bodies concerned with open systems (e.g. ISO, ITU-T).

In these standards, *conformance testing* is prescribed for testing a protocol implementation (IUT) with respect to its specification.

If conformance testing could be done in a complete and correct manner then two different implementations that passed the conformance test would be interoperable. In practice, conformance testing does not necessarily reach the intended point of completeness and correctness. Consequently, conformance testing may be followed by *interoperability testing* to determine whether two or more implementations will produce the expected behaviour under actual operating conditions.

In a more detailed analysis of the objectives of conformance and interoperability testing the following distinctions can be made:

a) The primary objective of interoperability testing is to confirm the end-to-end interoperability of two systems, which have both been developed to a common specification. Performance and load testing are possible, at least in principle.

b) Conformance testing can be defined as the exhaustive testing of an IUT against the functions and procedures defined in an agreed standard. Performance and load testing are not usually part of conformance testing which is restricted to the "logic" of the protocol implementation.

Furthermore, two essential practical differences between conformance and interoperability testing should be pointed out:

a) Incorrect protocol behavior. – Conformance testing allows "provoking"of the IUT, through incorrect protocol behavior, in order to study its stability. Interoperability testing provides only limited possibilities due to (normally) correct protocol implementations in real systems.

b) Distribution of test locations. – Conformance testing can be performed locally between IUT and a conformance testing equipment. Interoperability testing is normally distributed over at least two remote locations, therefore requiring more coordination effort.

Figure 4, below depicts the principal differences in test arrangements for interoperability and conformance testing.

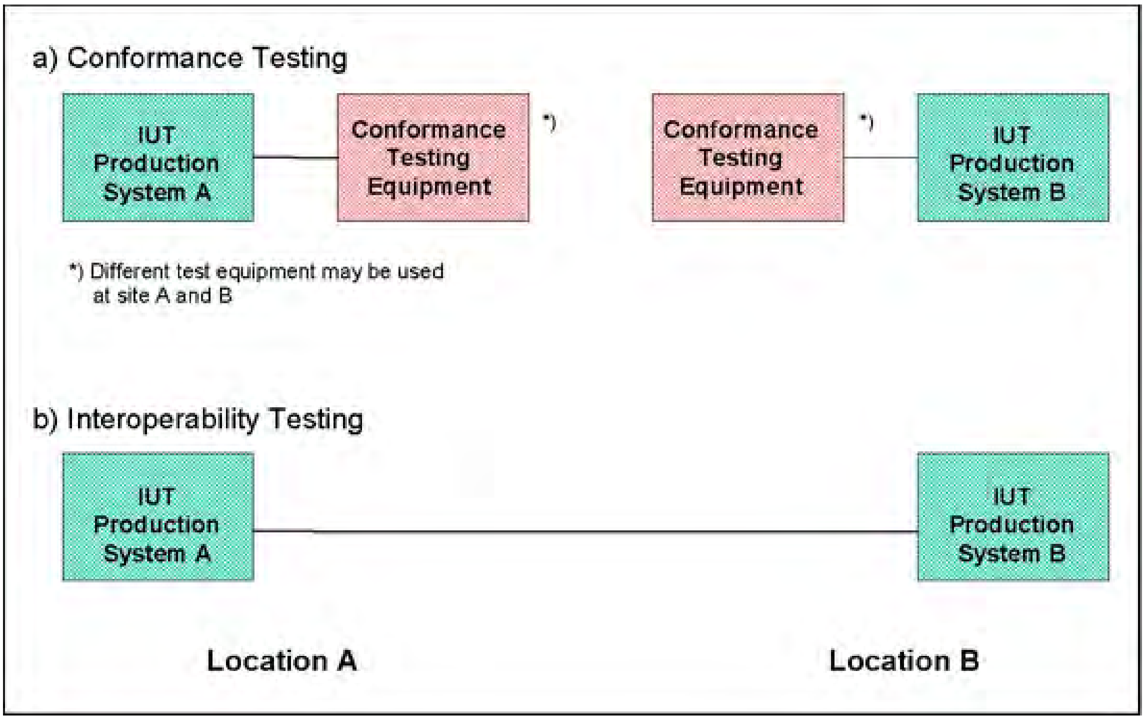


Figure 4: Principal test arrangements for conformance and interoperability testing

7.3 AMHS testing concept

7.3.1 Testing strategy

AMHS system implementations consist of protocol layers according to the principles of the Reference Model for Open Systems Interconnection. The AMHS functions to be tested reside in the application layer of the ISO/OSI reference model. The underlying layers provide supporting communication services, however they are not primarily subject to testing.

Figure 6 provides a generic functional presentation of an AMHS implementation under test.

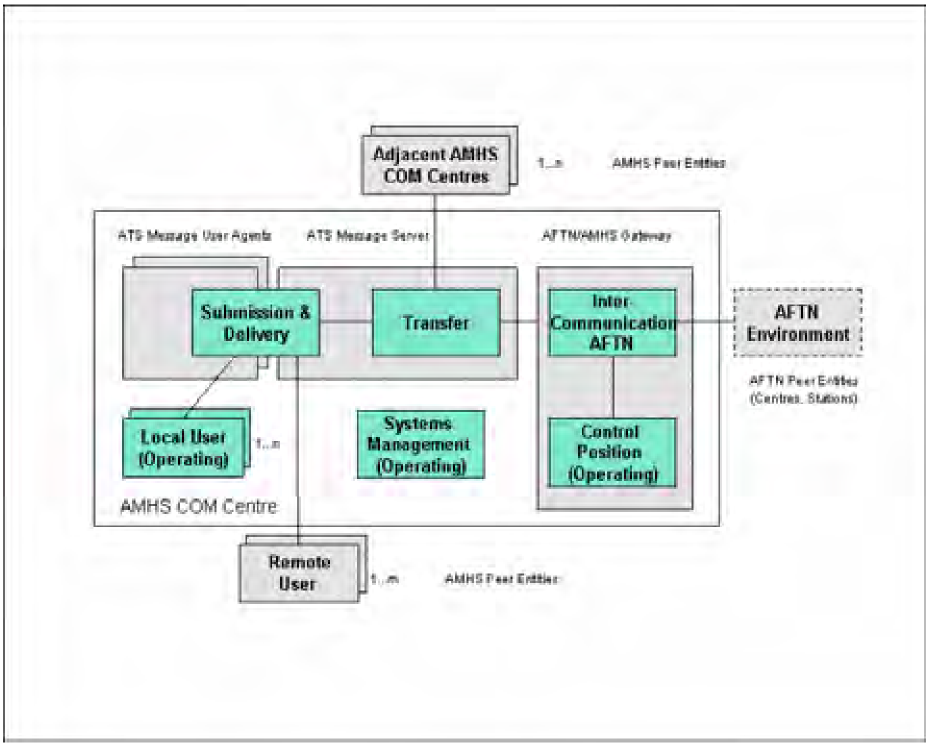


Figure 6: Functional view of an AMHS IUT

7.3.2 AMHS testing phases

7.3.2.1 AMHS Conformance testing

For the purposes of AMHS, *conformance testing* is considered mandatory and shall be performed in parallel with or after the acceptance testing of a new system.

The new system is tested as a *black box,* meaning that that required features are verified by observation of the external *behavior* of the IUT upon stimulation with well defined input events.

A *conformance testing equipment*, called the *AMHS test tool,* is used typically for the production of such input events and the monitoring of the resulting outputs from the IUT. In case such an AMHS test tool or reference implementation is *not* available, a test environment could be configured by using functional components of the IUT itself. Testing in such an environment may be seen as consistency testing rather than conformance testing.

The main AMHS functional areas covered by conformance testing are:

- Transfer of messages probes and reports
- Submission of messages and probes / delivery of messages and reports
- Intercommunication with AFTN
- Naming and addressing
- Parameters
- System management functions.

7.3.2.2 AMHS Interoperability testing

After successful completion of conformance testing, *interoperability testing* is recommended, particularly between AMHS implementations of different manufacturers.

As a first step to interoperability testing the interconnection between pairs of systems should be established and checked.

Then, at the bilateral level, the following functional areas should be covered:

- SUBMISSION, TRANSFER AND DELIVERY OPERATION (AMHS TO AMHS)
- GATEWAY OPERATIONS (AFTN TO AMHS)
- GATEWAY OPERATIONS (AMHS TO AFTN)
- GATEWAY OPERATIONS (AFTN TO AMHS TO AFTN)
- GATEWAY OPERATIONS – SPECIAL CASE SCENARIOS
- STRESS TRAFFIC SITUATIONS
- SUBMISSION/TRANSFER/DELIVERY AND RELAY OPERATIONS
- TEST OF SPECIAL SITUATIONS

At the multilateral level, interoperability testing involves more than two organizations, interchanging normal and exception messages and generating specific reactions of their systems.

7.3.2.3 AMHS Pre-operational testing

Before going into operation, pre-operational testing should be carried out between the AMHS systems concerned, within the operational network environment and using duplicated operational traffic.

The configuration details and the actual sub-sets of traffic to be used, have to be co-ordinated between the test partners. In any case, the operational traffic selected for this purpose should be traffic under the responsibility of the Communication Centres under test.

The AMHS relation between the two systems is considered operational, if the exchange of the total of operational traffic between them (or a subset of that), is performed by means of AMHS only. For this operational traffic no other transmission means (AFTN or X.25) is used.

8 References

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Annex A

Guidelines to QOS (Quality of Service)

Annex A

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all

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1 Scope

The purpose of this section is to define quality of service (QoS) requirements and set target performance objectives for the ASIAPAC AMHS. To this end, the properties of the AMHS are considered from the outside of the network, i.e. at its boundary, without taking into account the way in which the service, as defined on its boundary, is provided from within the network.

The performance requirements dealt with in this section are the common understanding on what the applications will get in terms of performance and what level of performance the network has to provide. The performance parameters are therefore necessary for designing applications as well as the network itself.

Numerical values for performance parameters are defined using the following input:

- anticipated location of message servers and gateways;
- analysis of existing and projected message flows in the ASIAPAC area based on presently available information;
- general design principles;
- user expertise.

As in most cases, in order to arrive at concrete values for the performance parameters, a number of assumptions and restrictions are made:

- QoS is not dependent on traffic volumes;
- QoS is measured between originator-recipient pairs;
- QoS is not geographically dependent;
- QoS is not dependent on time;
- QoS represents worst case performance;
- the underlying network should be sized to accommodate QoS;
- degree of corruption is not relevant to the Corruption QoS parameter;
- corruption is not dependent on message size;
- non reachability due to network causes is typically of the order of a few minutes (60per year);
- the bit error rate of an HDLC link is of the order 10^{-11}.

In dimensioning the AMHS only complete messages should be considered for the Following reasons:

- the message is the basic unit of data at the user interface;
- whole messages are stored and forwarded by MTAs in the network;

- in formulating performance requirements, transport or sub-network performance is not taken into account.

Of course, in dimensioning the network, it will be necessary to consider performance aspects of lower level infrastructure as well, but as a result of the user requirements formulated in this document and their impact on MTA performance.

`Further, it is important to note that the specification of performance requirements is based on individual messages, independently of all other messages.

When considering message size, only the volume of user information is relevant since the user has no control (or only very limited control) over the data overhead involved in message handling.

Formulating performance requirements of a given user, taking into account the simultaneous use of the network by other users, does not appear to be feasible. However, it has to be recognised that, in a real world situation, the performance of the network for a given message certainly does depend on the presence of other messages currently being processed. The performance requirements specified here represent minimum or worst-case performance under the load conditions (Traffic Volume Requirements).

Types of performance parameters

There are two distinct groups of performance parameters to be considered in connection with the AMHS. Parameters not dependent on message volumes: These parameters describe the quality of service (QoS), which is available to each individual message considered by itself, e.g. transit time. They can be measured, i.e. they are the quantitative results of the way in which messages are handled by the network.

Message volumes: These parameters describe the volumes of messages, message sizes and their distribution geographically, as they could be generated by users of the network. The parameters could be measured in the user end systems but it is not realistic to measure them in the network.

QoS per individual message

QoS requirements have to be satisfied under worst possible/allowable traffic volumes and most unfavourable originator/recipient pairs within a specific network configuration. Consequently, QoS is formulated for each individual message, independently of other messages being handled by the network.

This choice has been made for the following reasons:

- it is difficult to imagine that users would accept a QoS which is dependent on the demands which other users place on the network at the same time;

- the network has to be dimensioned to handle the maximum message volumes, while performing sufficiently well;

- the QoS requirements represent "worst case" performance when maximum degradation through interaction with other traffic occurs.

It must be pointed out, that AMHS provides the facilities to send messages many orders of magnitude greater than AFTN, with attachments measured in Mb. Clearly transfer times for such messages will be considerably longer than for the short text messages exchanged in AFTN. It is, thus, necessary to qualify the statement that QoS is independent of message size by adding 'for messages containing similar information to that carried over the AFTN'. If a quantitative limit is required, this will be between 4Kb and 6Kb, being the equivalent size of an AFTN message including the AMHS header.

Independence of QoS on location and time

QoS for an originator/recipient pair is most likely dependent on the relative locations of the two end systems, i.e. whether messages are transmitted with more or less hops through MHS systems (MTAs etc.). However, for simplicity reasons and since QoS requirements are "worst case" requirements, they are stated independently of the location of a message server.

Furthermore, QoS requirements remain constant at all times and are not dependent on date and time of day.

The AMHS performance requirements for the AFTN/AMHS Gateways, could, by agreement, be deemed to apply to interfaces between AMHS functions and AFTN functions in Gateways, e.g. a boundary point consisting of an interface between an internal Message Store and an AFTN handler within a Gateway.

Dependence of QoS on the AMHS service used

It may be necessary to specify different QoS levels for the AMHS corresponding to different sets of services used, i.e. there may be different classes of messages with respect to QoS. The number of QoS levels should be kept small for simplicity and the way in which service parameters map a message to a QoS level must be simple.

The values of QoS provided by the AMHS are useful to the application designer in deciding which services to use and how they are used. For example, the degree of certainty that a message will reach its destination will determine whether AMHS acknowledgement services are used and in what way. Furthermore, the values of QoS are useful in designing higher-level protocols.

2 Specification of performance requirements

The specification and meaningful application of performance requirements is not a simple task. This sub-section outlines some of the difficulties involved and principles to be adopted.

Statistical significance

The way in which performance parameters are formulated is necessarily statistical in nature. This is due to the large number of factors, which affect the performance of the network, such as:

- the current network configuration;
- the current overall load of the network, i.e. the behaviour of all users considered as a whole; and
- the dynamic properties of network nodes and transmission systems.

The need for measurement

For the specification and application of performance requirements to be meaningful, there has to be a framework for measuring performance with respect to the performance parameters. Aspects of a measurement framework which have to be considered are:

- because of the non-deterministic nature of network performance, measurements need to involve large samples of messages, as described in the previous section;

- measurements must be made at different locations simultaneously;

- consistent decisions have to be made as to where measurements are performed, e.g. at service interfaces in MTAs, UAs etc.

Network aspects relevant to performance

The following list contains factors which can affect message handling performance:

- processing speed, limits the capacity due to the store and forward nature of message handling;

- the finite transmission capacity (line speed) of links between nodes, limits the network throughput;

- the transmission times across links, affects the message transit time since complete messages are stored and forwarded a number of times between originator and recipient;

- the efficiency of message queues;

- transmission line failures and errors are obvious sources of degraded performance;

- table configuration errors can have major negative effects on network performance;

- software failures, which are difficult to treat quantitatively.

In designing the network, the performance requirements (amongst other things) have to be translated into properties of individual network components such that overall requirements are satisfied. Of course other considerations such as policy, expandability, ease of maintenance etc. enter into the network design as well.

AMHS Quality of Service Requirements

For reasons of completeness, simplicity and relevance, a minimal set of parameters was selected out of the large range of possibilities for expressing performance properties, to form a suitable "frame of reference" for discussing the dynamic properties of the AISAPAC AMHS:

These parameters defined and described in the following sub-sections in more detail, are:

- Destination Non-Reachability;

- Maximum Transit Time;

- Message Corruption**.**

The selection of these three parameters has been made for the sake of:

- Completeness: all relevant performance aspects of AMHS are covered;
- Simplicity: the formulation of requirements is intentionally kept simple; and
- Relevance: no aspects are included which are not considered to be relevant.

If the performance of the AMHS is such that these parameters are exceeded, then the service is deemed to be of poor quality.

Destination Non-Reachability

Destination Non-Reachability is expressed with respect to pairs of addresses (originator / recipient). It is the probability that a message sent by the originator will not reach the recipient within the Maximum Transit Delay (as defined below).

The above definition shows that the parameters Destination Non-Reachability and maximum Transit Time (see below) are not independent of each other: their definitions are coupled. This is intentional. The philosophy behind this definition is that the value of a message to a person or an application receiving it is dependent on its timely receipt. It is assumed, for a given flow type, that all messages belonging to it have the same value of this parameter.

The definition of Destination Non-Reachability is independent of whether the long (or infinite) transit time for a message is reported to its originator or not. It is also independent of whether acknowledgement procedures within the AMHS or on an application level detect the long (or infinite) transit time or not.

Destination Non-Reachability includes the cases in which messages are "lost", i.e. do not reach their destination in finite time. The probability of message loss must be negligible and this probability is included in the total probability of Destination Non-Reachability. However, there remains a need (for procurement purposes) to place a separate figure on this probability.

In keeping with the above rationale, it is required that the probability of message loss is, at most, one tenth of the probability of Destination Non-Reachability. Maximum Transit Delay

The Maximum Transit Delay is the time within which a single message has to be transmitted through the network end-to-end so that its transmission is of value to the applications (users).

If this time is exceeded, the receipt of the message is, in principle, of no value to the application. If the non-receipt within this time is known to the application, then, presumably, error procedures, such as message retransmission, will be initiated.

The transit delay is the time taken by the network to make the message available to the Message Store associated with the message recipient (UA). Therefore the boundary points of the network may, in this context, be considered to be the MTAs connected to the UAs serving the originators/recipients. The boundary points can also be the MTA functionality within AFTN/AMHS Gateways.

It must be borne in mind, that the parameters Maximum Transit Delay and destination Non-Reachability only have significance when they are taken together.

Message Corruption

The third Quality of Service Parameter concerns message integrity and is called "Message Corruption". It is the probability that each 1,000 octet content block of a message which arrives at its destination, has been corrupted in any way. The definition of Message Corruption applies only to messages which reach their recipients within the Maximum Transit Delay.

"Corruption" means a deviation, end-to-end, of the content of the received message from the content of the original message. The "content" is also deemed to include parameters, such as originator address, which are delivered together with the message. Corruption can also result from unauthorised changes to a message.

Since the volume unit for defining Message Corruption is large (1,000 octets), the requirement is almost independent of the size of (current) messages. This simplification is based on the assumption that corruption is due to unforeseen system malfunctioning, e.g. faulty software.

The corruption of messages due to such causes is not likely to be dependent on the size of messages. (This is true today, but the upcoming use of ADEXP messages-with message lengths up to 10koctets-has to be mentioned, as well as the potential forthcoming applications interchanging messages with binary body parts).

The probability of corruption due to other parameters such as system load, queue sizes, transmission errors etc. is almost negligible.

It is estimated, that the volume dependent non-detected bit error probability for a 1000 octet message traversing the AMHS and involving 5 links and 5 different systems (MTAs, UAs, MSs) is of the order of one bit in 10^5 or less. This justifies the (almost) volume-independent character of the Message Corruption parameter.

QoS Flow Type Classes

Different types of information exchange, called Flow Types here, place different QoS requirements on the AMHS.

In principle, each Flow Type might need to be associated with its own specific values of the three QoS parameters. However, taking into account the large number of possible Flow Types, this would result in a very complex analysis. A suitable approach to reducing this complexity is the introduction of “QoS Flow Type Classes” as follows:

Define a number of "QoS Flow Type Classes" and associate a set of fixed values of the three QoS parameters with each class. Depending on the properties and needs of applications using specific Flow Types, assign these to the QoS Flow Type Classes.

When engineering the network, message traffic volumes of each class need to be taken into account rather than individual Message Flow Types.

Three QoS Flow Type Classes

The approach outlined above is simple and practical provided the number of classes is small. In addition, there is a requirement that the QoS Flow Type Class to which a message belongs, can be coded in some way in the message itself. This requirement comes from the fact that all AMHS components, e.g. MTAs, must be able, at least in principle, to adapt their processing to the QoS Flow Type Class. The means for this coding must come from standard MHS protocol elements, since development specific to AMHS has to be avoided and the possibility of using third-party-service must be kept open. This rules out, for example, the representation of QoS Flow Type Classes by specific User Parts.

The use of the MHS message priority parameter with three values, "urgent", "normal" and "non urgent", belonging to the P1 protocol handled by MTAs, is currently also not suitable for this purpose. The association of values to messages originating from and destined for the AFTN is fixed by SARPs, since such messages traverse an AFTN/AMHS Gateway. This means that values of the MHS priority parameter cannot be freely assigned to message types which are currently handled by the AFTN.

There is no short-term solution to this problem. However, in the long-term, when the majority of messages handled by the AMHS are originated by and destined for native users, the priority parameter may become available for this purpose, keeping in mind, nevertheless, that various practical issues may need to be resolved. In keeping with the three possible values of the MHS message priority parameter, three corresponding QoS Flow Type Classes are defined:

(a) <u>The "High QoS" Flow Type Class</u>
Properties of this QoS Flow Type Class are:

- message transmissions are part of procedures, i.e. the sending and receipt of messages necessarily lead to actions or processing. Without receipt of the message, these actions or processing would not take place, or

- any corrupt information in messages could have serious consequences. This possibility has to be negligible.

(b) <u>The "Medium QoS" Flow Type Class</u>

This class has similar properties to the High QoS Flow Type Class, however the maximum Transit Time requirement can be somewhat less stringent. This distinction is important, because it can be expected that the Maximum Transit Time requirement will have a sensitive effect on network dimensioning.

Properties of this QoS Flow Type Class are:

- message transmissions tend to be of the nature of "information distribution" or "broadcast", possibly based on distribution lists rather than being parts of operational procedures. They are normally not acknowledged. Transit time and reachability constraints are not critical. In the case of non-delivery of messages, this may be noticed by users, in which case backup activities could be initiated; or

- message corruption could have serious consequences and needs to be as low as for the previous class.

(c) <u>The "Low QoS" Flow Type Class</u>

This class has similar properties to the Medium QoS Flow Type Class, however the Destination Non-Reachability and Message Corruption requirements can be somewhat less stringent. This is due to a certain amount of redundancy in the message contents and/or the regular updating and transmission of messages with similar content.

3 Numerical requirements

Guidelines for system requirements.

	High QoS Flow Type Class	Medium QoS Flow Type Class	Low QoS Flow Type Class
Destination Non-Reachability (probability)	$< 10^{-4}$	$< 10^{-4}$	$< 10^{-3}$
Maximum Transit Delay	< 10 seconds	< 5 minutes	< 5 minutes
Message Corruption (probability)	$< 10^{-6}$	$< 10^{-6}$	$< 10^{-5}$

Table 1: Numerical values of SPACE QoS performance requirements

It must be noted that the above numerical values:

- could be adopted as possible quantitative and qualitative characteristics for setting up the ASIAPAC AMHS network;
- will be reviewed on the basis of compiled AMHS operational experience.

4 Application of performance requirements

The QoS parameters are obviously of importance to the network operators, users and application designers.

The QoS requirements along with the volume requirements for each of the Flow Type Classes at the boundary of the network (servers and gateways) are used, in conjunction with a set of well defined design principles (see 3.3 AMHS topology), in order to:

- determine the local performance of servers and gateways, thus dimensioning their configuration,
- determine the throughput of MTAs and capacity of links,
- draft possible network configurations and select the “optimum” network design, and measure actual network performance.

5 Measurement

The specification of numerical values for Performance Requirements is meaningless unless provision is foreseen for measurement of network performance. Such measurement is needed:

- when implementing and enforcing Service Level Agreements between AMHS service providers and users;
- for acceptance testing of network components;
- to determine network capacity;
- to gain experience in network operation (e.g. testing of various routing strategies, etc.).
- to manage the network efficiently.

Technically, network performance measurement involves, among other things:

- generation of large message/data volumes;
- automation of measurement;
- time-stamping of messages;
- use of statistical analysis.

- *End*-

Annex B

AMHS Conformance and Compatibility Test

Annex B

Of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all

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1. Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional tests for an AMHS Conformance Test, which allows checking an AMHS implementation against the AMHS SARPs as a first step to ensure the interoperability between compliant systems.

1.2 Document Structure

Chapter 2 presents the test environment used for AMHS conformance testing.

Chapter 3 defines the addressing plan implemented in the test environment.

Chapter 4 contains the test procedures with subsections for each AMHS functional area.

Each test procedure is presented in a structured way consisting of
- defined test criteria,
- a (brief) scenario description,
- reference to the relevant part of the standard specification (SARPS section),
- reference to test classes (N, E)

1.3 Test Identification Scheme

Each test procedure has an identifier in the form

CT*xnn*

where CT is an acronym for Conformance Test, *x* is a number identifying the test group [1] and *nn* is a consecutive number identifying the individual test procedure.

Test procedures are presented in six groups:
- test of submission operations (x=1),
- test of delivery operations (x=2),
- test of transfer operations (x=3),
- test of gateway operations converting a user message from AMHS to AFTN (x=4),

2. AMHS Conformance Test Environment

The AMHS Implementation Under Test (IUT) is embedded in a simulated operational environment formed by the AMHS test tool with three MTA instances (representing three adjacent ATS Message Servers or three neighbour PRMDs) and one AFTN/X.25 source/sink (representing an adjacent AFTN/X.25 environment).

The IUT has an AMHS user agent (UA) attached, which is used in submission and delivery tests. Gateway tests involve either the AFTN/X.25 test application or the AFTN user terminal. It is also possible to make use of the IUT's associated Monitor & Control Position – if available - to observe outcomes of the conversion process, especially in error situations.

The AMHS test tool implements three MTA test applications (MTA-1, -2 and -3) to send and receive AMHS messages (IPM, IPN), reports and probes to and from three directions. The test tool generates AMHS data at the X.400/P1 level. It uses the AFTN/X.25 test application or the AFTN user terminal to send and receive AFTN user messages and AFTN service messages.

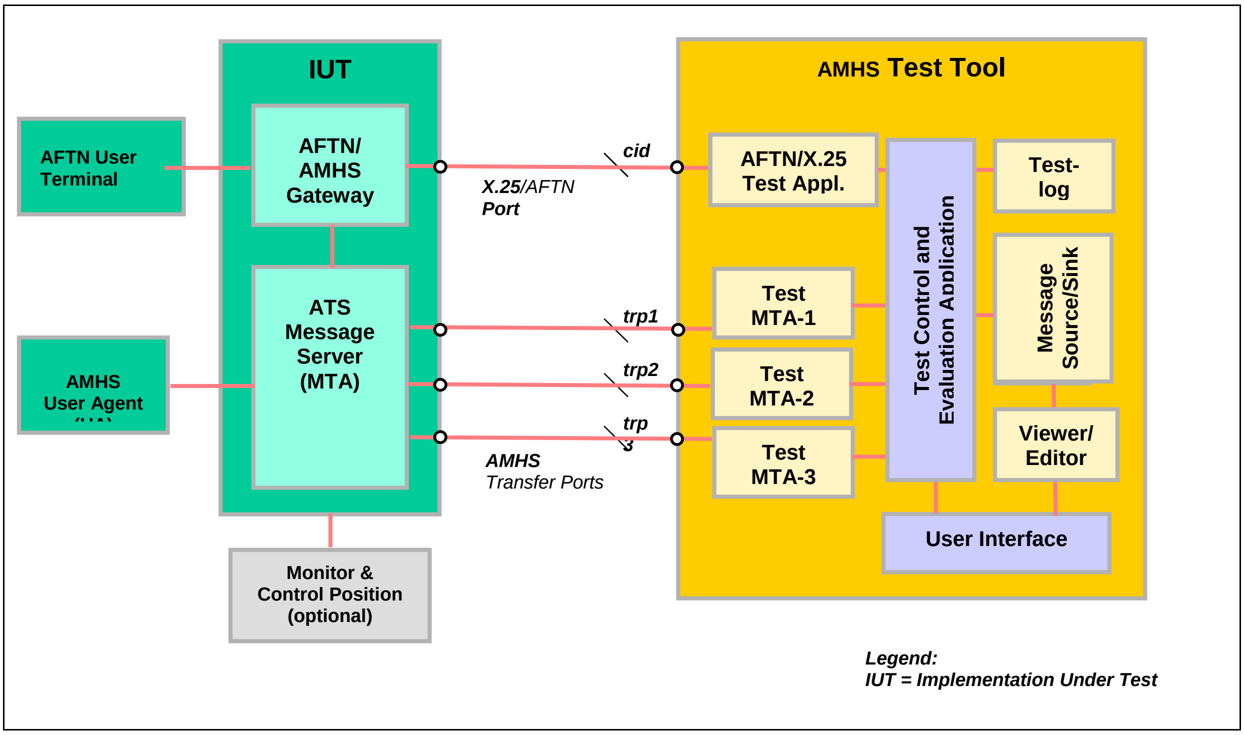


Figure 1: AMHS Conformance Test Environment

Figure 1 shows the test environment used for AMHS conformance tests (setup for the tests CTxxx in Part 3, where xxx refers to the test case number) and the components of the AMHS Test Tool. The AMHS Test Tool will be interconnected with the IUT's (standardized) external interfaces, i.e.

- three AMHS transfer ports (trp1, trp2, trp3) supporting the X.400/P1 protocol over a TCP/IP/LAN[1], and
- a AFTN/X.25 port (cid).

All test applications can be controlled independently via user interface through the Test Control and Evaluation Application. The Test Control and Evaluation Application:

[1] Optionally, an ATN stack can be supported instead of the TCP/IP interface to support the AMHS X.400/P1 protocol.

- maintains test samples in a repository (message source)
- executes test scripts,
- verifies the received messages (message sink),
- evaluates each performed test step,
- stores every test step result in a test log, and
- keeps record of all sent and received messages during a test run.

Test scenarios involve the test components as depicted in Figure 1 in the following way:

Submission operation tests:					
	AMHS User Agent	=>	IUT (ATS Message Server)	=>	MTA-1
Transfer operation tests:					
	MTA-1	=>	IUT (ATS Message Server)	=>	MTA-2 (and for distribution tests also MTA-3)
Delivery operation tests:					
	MTA-1	=>	IUT (ATS Message Server)	=>	AMHS User Agent
AMHS to AFTN gateway tests:					
	MTA-1	=>	IUT (ATS Message Server and Gateway)	=>	AFTN/X.25 Test Application or AFTN User Terminal
AFTN to AMHS gateway tests:					
	AFTN/X.25 Test Application or AFTN User Terminal	=>	IUT (Gateway and ATS Message Server)	=>	MTA-1

3. Addressing Plan for AMHS Conformance Testing

To meet the scope of testing, the test-address space used by AMHS Conformance Testing should include AMHS addresses placed in different AMHS PRMDs and AFTN addresses located in different countries.

As a minimum, there is a need of three generic PRMDs and three generic AFTN countries which may be called: AMHSLAND-1, AMHSLAND-2, AMHSLAND-3, AFTNLAND-1, AFTNLAND-2 and AFTNLAND-3. If required, an extension of the address space should follow the same principles.

This allows covering of all cases of selected addressing schemes, including:

- CAAS with one single organisation-name value for all location indicators within the PRMD,
- CAAS with multiple organisation-name values for different sets of location indicators within the PRMD,
- XF.

The Nationality Letters AA, AB, AC, BA, BB and BC have been reserved for the purpose of AMHS testing. The PRMD names and addressing schemes used for AMHS Conformance testing are indicated in Table 1:

Nationality Letter	C	ADMD	PRMD	Addressing Scheme
AA	XX	ICAO	AMHSLAND-1	CAAS
AB	XX	ICAO	AMHSLAND-2	CAAS
AC	XX	ICAO	AMHSLAND-3	XF
BA	XX	ICAO	AFTNLAND-1	CAAS
BB	XX	ICAO	AFTNLAND-2	CAAS
BC	XX	ICAO	AFTNLAND-3	XF

Table 1: PRMD names and addressing schemes

The user addresses of AMHSLAND-1 (Addressing scheme: CAAS – single "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1**

O=**AA-REGION** *OU1*=**AAAA** **->** *CN*=**AAAAMHAA** till **AAAAMHAZ**
and
CN=**AAAAMHBA** till **AAAAMHBZ**

The user addresses of AMHSLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-2**

O=**AB-REGION1** *O*=**AB-REGION1**	*OU1*=**ABAA** *OU1*=**ABAB**	**->** *CN*=**ABAAMHAA** till **ABAAMHAZ** **->** *CN*=**ABABMHAA** till **ABABMHAZ**
O=**AB-REGION2** *O*=**AB-REGION2**	*OU1*=**ABBA** *OU1*=**ABBB**	**->** *CN*=**ABBAMHAA** till **ABBAMHAZ** **->** *CN*=**ABBBMHAA** till **ABBBMHAZ**
O=**AB-REGION3** *O*=**AB-REGION3**	*OU1*=**ABCA** *OU1*=**ABCB**	**->** *CN*=**ABCAMHAA** till **ABCAMHAZ** **->** *CN*=**ABCBMHAA** till **ABCBMHAZ**

Table 2: AMHSLAND-2

The user addresses of AMHSLAND-3 (Addressing scheme: XF)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-3**

O=**AFTN** *OU1*=**ACCCMHAA** till **ACCCMHAZ** and
OU1=**ACCCMHBA** till **ACCCMHBZ**

The user addresses of AFTNLAND-1 (Addressing scheme: CAAS – single "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1**

O=**BA-REGION** *OU1*=**BAAA** **->** *CN*=**BAAAFTAA** till **BAAAFTZZ**

The user addresses of AFTNLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2**

O=**BB-REGION1** *O*=**BB-REGION1**	*OU1*=**BBAA** *OU1*=**BBAB**	**->** *CN*=**BBAAFTAA** till **BBAAFTAZ** **->** *CN*=**BBABFTAA** till **BBABFTAZ**
O=**BB-REGION2** *O*=**BB-REGION2**	*OU1*=**BBBA** *OU1*=**BBBB**	**->** *CN*=**BBBAFTAA** till **BBBAFTAZ** **->** *CN*=**BBBBFTAA** till **BBBBFTAZ**
O=**BB-REGION3** *O*=**BB-REGION3**	*OU1*=**BBCA** *OU1*=**BBCB**	**->** *CN*=**BBCAFTAA** till **BBCAFTAZ** **->** *CN*=**BBCBFTAA** till **BBCBFTZ**

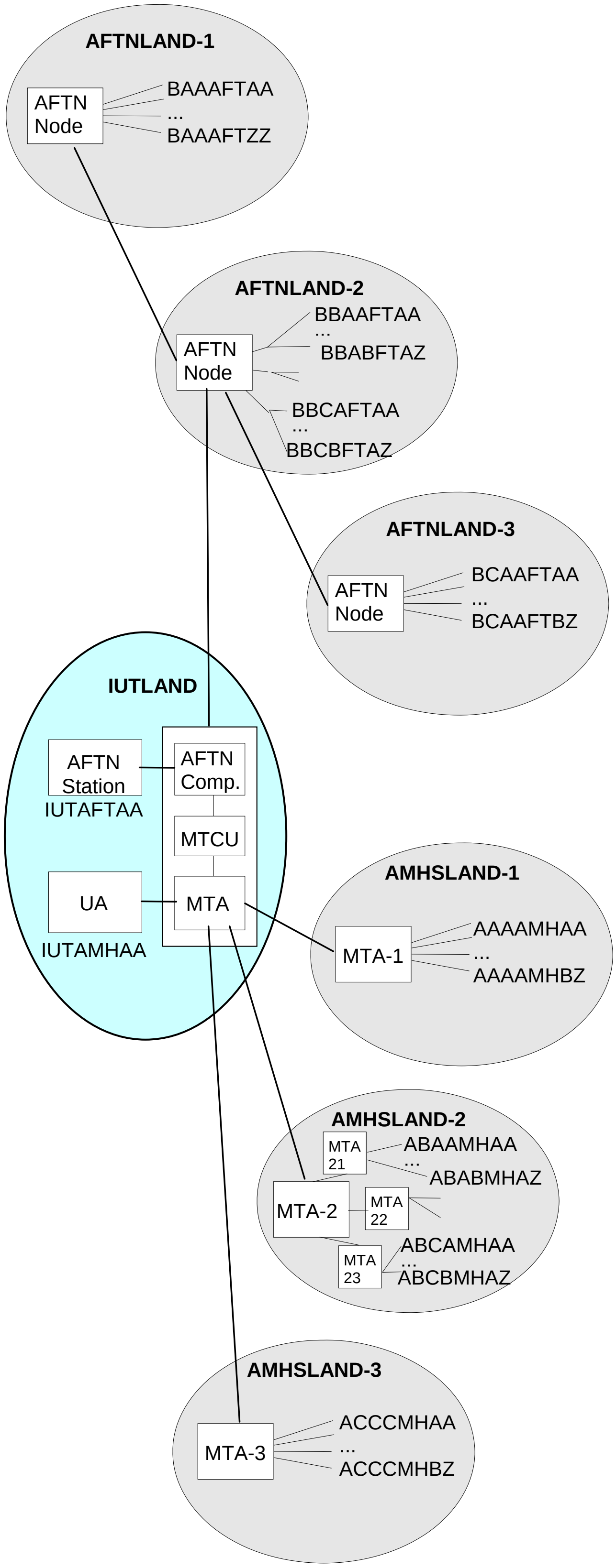
Table 3: AFTNLAND-2

The user addresses of AFTNLAND-3 (Addressing scheme: XF)

C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3**

O=**AFTN**	*OU1*=**BCAAFTAA**	till	**BCAAFTAZ**	and
	OU1=**BCAAFTBA**	till	**BCAAFTBZ**	

[The portion left empty]



AFTNLAND-1 (Addressing scheme: CAAS)

```
   C = XX
ADMD = ICAO
PRMD = AFTNLAND-1

e.g.   O = BA-REGION
     OU1 = BAAA
      CN = BAAAFTAA
```

AFTNLAND-2 (Addressing scheme: CAAS)

```
   C = XX
ADMD = ICAO
PRMD = AFTNLAND-2

e.g.   O = BB-REGION3
     OU1 = BBCB
      CN = BBCBFTAA
```

AFTNLAND-3 (Addressing scheme: XF)

```
   C = XX
ADMD = ICAO
PRMD = AFTNLAND-3

e.g.   O = AFTN
     OU1 = BCAAFTBZ
```

AMHSLAND-1 (Addressing scheme: CAAS)

```
   C = XX
ADMD = ICAO
PRMD = AMHSLAND-1

e.g.   O = AA-REGION
     OU1 = AAAA
      CN = AAAAMHAA
```

AMHSLAND-2 (Addressing scheme: CAAS)

```
   C = XX
ADMD = ICAO
PRMD = AMHSLAND-2

e.g.   O = AB-REGION3
     OU1 = ABCA
      CN = ABCAMHAA
```

AMHSLAND-3 (Addressing scheme: XF)

```
   C = XX
ADMD = ICAO
PRMD = AMHSLAND-3

e.g.   O = AFTN
     OU1 = ACCCMHBZ
```

Figure 2: Addressing Plan

For the IUT itself as test addresses could be used alternatively:

The original, operational AMHS and AFTN addresses assigned to the COM Centre or a generic address space taken from the fictitious PRMD/AFTN country IUTLAND including the generic user addresses IUTAFTAA and IUTAMHAA (or a more comprehensive set of addresses in case of CAAS with multiple "O" values) which may be mapped either onto the CAAS (preferred) or XF addressing scheme. The following table shows the generic address space assigned to the IUT.

CAAS (preferred) – single "O"	C=XX ADMD=ICAO PRMD=IUTLAND O=IUT-REGION OU1=IUTA CN=IUTAFTAA C=XX ADMD=ICAO PRMD=IUTLAND O=IUT-REGION OU1=IUTA CN=IUTAMHAA
CAAS (preferred) – multiple "O"	C=XX ADMD=ICAO PRMD=IUTLAND O=IUT-REGION1 OU1=IUTA CN=IUTAFTAA ... C=XX ADMD=ICAO PRMD=IUTLAND O=IUT-REGION1 OU1=IUTA CN=IUTAMHAA C=XX ADMD=ICAO PRMD=IUTLAND O=IUT REGION2 OU1=IUTB CN=IUTBFTAA ... C=XX ADMD=ICAO PRMD=IUTLAND O=IUT REGION2 OU1=IUTB CN=IUTBMHAA C=XX ADMD=ICAO PRMD=IUTLAND O=IUT-REGION3 OU1=IUTC CN=IUTCFTAA ... C=XX ADMD=ICAO PRMD=IUTLAND O=IUT-REGION3 OU1=IUTC CN=IUTCMHAA
XF	C=XX ADMD=ICAO PRMD=IUTLAND O=AFTN OU1=IUTAFTAA C=XX ADMD=ICAO PRMD=IUTLAND O=AFTN OU1=IUTAMHAA

Table 4: Generic address spaces of the IUT

3.1 "Unknown" addresses used for "negative testing"

Some conformance tests use addresses, which are "unknown" for the IUT and provoke specific reaction, e.g. return of a NDR. Several cases must be distinguished:

a) The AMHS component (MTA) of the IUT is not able to route the message, neither to an AMHS domain, nor to the AMHS/AFTN gateway (MTCU). For example, this occurs, when the global domain identifier does not match any X.400 routing entry (Table 5).

b) The AMHS/AFTN gateway component (MTCU) of the IUT is not able to find a match in the address mapping table and, therefore, can not translate the originator or recipient address from AMHS to AFTN (Table 6) or AFTN to AMHS (Table 7).

c) The AFTN component of the IUT is not able to route an AFTN message. *Note that AFTN routing is not subject of AMHS conformance tests, and therefore no requirement exists for "unknown" AFTN addresses that do not match a routing indicator in the AFTN routing table.*

The following "unknown" addresses may be used in the conformance tests:

"Unknown" AMHS addresses used to test MTA routing
C=**XX** *ADMD*=**ICAO** *PRMD*=**UNKNOWN** *O*=**AA-REGION** *OU1*=**AAAA** *CN*=**AAAAMHAA** ... *CN*=**AAAAMHBZ**
C=**XX** *ADMD*=**ICAO** *PRMD*=**UNKNOWN** *O*=**AB-REGION1** *OU1*=**ABAA** *CN*=**ABAAMHAA** ... *CN*=**ABAAMHBZ**
C=**XX** *ADMD*=**ICAO** *PRMD*=**UNKNOWN** *O*=**AFTN** *OU1*=**ACCCMHAA** ... *OU1*=**ACCCMHBZ**

Table 5: "Unknown" address spaces for MTA routing tests

"Unknown" AMHS addresses used to test MTCU mappings from AMHS to AFTN
C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**UNKNOWN** *OU1*=**BAAA** *CN*=**BAAAFTAA** ... *CN*=**BAAAFTBZ** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BAXX** *CN*=**BAXXXXXX** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION** *OU1*=**BAAX** *CN*=**BAAXXXXX**
C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**UNKNOWN** *OU1*=**BBAA** *CN*=**BBAAFTAA** ... *CN*=**BBAAFTBZ** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**BB-REGION1** *OU1*=**BBAX** *CN*=**BBAXXXXX** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**BB-REGION2** *OU1*=**BBBX** *CN*=**BBBXXXXX** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**BB-REGION3** *OU1*=**BBCX** *CN*=**BBCXXXXX**
C=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3** *O*=**UNKNOWN** *OU1*=**BCAAFTAA** ... *OU1*=**BCAAFTBZ** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3** *O*=**AFTN** *OU1*=**BCXXXXXX** *C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3** *O*=**AFTN** *OU1*=**BCAXXXXX**

Table 6: "Unknown" AMHS addresses for MTCU mapping tests

"Unknown" AFTN addresses used to test MTCU mappings from AFTN to AMHS
AAXXXXXX, AAAXXXXX, AAABXXXX, ABXXXXXX, ABAXXXXX, ABBXXXXX, ABCXXXXX, ABACXXXX, ABABXXXX ACXXXXXX, ACCXXXXX, ACAAXXXX, ACBAXXXX BAXXXXXX, BBXXXXXX, BCXXXXXX

Remark: These addresses match a routing indicator in the AFTN routing table, but not in the AFTN/AMHS address mapping table.

Table 7: "Unknown" AFTN addresses for MTCU mapping tests

AMHS/AFTN gateway settings

To fulfil the requirements of the "unknown" addresses following setting of the MD Lookup Tables of the AMHS/AFTN gateway is requested:

Nationality Letters, Location Indicator	**Mapped to**	**Used addressing scheme**
AAAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-1** *O*=**AA-REGION**	CAAS
ABAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-2** *O*=**AB-REGION1**	CAAS
ABBA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-2** *O*=**AB-REGION2**	CAAS
ABCA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-2** *O*=**AB-REGION3**	CAAS
ACCC	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AMHSLAND-3** *O*=**AFTN**	XF
BAAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-1** *O*=**BA-REGION**	CAAS
BBAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**BB-REGION1**	CAAS
BBBA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**BB-REGION2**	CAAS
BBCA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-2** *O*=**BB-REGION3**	CAAS
BCAA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**AFTNLAND-3** *O*=**AFTN**	XF
IUTA	*C*=**XX** *ADMD*=**ICAO** *PRMD*=**IUTLAND** *O*=**IUT-REGION**	CAAS

Table 8: MD Lookup Table settings of AMHS/AFTN gateway

4 Test Procedures

4.1 Submission Operations

CT101 - Forward a submitted IPM

CT101	**Forward a submitted IPM**
Test criteria	This test is successful, if the IUT forwards a submitted ATS message (IPM) to a peer MTA correctly.
Scenario description	From the UA send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user reachable via AMHS transfer port *trp1*. • Message 1 (CT101M01) shall have ATS-message-priority KK. • Message 2 (CT101M02) shall have ATS-message-priority GG. • Message 3 (CT101M03) shall have ATS-message-priority FF. • Message 4 (CT101M04) shall have ATS-message-priority DD. • Message 5 (CT101M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The *optional-heading-information* element shall be empty. Verify the messages received by the test tool at the AMHS interface. Check the format and contents of MTE, IPM heading and body. In particular, verify the priority value contained in the MTE and the following elements contained in the IPM body: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent), 3.1.2.2.2 (ATS Message Server), 3.1.2.2.3.2.3.1 (ATS-Message-Header)
Test class	Normal AMHS communications

4.2 Delivery Operations

CT201 – Delivery an IPM to a local AMHS user

CT201	Deliver an IPM to a local AMHS user
Test criteria	This test is successful, if the IUT correctly delivers an ATS message (IPM) received from a peer MTA to its local AMHS user.
Scenario description	From the AMHS Test Tool send a sequence of five ATS messages (IPMs) to the IUT addressing a local UA. • The first ATS message shall have ATS-message-priority KK. • The second ATS message shall have ATS-message-priority GG. • The third ATS message shall have ATS-message-priority FF. • The fourth ATS message shall have ATS-message-priority DD. • The fifth ATS message shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Verify the messages received at the AMHS user agent. In particular, verify the following elements displayed at the AMHS user agent: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.1.6 (AMHS routing)
Test class	Normal AMHS communications

CT202 – Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format

CT202	Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format
Test criteria	This test is successful, if the IUT, when receiving an IPM containing erroneous ATS-message-header or ATS-message-text from a peer MTA: • delivers this message to its local AMHS user regardless of the contained error, or • indicates the error situation, or • returns a non-receipt notification or NDR.
Scenario description	From the AMHS Test Tool send a sequence of six messages (IPMs) to the IUT addressed to a local UA. • The first message (IPM) shall contain an empty ATS-message-priority. • The second message (IPM) shall contain an invalid ATS-message-priority • The third message (IPM) shall contain an empty ATS-message-filing-time. • The fourth message (IPM) shall contain an invalid ATS-message-filing-time. • The fifth message (IPM) shall contain an OHI text longer than 53 characters. • The sixth message (IPM) shall contain an empty ATS-message-header. • The seventh message (IPM) shall contain an empty ATS-message-text. Verify that the messages are delivered to the UA. Analyse the IUT's log files with respect to delivered messages and reported errors, if any. Check the contents of the received ATS message and verify the ATS-message-priority, ATS-message-filing-time and ATS-message-text displayed at the UA[3].
AMHS SARPs reference	3.1.2.2.3.2 (IPM text)
Test class	Erroneous AMHS parameters

[3] The displayed message depends on the UA capabilities

CT203 – Deliver an IPM containing empty or invalid IPM heading fields

CT203	**Deliver an IPM containing empty or invalid IPM heading fields**
Test criteria	This test is successful, if the IUT when receiving an ATS message (IPM) from a peer MTA containing empty or invalid IPM heading fields: • delivers this message to its local AMHS user regardless of the empty or invalid IPM heading fields, or • indicates the error situation, or • returns a non-receipt notification or NDR.
Scenario description	From the AMHS Test Tool send a sequence of messages (IPMs) to the IUT addressing a local UA. The MTE shall be correctly formatted while the IPM heading contains empty or invalid values. • The first message shall contain an empty originator field in the IPM heading. • The second message shall contain neither primary nor copy nor blind copy recipient addresses in the IPM heading. • The third message shall contain a primary recipient with an invalid combination of the notification-request flag (rn bit = true and nrn bit = false). Check the IUT's log files with respect to delivered messages and reported errors, if any. Check any messages received and displayed at the UA[4].
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent – AMH21)
Test class	Erroneous IPMS information objects

[4] The displayed message depends on the UA capabilities.

4.3 Transfer Operations

CT301 – Transfer messages (IPMs and IPNs)

CT301	Transfer messages (IPMs and IPNs)
Test criteria	This test is successful, if the IUT transfers (forwards) messages (IPMs, IPNs) correctly.
Scenario description	From the AMHS Test Tool send a sequence of messages to the IUT's transfer port *trp1*. All envelopes shall contain a remote recipient address reachable via transfer port *trp2*. All messages shall have the *originator-report-request* flag and the *originating-MTA-report-request* flag set to "non-delivery-report". The sequence of messages shall consist of: • an IPM with ia-5-text body part, • an IPM with general-text body part, • an IPN containing a RN, • an IPN containing a NRN. Monitor the outcome of IUT transfer ports *trp1*, *trp2* and *trp3*. Verify that: • all messages are routed correctly via transfer port *trp2*, and there is no message misrouted, i.e. no output from the IUT at transfer port *trp1* or *trp3*, • there is no NDR returned via *trp1*, • the content of the forwarded message has not changed, but is identical to the original content, • trace information is added in the message transfer envelope (MTE).
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT302 – Transfer a report

CT302	**Transfer a report**
Test criteria	This test is successful, if the IUT transfers (forwards) reports correctly.
Scenario description	From the AMHS Test Tool send two manually prepared reports (a DR and a NDR) to the IUT's transfer port *trp1*. The report transfer envelope shall contain a remote recipient address reachable via transfer port *trp2*. The reports shall contain fictitious values for those fields, which are normally automatically generated from the related subject message, for example, the subject-MTS-identifier and originally intended recipients. Monitor the outcome of IUT transfer ports *trp1*, *trp2* and *trp3*. Verify that: • all reports are routed correctly via transfer port *trp2*, and there is no report misrouted, i.e. no output from the IUT at transfer port *trp1* or *trp3*, • the content of the forwarded report has not changed, but is identical to the original report content, • trace information is added in the report transfer envelope (RTE).
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT303 – Transfer a probe

CT303	**Transfer a probe**
Test criteria	This test is successful, if the IUT transfers (forwards) a probe testing the reachability of a remote AMHS user correctly and returns a NDR, if the probe contains a content-length value which exceeds the length supported by the IUT's MTA component.
Scenario description	From the AMHS Test Tool send two probes to the IUT's transfer port *trp1*. The probe (envelope) shall contain an intended recipient address reachable via transfer port *trp2*. • The first probe shall contain a content length value of 1.048.576 (octets), which is a length, which must be supported by the IUT's MTA component. • The second probe shall contain a content length value of 2.147.483.647 (octets), which is the maximum length in octets specified in X.411:06/1999. It equals the largest integer in 32 bits. Monitor the outcome of IUT transfer ports *trp1*, *trp2* and *trp3*. Verify that: • the first probe is routed correctly via transfer port *trp2*, and there is not any NDR returned from the IUT, • the second probe is either routed correctly via transfer port *trp2* or rejected, if such a length is not supported by the IUT's transfer capabilities. Check, if either a forwarded probe or a NDR is received from the IUT. *Note. – The AMHS Test Tool shall respond with a DR, if it receives a valid probe for a user residing in the test tool's domain.*
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT304– Reject a message, if DL expansion is prohibited

CT304	**Reject a message, if DL expansion is prohibited**
Test criteria	This test is successful, if the IUT distributes a received IPM addressing a distribution list (DL) only, if the *dl-expansion-prohibited* flag is set to “false” and rejects the message, if the *dl-expansion-prohibited* flag is set to “true”. In the latter case, the IUT shall return a NDR.
Scenario description	From the AMHS Test Tool send two IPMs to the IUT’s transfer port *trp1*. The recipient in the message transfer envelope (MTE) shall address a distribution list. The distribution list, in turn, shall address three remote AMHS users, one reachable via transfer port *trp1*, one reachable via *trp2* and one via *trp3*. The first message shall have the *dl-expansion-prohibited* flag set to “false” and the second to “true”. Monitor the outcome of transfer ports *trp1*, *trp2* and *trp3*. Verify that: • only the first message is distributed by the IUT and three messages are received at the AMHS Test Tool, • a NDR is returned to trp1 for the second message.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group)
Test class	Normal AMHS communications

CT305– Loop detection

CT305	**Loop detection**
Test criteria	This test is successful, if the IUT detects that the received message, IPN, report and probe have traversed a loop.
Scenario description	Create a temporary routing loop, i.e. modify the routing table in MTA-2 to forward all messages addressed to AMHSLAND-2 to MTA-1, which in turn forwards those messages to the IUT. Configure the loop detection mechanism in the AMHS Test Tool (MTA-1 and MTA-2) to allow a message to run through the loop 32 times. From the AMHS Test Tool send an AMHS message (IPM) to the IUT addressing an AMHS user in AMHSLAND-2. Verify that: • the IUT detects the loop, • discards the message and • sends a NDR (before the test tool detects that the message has traversed the loop 32 times). Repeat the test for an IPN, a report and a probe. The IUT shall detect the loop in all cases and return a NDR for the IPN and the probe (but not for the report).
AMHS SARPs reference	3.1.1, Note 2a (ISO/IEC 10021), *See also ITU-T Rec. X.411 clause 14.3.1 and clause 12.3.1.*
Test class	MHS procedural errors

CT306– Generate a NDR, if transfer fails

CT306	**Generate a NDR, if transfer fails**
Test criteria	This test is successful, if the IUT correctly generates a NDR, if it can not transfer the received IPM towards the specified recipient.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT's transfer port *trp1*. All messages shall contain an unknown primary recipient address and have different combinations of settings for the *originator-report-request* flag and the *originating-mta-report-request* flag according to Table . Verify that in all cases the IUT returns a NDR. Verify that the report is always addressed to the originator of the message. Verify that the *originator-report-request* flag setting in the per-recipient-fields of the generated NDR is equal to the setting in the subject message.
AMHS SARPs reference	3.1.2.2.2.1.1 (AMH22/AMH11)
Test class	Normal AMHS communications

ATS Message	Value of the originator-report-request element	Value of the originating-MTA-report-request element	Expected result
1	no-report(0)	report(2)	IUT returns a NDR with the *originator-report-request* flag set to no-report(0).
2	non-delivery-report(1)	report(2)	IUT returns a NDR with the *originator-report-request* flag set to non-delivery-report(1).
3	report(2)	report(2)	IUT returns a NDR with the *originator-report-request* flag set to report(2).

Table 9: CT306 report request settings[5]

[5] Note that the originating-MTA-report-request argument shall specify at least the level specified in the originator-report-request (see ITU-T recommendation X.411, clause 12.2.1.1.1.8)

4.4 Gateway Operations (AMHS to AFTN)

CT401 – Convert an incoming IPM to AFTN format

CT401	**Convert an incoming IPM to AFTN format**
Test criteria	This test is successful, if the IUT converts an IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user. • The first ATS message shall have ATS-message-priority KK. • The second ATS message shall have ATS-message-priority GG. • The third ATS message shall have ATS-message-priority FF. • The fourth ATS message shall have ATS-message-priority DD. • The fifth ATS message shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text and address an AFTN user reachable via the AFTN/X.25 port *cid1*. The optional-heading-information element shall be empty[1]. The implicit-conversion-prohibited attribute of the AMHS message must be set to "false". Verify the messages received at the AFTN/X.25 interface of the AMHS Test Tool. Check the correct format of the AFTN message. Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.
AMHS SARPs reference	3.1.2.3.5.2 (AMHS IPM conversion)
Test class	Normal AMHS communications

[1] There is a separate test case specified, that will test the conversion of the optional-heading-information element.

CT402 – Convert an IPM containing optional-heading-information in the ATS-message-header

CT402	**Convert an IPM containing optional-heading-information in the ATS-message-header**
Test criteria	This test is successful, if the IUT converts an IPM containing optional-heading-information (OHI) in the ATS-message-header correctly into AFTN format and returns a non-delivery report, if it cannot convert the message, because the OHI text is too long.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over the AMHS transfer port to the IUT. The sequence of IPMs shall address a remote AFTN user. • The first ATS message shall have FF priority and contain OHI text of less than 53 characters[1]. • The second ATS message shall have FF priority and contain OHI text of exactly 53 characters. • The third ATS message shall have FF priority and contain OHI text of more than 53 characters. • The fourth ATS message shall have SS priority and contain OHI text of less than 48 characters[2]. • The fifth ATS message shall have SS priority and contain OHI text of exactly 48 characters. • The sixth ATS message shall have SS priority and contain OHI text of more than 48 characters. Check the AFTN messages received at the X.25/AFTN port and verify the AFTN format. In particular, check the format and contents of the OHI. Verify that the IUT returns a NDR for the third and sixth ATS message containing the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.1.5-b): • “unable-to-transfer” for the *non-delivery-reason-code*, • “content-syntax-error” for the *non-delivery-diagnostic-code*, and • “unable to convert to AFTN due to ATS-Message-Header or Heading Fields syntax error” for the supplementary-information.
AMHS SARPs reference	3.1.2.3.5.2.2.8 (OHI), 3.1.2.2.3.2.3.4 (ATS Message Optional Heading Info), PDR M4100001
Test class	Normal AMHS communications

[1] OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69. (total line length = OHI text + space + 6 digit filing time + space + 8 characters originator.)
[2] OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 character priority alarm.)

CT403 – Generate a DR for a successfully translated IPM

CT403	**Generate a DR for a successfully translated IPM**
Test criteria	This test is successful, if the IUT returns a DR for a successfully translated ATS message (IPM), if a report was requested by the originator or the originating MTA.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT addressing an AFTN user. The IPMs shall have ATS-Message-Priority “FF” and different combinations of settings for the *originator-report-request* flag and the *originating-mta-report-request* flag according to Table . The IUT shall convert all ATS messages into AFTN format and forward them via the AFTN/X.25 port *cid1* to the AMHS Test Tool. Check the messages received at the AMHS interface and verify that the IUT sends a DR for every ATS message, if: a) the *originator-report-request* element is set to “report”, or b) the originating-mta-report-request element is set to “report” or “audited-report”. (see Table).
AMHS SARPs reference	3.1.2.3.5.6.1.3 (generation of AMHS reports)
Test class	Normal AMHS communications

ATS Message	Value of the originator-report-request element	Value of the originating-MTA-report-request element	Expected result for conformance test CT403
1	no-report(0)	non-delivery-report(1)	IUT does not return a report
2	no-report(0)	report(2)	IUT returns a DR
3	no-report(0)	audited-report(3)	IUT returns a DR
4	non-delivery-report(1)	non-delivery-report(1)	IUT does not return a report
5	non-delivery-report(1)	report(2)	IUT returns a DR
6	non-delivery-report(1)	audited-report(3)	IUT returns a DR
7	report(2)	report(2)	IUT returns a DR
8	report(2)	audited-report(3)	IUT returns a DR

Table 10: CT403 report request settings[1]

[1] Note that the originating-MTA-report-request argument shall specify at least the level specified in the originator-report-request (see ITU-T recommendation X.411, clause 12.2.1.1.1.8)

CT404 – Generate a NDR, if implicit conversion is prohibited

CT404	**Generate a NDR, if implicit conversion is prohibited**
Test criteria	This test is successful, if the IUT rejects a received IPM addressed to an AFTN user, if the *implicit-conversion-prohibited* attribute is set to “true” and generates a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port *trp1*. The IPMs shall have both the *originator-report-request* and the *originating-MTA-report-request* flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port *cid1*. The first message shall have the argument *implicit-conversion-prohibited* set to “false” and the second message set to “true”. Verify that only the first message is transferred over the AFTN/X.25 test interface to the AMHS Test Tool, and a NDR is generated for the second message and received by the AMHS Test Tool via the transfer port *trp1*. Verify that this NDR contains the following elements (as specified in the AMHS SARPs 3.1.2.3.5.2.1.2): • “conversion-not-performed” for the *non-delivery-reason-code*, • “implicit-conversion-prohibited” for the *non-delivery-diagnostic-code*, and • “unable to convert to AFTN” for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.2
Test class	Normal AMHS communications

CT405 – Generate a NDR, if the ATS-message-header has a syntax error

<table>
<tr><th>CT405</th><th>Generate a NDR, if the ATS-message-header has a syntax error</th></tr>
<tr><td>Test criteria</td><td>This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing erroneous ATS-message-header or ATS-message-text.</td></tr>
<tr><td>Scenario description</td><td>From the AMHS Test Tool send a sequence of seven messages (IPMs) to the IUT addressed to an AFTN user reachable via the IUT’s gateway.

The first message (IPM) shall contain an empty ATS-message-priority.
The second message (IPM) shall contain an invalid ATS-message-priority
The third message (IPM) shall contain an empty ATS-message-filing-time.
The fourth message (IPM) shall contain an invalid ATS-message-filing-time.
The fifth message (IPM) shall contain OHI text longer than 53 characters.
The sixth message (IPM) shall contain an empty ATS-message-header.
The seventh message (IPM) shall contain an empty ATS-message-text.

Check the messages received at the AMHS- and X.25/AFTN-interfaces of the AMHS Test Tool. Verify that the IUT - except for the seventh message[10] - does not convert the received AMHS messages into AFTN, but returns a NDR for each message via its transfer port trp1. Verify that all NDRs contains the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.1.5-b):

“unable-to-transfer” for the non-delivery-reason-code,
“content-syntax-error” for the non-delivery-diagnostic-code, and
“unable to convert to AFTN due to ATS-Message-Header or Heading Fields syntax error” for the supplementary-information.
</td></tr>
<tr><td>AMHS SARPs reference</td><td>3.1.2.3.5.2.1.5-b), 3.1.2.2.3.2.3 (ATS Message Header)</td></tr>
<tr><td>Test class</td><td>Erroneous AMHS parameters</td></tr>
</table>

[10] The AMHS SARPS (3.1.2.2.3.2.4) do not exclude an IPM containing empty ATS-message-text.

CT406 – Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters

CT406	**Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters**
Test criteria	This test is successful, if the IUT, when it receives an ATS message with long ATS-message-text of more than 1800 characters, a) rejects the message and returns a NDR, or b) splits the received IPM into several messages and converts the resulting messages into AFTN format as specified in ICAO Annex 10, Attm. B (changed from D to B with Amendment 78) . *Note. – The AMHS SARPS (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b).*
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT containing ATS-message-text of 4500 characters to an AFTN user recipient. If case a) is implemented: Verify that the IUT does not convert the IPM into AFTN format, but returns a NDR. Check the NDR contents received at the TSMS-AMHS interface. Verify that the NDR contains the following elements: • “unable-to-transfer” for the *non-delivery-reason-code*; • “content-too-long” for the *non-delivery-diagnostic-code*; and • “unable to convert to AFTN due to message text length” for the *supplementary-information*. If case b) is implemented: Verify that (at least) three AFTN messages are received at the AFTN/X.25 test interface. Check the correct format of the AFTN messages. Check the text field of all received AFTN messages. Verify that the text is complete and unchanged, i.e. compare the received data with the *ATS-message-text* provided in the original IPM.
AMHS SARPs reference	3.1.2.3.5.2.1.7
Test class	Normal AMHS communications

CT407 – Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters

CT407	**Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters**
Test criteria	This test is successful, if the IUT converts a received IPM containing an ATS-messages-text with lines of more than 69 characters, if *conversion-with-loss-prohibited* is set to “false”. Otherwise the IUT shall reject the message and generate a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port. The messages shall have both the *originator-report-request* and the *originating-MTA-report-request* flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port *cid1*. The IPM body shall contain ATS-message-text with lines exceeding 69 characters. In the first message the argument *conversion-with-loss-prohibited* shall be set to “false” and in the second message to the value “true”. Verify that only messages are received at the AFTN/X.25 test interface of the AMHS Test Tool, if the *conversion-with-loss-prohibited* was set to “false”. Check the correct format of the AFTN message. Verify that an additional line feed has been inserted for every text line exceeding 69 characters. In case of message rejection, verify that a NDR is generated and received by AMHS Test Tool via the transfer port *trp1* with the following values: • “conversion-not-performed” for the *non-delivery-reason-code*, and • “line-too-long” for the diagnostic code.
AMHS SARPs reference	3.1.2.3.5.2.1.6 a)
Test class	Normal AMHS communications

CT408 – Convert or reject an IPM, if the ATS-message-text contains characters not allowed by ICAO Annex 10

CT408	**Convert or reject an IPM, if the ATS-message-text contains characters not allowed by ICAO Annex 10**
Test criteria	This test is successful, if the IUT converts a received IPM containing an ATS-messages-text with characters not allowed by ICAO Annex 10, if *conversion-with-loss-prohibited* is set to "false". Otherwise the IUT shall reject the message and generate a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port *trp1*. The messages shall have both the *originator-report-request* and the *originating-MTA-report-request* flag set to "non-delivery-report" and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port *cid1*. • In the first message the ATS-Message-Text shall contain one or more IA-5 characters that are not allowed by ICAO Annex 10, e.g. the punctuation symbol ";" and have the *conversion-with-loss-prohibited* argument set to "false", • The second message shall contain equal ATS-Message-Text, but have the *conversion-with-loss-prohibited* argument set to "true", Verify that only messages are received at the AFTN/X.25 test interface of the AMHS Test Tool, if the *conversion-with-loss-prohibited* was set to "false". In such a case, check the converted AFTN message format. In case of message rejection, verify that a NDR is generated and received by AMHS Test Tool via the transfer port *trp1* with the following values: • "conversion-not-performed" for the *non-delivery-reason-code*, and • "punctuation-symbol-loss" for the diagnostic code.
AMHS SARPs reference	3.1.2.3.5.2.1.6 c), d) and e)
Test class	Normal AMHS communications

CT409 – Reject an IPM with multiple body part

CT409	**Reject an IPM with multiple body part**
Test criteria	This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing multiple body parts.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT transfer port *trp1*. The message shall contain two (or more) ia5-text body parts. Verify that a NDR is generated and received by AMHS Test Tool via the transfer port *trp1* with the following elements: • “unable-to-transfer” for the *non-delivery-reason-code*, • “content-syntax-error” for the *non-delivery-diagnostic-code*, and • “unable to convert to AFTN due to multiple body parts” for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.3
Test class	Erroneous AMHS parameters

CT410 – Distribute an IPM to AMHS and AFTN users

CT410	**Distribute an IPM to AMHS and AFTN users**
Test criteria	This test is successful, if the IUT distributes an IPM addressing both an AMHS and an AFTN user correctly.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) addressing both AMHS and AFTN users to the IUT via transfer port *trp1*. • The IPM Heading of the first message shall contain two primary recipients, which are one AMHS and one AFTN user and two copy recipients, which are also one AMHS and one AFTN user. • The IPM Heading of the second message shall contain two primary recipients, which are one AMHS and one AFTN user and two blind copy recipients, which are also one AMHS and one AFTN user. The message shall have the *originator-report-request* flag set to “non-delivery-report”. Verify that both messages (IPMs) are: • relayed to AMHS transfer port *trp2*, and • relayed and converted to AFTN format and transferred via the AFTN/X.25 port *cid1*. Check the messages received at the AMHS-interface. Verify that: • both messages contain an MTE with all AMHS recipient addresses and an IPM heading with all AMHS and AFTN recipients. Check the messages received at the AFTN/X.25 port. Verify that: • both messages contain the addresses of both AFTN users.
AMHS SARPs reference	3.1.2.2.1 (ATS message user agent), 3.1.2.2.2 (ATS message server), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications

CT411 – Expand a DL addressing both AMHS and AFTN users

CT411	**Expand a DL addressing both AMHS and AFTN users**
Test criteria	This test is successful, if the IUT distributes an IPM addressing AMHS and AFTN users in a distribution list correctly.
Scenario description	From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port *trp1*. The recipient contained in the MTE, shall address a distribution list, for which the IUT is responsible. The distribution list shall address one AMHS user and two AFTN users. The AMHS user is reachable via the AMHS transfer port *trp2* and the AFTN users are reachable via the X.25/AFTN port *cid1*. The first message shall have the *dl-expansion-prohibited* flag set to “false” and the second to “true”. Check the messages received at the AMHS and X.25/AFTN interfaces of the AMHS Test Tool. Verify that only the first IPM is: • transferred via AMHS transfer port *trp2*, and • converted to AFTN format and transferred via the X.25/AFTN port *cid1*. Verify for the first IPM that: • one message is received at the AMHS-interface *trp2* containing (only) the AMHS recipient address in the MTE and the DL recipient address in the IPM heading • one AFTN message is received at the X.25/AFTN-interface containing the addresses of both AFTN users Verify for the second message that: • a NDR is returned to *trp1*.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications

CT412 –Split or reject an incoming IPM addressing more than 21 AFTN users

CT412	**Split or reject an incoming IPM addressing more than 21 AFTN users**
Test criteria	This test is successful, if the IUT receives an ATS message (IPM) addressing more than 21 AFTN users and a) splits the received IPM into several messages, each addressing 21 or less AFTN users if no more than 512 AFTN users are addressed, or b) rejects the received IPM and returns a NDR if more than 512 AFTN users are addressed. *Note. – With the resolution of PDR M4050004 a message with more than 21, but no more than 512 recipient addresses must not be rejected by the gateway*.
Scenario description	From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port *trp1*. The message shall have the *originator-report-request* flag set to "non-delivery-report". • Send one IPM with 512 recipients. Verify that this message is split into 25 AFTN messages, each of the first 24 messages containing 21 addresses, the last one containing 8 addresses. • Send one IPM with 513 recipients. Verify that the IUT does <u>not</u> convert the AMHS message into AFTN format, but returns a NDR via its transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, • "too-many-recipients" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to number of recipients" for the *supplementary-information.*
AMHS SARPs reference	3.1.2.3.5.2.1.8, PDR M4050004
Test class	Normal AMHS communications

CT413 – Remove an unknown address before conversion into AFTN format

CT413	**Remove an unknown address before conversion into AFTN format**
Test criteria	This test is successful, if the IUT that receives an ATS message (IPM) addressed to multiple AFTN users removes any unknown address before conversion.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT via AMHS transfer port *trp1*. The message shall have two (primary) recipients addressing two AFTN users. Only the AMHS address of the first AFTN user can be translated by the MTCU into a valid AFTN addressee indicator, the AMHS address of the second AFTN user is unknown and the MTCU can not find a match in its address look-up table. Check the messages received at the AMHS- and X.25/AFTN-interfaces of the AMHS Test Tool. Verify that the IUT: • converts the received AMHS message into AFTN format, removes the unknown address and sends it via the X.25/AFTN-interfaces *cid1*, • returns a NDR via transfer port *trp1* for the unknown recipient. Verify that the NDR contains the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.2.6.2 d): • “unable-to-transfer” for the *non-delivery-reason-code*, and • “unrecognised-OR-name” for the *non-delivery-diagnostic-code*
AMHS SARPs reference	3.1.2.3.5.2.2.6.2
Test class	Normal AMHS communications

CT414 – Convert an incoming AFTN acknowledgement

CT414	**Convert an incoming AFTN acknowledgement**
Test criteria	This test is successful, if the IUT converts an AFTN acknowledgement (SS ACK message) to a receipt notification correctly.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The IPM shall have the *receipt-notification* request flag activated and the *ATS-message-priority* shall have the value “SS”. The IUT shall convert the AMHS message to an AFTN message with priority indicator “SS” and send it via the AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement to the IUT (via the AFTN/X.25 test interface *cid1*). The subject message shall refer to the received AFTN user message. The IUT shall convert this AFTN acknowledgement to an AMHS receipt notification and send it via the AMHS test interface *trp1*. Verify that the AMHS Test Tool receives a receipt notification. In particular, verify that: • the originator indicator contained in the AFTN acknowledgement is translated to the *ipn-originator* (IPN) and the *originator-name* (MTE), • the *receipt-time* of the IPN is generated from the *filing time* of the AFTN acknowledgement, • the value of the *priority* element in the MTE is set to “urgent”, • the values of *subject-ipm* and *recipient-name* are inserted correctly from log entries.
AMHS SARPs reference	3.1.2.3.4.3 (conversion AFTN ACK)
Test class	Normal AMHS communications

CT415 – Incoming AFTN acknowledgement with unknown AFTN originator

CT415	**Incoming AFTN acknowledgement with unknown AFTN originator**
Test criteria	This test is successful, if the IUT informs its control position, when the AFTN acknowledgement (SS ACK message) can not be converted because the AFTN originator is unknown.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The IPM shall have the *receipt-notification* request flag activated and the *ATS-message-priority* shall have the value “SS”. The IUT shall convert the AMHS message to an AFTN message with priority indicator “SS” and send it via the AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement (SS ACK) to the IUT (via the AFTN/X.25 test interface *cid1*). The subject message shall refer to the received AFTN user message, but the originator of the AFTN acknowledgement (SS ACK) message shall be unknown to the IUT, i.e. not contained in any of the IUT’s conversion or address mapping tables. Check the output of the IUT at the AMHS test interfaces and the control position. Verify that the IUT does not send any IPM nor IPN via the AMHS transfer port, but reports the error situation to the control position.
AMHS SARPs reference	3.1.2.3.4.3.2.3
Test class	Erroneous AMHS parameters

CT416 – Incoming AFTN acknowledgement relating to a subject message without receipt-notification request

CT416	**Incoming AFTN acknowledgement relating to a subject message without receipt-notification request**
Test criteria	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not have the receipt notification flag set.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The message shall have the *ATS-message-priority* set to “SS”, however, the *receipt-notification-request* shall be deactivated. The IUT shall convert the AMHS message into an AFTN message with priority indicator “SS” and send it over the AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN SS acknowledgement to the IUT with the subject message relating to the previously received AFTN user message. Since the initial ATS message (IPM) did not have the *receipt-notification-request* activated, the IUT shall not convert the AFTN acknowledgement into a RN, but encapsulate the AFTN acknowledgement into an IPM, instead. Check the output of the IUT at the AMHS test interface *trp1* and the control position. Verify that the IUT sends an ATS message (IPM) with the addressed AMHS user as recipient. Verify that the message contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.
AMHS SARPs reference	3.1.2.3.4.3.1.2
Test class	MHS procedural errors, Erroneous IPMS information objects

CT417 – Incoming AFTN acknowledgement without related subject message

CT417	Incoming AFTN acknowledgement without related subject message
Test criteria	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not pass the gateway before.
Scenario description	From the AMHS Test Tool send an AFTN acknowledgement (SS ACK message) via the AFTN/X.25 test interface *cid1* to the IUT addressing an AMHS user. The AFTN acknowledgement shall have a fictitious origin subject message in the message text. Check the output of the IUT at the AMHS transfer port and the control position. Verify that the IUT sends an IPM with the addressed AMHS user as recipient. Verify that the IPM contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.
AMHS SARPs reference	3.1.2.3.4.3.1.1
Test class	MHS procedural errors , Erroneous IPMS information objects

CT418 – Convert an AFTN SVC “Unknown Addressee Indicator” to a NDR

CT418	**Convert an AFTN SVC “Unknown Addressee Indicator” to a NDR**
Test criteria	This test is successful, if the IUT converts a received AFTN service message (SVC) of type “Unknown Addressee Indicator” to a NDR correctly.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface *trp1* to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface *cid1*. The IUT shall convert the IPM to an AFTN user message and send it over AFTN/X.25 test interface *cid1* to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN service message of type “Unknown Addressee Indicator” to the IUT that relates to the formerly received message. The IUT shall convert this AFTN service message to a NDR. Verify that a NDR is generated (as specified in the AMHS SARPs, section 3.1.2.3.4.4) and received by AMHS Test Tool via the AMHS test interface *trp1* with the following elements: • for the report-destination-name the *originator-name* of the subject AMHS message, for the subject-identifier the *message-identifier* of the subject AMHS message, for the actual-recipient-name the *unknown addressee indicator* reported with the SVC, • “unable-to-transfer” for the *non-delivery-reason-code*, and • “unrecognised-OR-name” for the *non-delivery-diagnostic-code*.
AMHS SARPs reference	3.1.2.3.4.4 (conversion AFTN SVC unknown)
Test class	Normal AMHS communications

CT419 – Incoming AFTN SVC “Unknown Addressee Indicator” without related subject message

CT419	**Incoming AFTN SVC “Unknown Addressee Indicator” without related subject message**
Test criteria	This test is successful, if the IUT encapsulates a received AFTN service message (SVC) of type “Unknown Addressee Indicator” into an IPM, if the subject message did not pass the gateway before.
Scenario description	From the AMHS Test Tool send an AFTN service message of type “Unknown Addressee Indicator” to the IUT addressing an AMHS user. The AFTN service message shall have a fictitious origin subject message in the message text. Check the output of the IUT at the AMHS transfer port. Verify that the IUT sends an IPM with the addressed AMHS user as recipient. Verify that the IPM contains the original AFTN SVC in the IPM body (ATS-message-text).
AMHS SARPs reference	3.1.2.3.4.4.1.1 b)
Test class	Normal AMHS communications

CT420 – Processing of an incoming SVC QTA RPT Message

CT420	**Processing of an incoming SVC QTA RPT Message**
Test criteria	This test is successful, if the IUT sends an AFTN user message a second time, if it receives an SVC QTA RPT message.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT addressing an AFTN user. The IUT shall convert the message into AFTN format and send it over the AFTN/X.25 test interface to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN service message of type QTA RPT related to the previously received AFTN message. Verify that the IUT does not translate the AFTN service message into an IPM, but processes the QTA RPT so that the previous message is sent to the AFTN user (automatically or by operator intervention) a second time.
AMHS SARPs reference	3.1.2.3.2.1.12
Test class	Normal AMHS communications

CT421 – Probe Conveyance Test

CT421	Probe Conveyance Test
Test criteria	This test is successful, if the IUT (receiving a probe with an AFTN user as intended recipient) generates a DR, if conversion to AFTN is possible or an NDR, if conversion to AFTN is not possible.
Scenario description	From the AMHS Test Tool send a sequence of AMHS probes to the IUT. • Probe 1 shall specify a content-length of 1800 and address an AFTN user recipient reachable via the AMHS/AFTN gateway. • Probe 2 shall specify a content-length of 1800 and address an AFTN user recipient, which is routed by the IUT via the gateway (MTCU), but which can not be mapped onto a valid AFTN address by the MTCU. • Probe 3 shall specify a content-length of 1800 and address two AFTN user recipients, one which can be mapped and one which can not be mapped onto a valid AFTN address. • Probe 4 shall specify a content-length of 10.000 and address an AFTN user recipient reachable via the AMHS/AFTN gateway. • Probe 5 shall specify a content-length of 100.000 and address an AFTN user recipient reachable via the AMHS/AFTN gateway. • Probe 6 shall have a recipient argument addressing 512 AFTN users. • Probe 7 shall have a recipient argument addressing more than 512 AFTN users. Check the messages received at the AMHS Test Tool-AMHS interface. Verify that the IUT returns a report for each probe. Check the report contents and determine if it is a DR, NDR or combined report: • A DR shall be returned in response to probe 1. • A NDR shall be returned in response to probe 2. • A DR and NDR (one combined report or two reports) shall be returned in response to probe 3. • Depending on the gateway's capabilities, a DR or NDR shall be returned for probe 4 and 5. • A DR shall be returned for Probe 6. • A NDR shall be returned for Probe 7.
AMHS SARPs reference	3.1.2.3.5.5 (reception of AMHS probe), PDR M4050004, PDR M601003
Test class	Normal AMHS communications

CT422 – Reject an IPM with unsupported content-type

CT422	**Reject an IPM with unsupported content-type**
Test criteria	This test is successful, if the IUT's gateway component rejects an incoming message of content-type other than IPM 84 or IPM 88 and generates a NDR.
Scenario description	From the AMHS Test Tool send a sequence of messages to the IUT via transfer port *trp1* addressed to an AFTN user recipient. The messages shall have different values for the content-type contained in the MTE. • The 1st message shall contain a *built-in content-type* value "interpersonal-messaging-1984(2)". • The 2nd message shall contain a *built-in content-type* value "interpersonal-messaging-1988(22)". • The 3rd message shall contain a *built-in content-type* value "edi-messaging(35)". • The 4th message shall contain a *built-in content-type* value "unidentified(0)". All messages shall contain an IPM body with ATS-message-header and ATS-message-text.[11] Verify that the IUT's gateway component accepts and converts the 1st and 2nd message, but rejects the 3rd and 4th message. Verify that the IUT returns a NDR for the 3rd and 4th message containing: • "unable-to-transfer" for the *non-delivery-reason-code*, and • "content-type-not-supported" for the *non-delivery-diagnostic-code*.
AMHS SARPs reference	3.1.2.3.5.1.1
Test class	Normal AMHS communications, Erroneous AMHS parameters

[11] It is assumed that MTAs on the relay path do not verify the specified content-type against the contained body part(s) and transfer all type of messages towards the gateway (MTCU).

CT423 – Processing of the original-encoded-information-types (EIT)

CT423	**Processing of the original-encoded-information-types (EIT)**
Test criteria	This test is successful, if the IUT's gateway component evaluates the original-encoded-information-types contained in the incoming ATS message and: • accepts (and converts) the message, if it contains one of those values specified in section 3.1.2.3.5.2.1.1 of the AMHS SARPs, or • rejects the message, if it does not contain any of those values and generates a NDR.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user. The messages shall have the following values for the *original-encoded-information-types* (EIT) contained in the Message Transfer Envelope (MTE) • The 1st message shall contain *built-in-encoded-information-types* with value "ia5-text(2)". • The 2nd message shall contain *built-in-encoded-information-types* with value "unknown(0)". • The 3rd message shall contain *extended-encoded-information-types* with OID "2.6.3.4.2" for ia5-text information types. • The 4th message shall contain *extended-encoded-information-types* with OID "2.6.3.4.0" for unknown information types. • The 5th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1}. • The 6th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}. • The 7th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and OID {id-cs-eit-authority 100}. • The 8th message shall contain *extended-encoded-information-types* with (invalid) OID {id-cs-eit-authority 3}. • The 9th message shall contain *extended-encoded-information-types* with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and (invalid) OID {id-cs-eit-authority 7}. • The 10th message shall contain *built-in-encoded-information-types* with value "ia5-text(2)" and *extended-encoded-information-types* with OID "2.6.3.4.2" for ia5-text as well as OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}. The messages shall contain a body part corresponding to the (first valid) *original-encoded-information-types* value. Verify that all messages with valid EIT argument are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/X.25 test interface of the AMHS Test Tool. Verify that all messages with any invalid EIT argument are rejected by the IUT and a NDR is returned via transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, and • "encoded-information-types-unsupported" for the *non-delivery-diagnostic-code*.

AMHS SARPs reference	3.1.2.3.5.2.1.1
Test class	Normal AMHS communications and Erroneous AMHS parameters

CT 424 – Incoming IPM with extended body part of type "ia5-text-body-part"

CT424	**Incoming IPM with extended body part of type "ia5-text-body-part"**
Test criteria	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with extended body part of type "ia5-text-body-part" and converts the IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user. • The first message shall contain an <u>extended</u> body part of type "ia5-text-body-part", which includes an ATS-message-header and ATS-message-text with IA5-text characters. The *original-encoded-information-types* attribute shall contain *extended-encoded-information-types* with OID "2.6.3.4.2" (ia5-text). • The second message shall be equal except for the *original-encoded-information-types*, which has a <u>built-in</u> value for ia5-text(2)[12]. • The third message shall be equal to the first, but the *repertoire* argument in the body shall be different from ia5(5). • The fourth message shall be equal to the first, but the body part data shall contain characters different from IA5String, e.g. special characters of local language – as in German "ä", "ö" and "ü" or in French "é". Verify that the first and second message are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/X.25 test interface of the AMHS Test Tool. Verify that the other messages are converted or rejected by the IUT and an NDR is returned via transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code,* • "content-syntax-error" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to unsupported body part type" for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 2)
Test class	Normal AMHS communications

[12] It is assumed that an extended ia5-text-body-part can be associated with either a built-in EIT or extended EIT value for ia5-text.

CT425 – Incoming IPM with extended body part type "general-text-body-part" and ISO 646 repertoire

CT425	**Incoming IPM with extended body part type "general-text-body-part" and ISO 646 repertoire**
Test criteria	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with extended body part type "general-text-body-part" of which the repertoire set description is Basic (ISO 646) and converts the IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user recipient. All messages shall contain an extended body part of type "general-text-body-part", which includes an ATS-message-header and ATS-message-text with general-text data. The *original-encoded-information-types* shall be set to *extended-encoded-information-types* with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}. The message text (data part) shall include ISO 646 (US-ASCII) characters, only. The parameter argument in the IPM body part shall specify the following character sets: • The 1st message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire. • The 2nd message shall contain character set registration numbers 1 and 5. • The 3rd message shall contain character set registration numbers 2 and 5. • The 4th message shall contain an empty set of character registration. The message text (data part) shall include ISO 646 (US-ASCII – see Table 11) characters, only. Verify that only the first message is accepted by the IUT's gateway component, converted to AFTN format and received at the X.25/AFTN interface of the AMHS Test Tool. Analyse the received AFTN messages with respect to the AFTN message text. Verify that all other messages are rejected by the IUT and an NDR is returned via transfer port *trp1* with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, • "content-syntax-error" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to unsupported body part type" for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 3)
Test class	Normal AMHS communications and Erroneous AMHS parameters

20	21 !	22 "	23 #	24 $	25 %	26 &	27 '	28 (	29)	2A *	2B +	2C ,	2D -	2E .	2F /
30 0	31 1	32 2	33 3	34 4	35 5	36 6	37 7	38 8	39 9	3A :	3B ;	3C <	3D =	3E >	3F ?
40 @	41 A	42 B	43 C	44 D	45 E	46 F	47 G	48 H	49 I	4A J	4B K	4C L	4D M	4E N	4F O
50 P	51 Q	52 R	53 S	54 T	55 U	56 V	57 W	58 X	59 Y	5A Z	5B [	5C \	5D]	5E ^	5F _
60 `	61 a	62 b	63 c	64 d	65 e	66 f	67 g	68 h	69 i	6A j	6B k	6C l	6D m	6E n	6F o
70 p	71 q	72 r	73 s	74 t	75 u	76 v	77 w	78 x	79 y	7A z	7B {	7C |	7D }	7E ~	

Table 11: The ISO 646 (US-ASCII) character set

CT426 – Incoming IPM with extended body part type "general-text-body-part" and ISO 8859-1 repertoire

CT426	**Incoming IPM with extended body part type "general-text-body-part" and ISO 8859-1 repertoire**
Test criteria	This test is successful, if the IUT's gateway component processes a received ATS message (IPM) with extended body part type "general-text-body-part" of which the repertoire set description is Basic-1 (ISO 8859-1) according to its local AMHS Management Domain policy. *Note. – Depending on the local policy of the AMHS Management Domain a received message with extended body part type "general-text-body-part" of which the repertoire set description is Basic-1 (ISO 8859-1) can be converted or rejected.*
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user recipient. All messages shall contain an extended body part of type "general-text-body-part", which includes an ATS-message-header and ATS-message-text with general-text data. The *original-encoded-information-types* shall be set to *extended-encoded-information-types* with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and OID {id-cs-eit-authority 100}. The message text (data part) shall include ISO 8859-1 characters (Latin-1, Western Europe – see Table 12). The parameter argument in the IPM body part shall specify the following character sets: • The 1st message shall contain character set registration numbers 1, 6 and 100 which specify the ISO 8859-1 repertoire. • The 2nd message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire. • The 3rd message shall contain an empty set of character registration. The characters used in the message text (data part) shall be equal for all messages. Check, if the messages are converted or rejected by the IUT according to its local policy. In case of conversion, analyse the received AFTN messages with respect to the characters contained in the AFTN message text. In case of message rejection, check, if the NDR returned via transfer port *trp1* contains the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, • "content-syntax-error" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to unsupported body part type" for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 4) 3.1.2.3.5.2.1.4 b)
Test class	Normal AMHS communications and Erroneous AMHS parameters

A0	A1 ¡	A2 ¢	A3 £	A4 ¤	A5 ¥	A6 ¦	A7 §	A8 ¨	A9 ©	AA ª	AB «	AC ¬	AD -	AE ®	AF ¯
B0 °	B1 ±	B2 ²	B3 ³	B4 ´	B5 µ	B6 ¶	B7 ·	B8 ¸	B9 ¹	BA º	BB »	BC ¼	BD ½	BE ¾	BF ¿
C0 À	C1 Á	C2 Â	C3 Ã	C4 Ä	C5 Å	C6 Æ	C7 Ç	C8 È	C9 É	CA Ê	CB Ë	CC Ì	CD Í	CE Î	CF Ï
D0 Ð	D1 Ñ	D2 Ò	D3 Ó	D4 Ô	D5 Õ	D6 Ö	D7 ×	D8 Ø	D9 Ù	DA Ú	DB Û	DC Ü	DD Ý	DE Þ	DF ß
E0 à	E1 á	E2 â	E3 ã	E4 ä	E5 å	E6 æ	E7 ç	E8 è	E9 é	EA ê	EB ë	EC ì	ED í	EE î	EF ï
F0 ð	F1 ñ	F2 ò	F3 ó	F4 ô	F5 õ	F6 ö	F7 ÷	F8 ø	F9 ù	FA ú	FB û	FC ü	FD ý	FE þ	FF ÿ

Table 12: The ISO 8859-1 character set

4.5 Gateway Operations (AFTN to AMHS)

CT501 – Convert an AFTN user message to AMHS format

CT501	**Convert an AFTN user message to AMHS format**
Test criteria	This test is successful, if the IUT converts an AFTN user message to an AMHS message (IPM) correctly.
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of five messages, one for each AFTN priority, i.e. SS, DD, FF, GG, KK. The filing time shall be different for each message and the OHI field shall be empty for all messages[1]. Check the IPMs that the AMHS Test Tool receives from the IUT via the AMHS transfer port. Verify that the IUT has converted the messages correctly according to Table 3.1.2-8 of the AMHS SARPs – see section 3.1.2.3.4.2. Check message envelopes and contents. In particular, verify that: • the *ATS-message-header* and *ATS-message-text* in the IPM body part has the correct format, • the AFTN message text is correctly inserted in the *ATS-message-text* field, • the AFTN message priority is correctly inserted in the *ATS-message-priority* field, • that the IUT has translated the AFTN priority indicator and inserted the correct priority in the message transfer envelope (MTE) – see Table 13, • the addressee indicator is correctly translated in the corresponding AMHS OR address and entered as *primary-recipient* in the IPM heading and as *recipient-name* in the MTE, • the AFTN originator is translated in the AMHS OR address which was registered for identification of the AFTN originator in the AMHS and allocated to the elements *originator* (MTE), *originator-name* and the sub-component user of the element *this-IPM* (IPM heading), • the filing time is correctly inserted in the *ATS-message-header*.
AMHS SARPs reference	3.1.2.3.4.2
Test class	Normal AMHS communications

AFTN Priority Indicator	**AMHS MTE priority**	**AMHS ATS-Message-Priority priority-indicator**
SS	Urgent	SS
DD	Normal	DD
FF	Normal	FF
GG	non-urgent	GG
KK	non-urgent	KK

Table 13: Mapping of AFTN Priority Indicator for the Basic ATS Message Handling Service[2]

[1] Conversion of the optional-heading-information element is subject to another test.
[2] The mapping of the AFTN priority indicator is specified in table 3.1.2-7 of the AMHS SARPs

CT502 – Convert an AFTN user message containing optional heading information

CT502	**Convert an AFTN user message containing optional heading information**
Test criteria	This test is successful, if the IUT converts an AFTN user message containing optional heading information (OHI) correctly into an AMHS message (IPM).
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of • a normal (non-SS) priority AFTN message containing (short) OHI text, • a normal (non-SS) priority AFTN message containing OHI filling the originator line, • an SS priority AFTN message containing (short) OHI text, • an SS priority AFTN message containing OHI filling the originator line. Check the IPMs transferred via the AMHS transfer port. Verify that the IUT has converted the messages correctly. Check envelopes and contents. In particular, verify the correct format of the ATS-message-header.
AMHS SARPs reference	3.1.2.3.4.2.1.6
Test class	Normal AMHS communications

CT503 – Generate an AFTN service message of the type “Unknown Addressee Indicator”

CT503	**Generate an AFTN service message of the type “Unknown Addressee Indicator”**
Test criteria	This test is successful, if the IUT returns an AFTN service message of the type “Unknown Addressee Indicator”, if the translation of addressee indicator fails.
Scenario description	From the AMHS Test Tool send an AFTN messages over the AFTN/X.25 test interface to the IUT. The AFTN message shall contain an addressee indicator which can not be mapped by the IUT. Verify that the IUT does not convert the received AFTN message into an AMHS message (IPM), but returns an AFTN service message of the type “Unknown Addressee Indicator” over the AFTN/X.25 test interface.
AMHS SARPs reference	3.1.2.3.5.4 (NDR conversion)
Test class	Normal AMHS communications

CT504 – Incoming AFTN user message with unknown originator indicator

CT504	Incoming AFTN message with unknown originator indicator
Test criteria	This test is successful, if the IUT informs its control position, if during the conversion process the translation of the originator indicator fails.
Scenario description	From the AMHS Test Tool send an AFTN messages over the AFTN/X.25 test interface to the IUT. The AFTN message shall contain an originator indicator which is unknown in the IUT. Verify that the IUT does not send any message via the X.25/AFTN or AMHS interface but informs its control position that the gateway is not able to translate the originator indicator.
AMHS SARPs reference	3.1.2.3.4.2.1.4.1
Test class	Erroneous AMHS parameters

CT505 – Convert a receipt notification

CT505	**Convert a receipt notification**
Test criteria	This test is successful, if the IUT converts a received IPN containing a receipt notification (RN) to an AFTN acknowledgement correctly.
Scenario description	From the AMHS Test Tool send an AFTN user message with priority "SS" via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent as an IPM to the AMHS Test Tool via transfer port *trp1*. Upon receipt of the IPM the AMHS Test Tool returns a RN. Verify that the IUT converts the received RN correctly into an AFTN acknowledgement. In particular, verify that: • the *originator-name* is translated into the *Originator Indicator* of the AFTN acknowledgement,the *receipt-time* forms the *Filing Time* of the AFTN acknowledgement, logged elements of the previously handled *subject AFTN message* are used and inserted correctly into the AFTN acknowledgement.
AMHS SARPs reference	3.1.2.3.5.3 (RN conversion),
Test class	Normal AMHS communications

CT506 – Incoming non-receipt notification

CT506	Incoming non-receipt notification
Test criteria	This test is successful, if the IUT reports to its control position and stores the message, if it receives an IPN containing a NRN addressed to an AFTN user.
Scenario description	From the AMHS Test Tool send an AFTN message with priority “SS” via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port *trp1*. Upon receipt of the AMHS message the AMHS Test Tool returns a NRN. Verify that the IUT behaves as specified in the AMHS SARPs, section 3.1.2.3.5.1.2, i.e. • logs the error situation and reports to a control position, and • stores the message for appropriate processing at the control position.
AMHS SARPs reference	3.1.2.3.5.1.2 c) (processing of NRN)
Test class	Erroneous AMHS parameters

CT507 – Generate a NDR as a result of misrouted RN

CT507	**Generate a NDR as a result of misrouted RN**
Test criteria	This test is successful, if the IUT rejects a misrouted IPN containing a receipt notification (RN) and returns a NDR.
Scenario description	From the AMHS Test Tool send a RN to the IUT via transfer port trp1 addressed to an AFTN user. The RN contains a fictitious value for the subject-ipm (subject AFTN message) and is not related to any message that had previously passed the IUT. Verify that the IUT does not transfer any AFTN acknowledgement over the AFTN/X.25 test interface to the AMHS Test Tool, but generates a NDR and sends it via the transfer port *trp1* to the AMHS Test Tool. Verify that the NDR contains the following elements as specified in the AMHS SARPS, section 3.1.2.3.5.3.1.1: • “unable-to-transfer” for the *non-delivery-reason-code*; • “invalid-arguments” for the *non-delivery-diagnostic-code*; and • “unable to convert RN to AFTN ACK service message due to misrouted RN” for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.3.1.1
Test class	MHS procedural errors

CT508 – Convert a non-delivery report (NDR)

CT508	**Convert a non-delivery report (NDR)**
Test criteria	This test is successful, if the IUT converts a received NDR with a *non-delivery-diagnostic-code* of the value “unrecognised-OR-name” to an AFTN service message (SVC) of the type “Unknown Addressee”.
Scenario description	From the AMHS Test Tool send an AFTN message via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port *trp1*. The AMHS Test Tool shall return a NDR related to the received message and with a *non-delivery-diagnostic-code* of the value “unrecognised-OR-name”. Verify that the IUT converts the received NDR into an AFTN service message (SVC) and sends it over the AFTN/X.25 test interface to the AMHS Test Tool. In particular, verify that: • the *actual-recipient-name* elements (provided with the *per-recipient-fields* in the Report Transfer Content) are converted into AFTN addresses which form the *unknown-addressee-indicators* in the text of the AFTN SVC,priority indicator, addressee indicator, origin and the first-address-line of the subject message are taken from log entries made for the handled subject message, and the filing time is generated correctly by the gateway component of the IUT. • the originator indicator of the service message is the AFTN Address of the AFTN Component of the AFTN/AMHS Gateway
AMHS SARPs reference	3.1.2.3.5.4 (NDR conversion), 3.1.2.3.5.4.2.7
Test class	Normal AMHS communications

CT509 – NDR conversion process failures

CT509	**NDR conversion process failures**
Test criteria	This test is successful, if the IUT reports to its control position, whenever an error occurs in the NDR conversion process.
Scenario description	From the AMHS Test Tool send three AFTN messages via the X.25/AFTN interface to the IUT. The messages shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port *trp1*. The AMHS Test Tool shall return a NDR for each received message. • The 1st NDR shall contain a *non-delivery-diagnostic-code* different from “unrecognised-OR-name”.The 2nd NDR shall contain an unknown address in the *actual-recipient-name* element. • The 3rd NDR shall refer to a fictitious subject message that did never pass the gateway before. Check the output of the IUT at the control position. Verify that for each NDR the IUT behaves as specified in the relevant sections of the AMHS SARPs, i.e. • logs the non-delivery situation and reports to a control position, and • stores the non-delivery report for appropriate processing at the control position.
AMHS SARPs reference	3.1.2.3.5.4.1.1, 3.1.2.3.5.4.1.3
Test class	Erroneous AMHS parameters

4.6 Naming and Addressing

CT601 – Address conversion from AMHS CAAS- and XF-addresses to AFTN addresses

CT601	**Address conversion from AMHS CAAS- and XF-addresses to AFTN addresses**
Test criteria	This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators correctly. Conversion shall be correct for both types, i.e. CAAS and XF-addresses.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer ports *trp1*, *trp2* and *trp3* to the IUT, addressing different AFTN users reachable via the AFTN/X.25 port *cid1*. • The 1st ATS message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing an AFTN user in AFTNLAND-1. Note that both PRMDs (AMHSLAND-1 and AFTNLAND-1) implement the CAAS with one single organisation-name value for all location indicators within the PRMD. • The 2nd ATS message shall be sent via MTA-2 with originator from AMHSLAND-2 addressing an AFTN user in AFTNLAND-2. Note that both PRMDs (AMHSLAND-2 and AFTNLAND-2) implement the CAAS with multiple organisation-name values for different sets of location indicators within the PRMD. • The 3rd ATS message shall be sent via MTA-3 with originator from AMHSLAND-3 addressing an AFTN user in AFTNLAND-3. Note that both PRMDs (AMHSLAND-3 and AFTNLAND-3) implement the XF addressing scheme. • The 4th message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing three AFTN users, one in AFTNLAND-1, one in AFTNLAND-2 and one in AFTNLAND-3. All messages shall have an IA5-text body part with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[1]. Check the messages received at the X.25/AFTN interface. Verify that the IUT was able to map all AMHS O/R addresses to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Normal AMHS communications

[1] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

CT602 – Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses

CT602	**Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses**
Test criteria	This test is successful, if the IUT that converts an AFTN user message to AMHS translates the AFTN originator indicator and all addressee indicators into correct AMHS addresses, which may be either XF- or CAAS addresses.
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 port *cid1* to the IUT addressing different AMHS users reachable via the AMHS transfer ports *trp1, trp2* and *trp3*. • The 1st AFTN user message shall be sent with originator from AFTNLAND-1 addressing an AMHS user in AMHSLAND-1. Note that both PRMDs (AFTNLAND-1 and AMHSLAND-1) implement the CAAS with one single organisation-name value for all location indicators within the PRMD. • The 2nd ATS message shall be sent with originator from AFTNLAND-2 addressing an AMHS user in AMHSLAND-2. Note that both PRMDs (AFTNLAND-2 and AMHSLAND-2) implement the CAAS with multiple organisation-name values for different sets of location indicators within the PRMD. • The 3rd ATS message shall be sent with originator from AFTNLAND-3 addressing an AMHS user in AMHSLAND-3. Note that both PRMDs (AFTNLAND-3 and AMHSLAND-3) implement the XF addressing scheme. • The 4th message shall be sent with originator from AFTNLAND-1 addressing three AMHS users, one in AMHSLAND-1, one in AMHSLAND-2 and one in AMHSLAND-3. Check the messages received at AMHS transfer ports *trp1*, *trp2* and *trp3*. Verify that the IUT was able to map all AFTN originator and addressee indicators to AMHS O/R addresses. Verify the correct AMHS O/R addresses in the originator and recipient fields of both MTE and IPM headings.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.4.2.1.4.1 (Translation of the AFTN originator indicator) 3.1.2.3.4.2.1.4.2 (Translation of the AFTN addressee indicator)
Test class	Normal AMHS communications

CT603 – Reject an IPM with invalid recipient address (CAAS)

<table>
<tr><th>CT603</th><th>Reject an IPM with invalid recipient address (CAAS)</th></tr>
<tr><td>Test criteria</td><td>This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type CAAS which can not be mapped to a valid AFTN addressee indicator.</td></tr>
<tr><td>Scenario description</td><td>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port trp1 to the IUT addressing an AFTN user in the PRMD “AFTNLAND-1” that implements the CAAS. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[1].
The 1st ATS message shall contain a recipient address with the value “AFTN” in the organization-name attribute, which is not correct for the CAAS.
The 2nd ATS message shall contain a recipient address with an invalid common-name attribute, that contains 9 letters, e.g. “BAAAFTABC”.
The 3rd ATS message shall contain a recipient address with an invalid common-name attribute, that contains only 6 letters, e.g. “BAAAFT”.
The 4th ATS message shall contain a recipient address with a valid common-name attribute “BAAAFTAA”, but an empty organizational-unit-names attribute.
The 5th ATS message shall contain a recipient address with a valid common-name attribute “BAAAFTAA”, but an organizational-unit-names attribute that is different from the first 4 letters of the common-name attribute, e.g. “BAAX”.
Verify that for each message a NDR is generated by the IUT with the following elements:
“unable-to-transfer” for the non-delivery-reason-code, and
“unrecognised-OR-name” for the non-delivery-diagnostic-code.</td></tr>
<tr><td>AMHS SARPs reference</td><td>3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator)
3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)</td></tr>
<tr><td>Test class</td><td>Erroneous AMHS parameters</td></tr>
</table>

[1] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

CT604 – Reject an IPM with invalid recipient address (XF)

CT604	**Reject an IPM with invalid recipient address (XF)**
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type XF which can not be mapped to a valid AFTN addressee indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user in the PRMD “AFTNLAND-3” that implements the XF addressing scheme. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[1]. • The 1st ATS message shall contain a recipient address of type CAAS, which is not valid for AFTNLAND-3. • The 2nd message shall contain a recipient address with the value “AFTN” in the *organization-name* attribute, but the four letter location indicator in the *organizational-unit-names* attribute and the AFTN address in the *common-name* attribute value. • The 3rd message shall contain a recipient address with the value “AFTN” in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value “BCAAFTABC”. • The 4th message shall contain a recipient address with the value “AFTN” in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value “BCAAFT”. • The 5th message shall contain a recipient address with the value “AFTN” in the *organization-name* attribute, but an empty *organizational-unit-names* attribute. Verify that for each message a NDR is generated by the IUT with the following elements: • “unable-to-transfer” for the *non-delivery-reason-code*, and • “unrecognised-OR-name” for the *non-delivery-diagnostic-code*.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

[1] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

CT605 – Reject an IPM with invalid originator address (CAAS)

CT605	Reject an IPM with invalid originator address (CAAS)
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type CAAS which can not be mapped to a valid AFTN originator indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp1* to the IUT addressing an AFTN user reachable via the AFTN/X.25 port *cid1*. All messages shall be originated from the PRMD "AMHSLAND-1" which implements the CAAS. They shall have a valid recipient address for the PRMD "AFTNLAND-1", but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[18]. • The 1st ATS message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, which is not correct for the CAAS. • The 2nd ATS message shall contain an originator address with an invalid *common-name* attribute, e.g. "AAAAMHABC". • The 3rd ATS message shall contain an originator address with an invalid *common-name* attribute that contains only 6 letters, e.g. "AAAAMH". • The 4th ATS message shall contain an originator address with a valid *common-name* attribute "AAAAMHAA", but an empty *organizational-unit-names* attribute. • The 5th ATS message shall contain a recipient address with a valid *common-name* attribute "AAAAMHAA", but an *organizational-unit-names* attribute that is different from the first 4 letters of the *common-name* attribute, e.g. "AAAX". Verify that for each message a NDR is generated by the IUT with the following elements: • "unable-to-transfer" for the *non-delivery-reason-code*, • "invalid-arguments" for the *non-delivery-diagnostic-code*, and • "unable to convert to AFTN due to unrecognized originator O/R address" for the *supplementary-information*.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

[18] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 "Use of IPM elements" those addresses are discarded by the MTCU.

CT606 – Reject an IPM with invalid originator address (XF)

CT606	**Reject an IPM with invalid originator address (XF)**
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type XF which can not be mapped to a valid AFTN originator indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port *trp3* to the IUT addressing an AFTN user reachable via the AFTN/X.25 port *cid1*. All messages shall be originated from the PRMD "AMHSLAND-3" which implements the XF addressing scheme. They shall have a valid recipient address for the PRMD "AFTNLAND-3", but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty[1]. • The 1st ATS message shall contain an originator address of type CAAS, which is not valid for AMHSLAND-3. • The 2nd message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, but the four letter location indicator in the *organizational-unit-names* attribute and the AFTN address in the *common-name* attribute value. • The 3rd message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value "ACCCMHABC". • The 4th message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, but an invalid *organizational-unit-names* attribute, e.g. value "ACCCMH". • The 5th message shall contain an originator address with the value "AFTN" in the *organization-name* attribute, but an empty *organizational-unit-names* attribute.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters 1)

[1] Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 "Use of IPM elements" those addresses are discarded by the MTCU.

Annex C

Test Procedure
for
ATN Router Connection Test

Annex C

Of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all

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1 Introduction

1.1 This document describes the test procedure for the Ground-Ground (G/G) Aeronautical Telecommunication Network (ATN) router connection, up to 3 ATN router interconnections.

2 References

[1] Asia/Pacific Regional ATN G/G Router ICD for ISO/IEC 8202 Sub-Network.

[2] ASIA/PAC Interface Control Document (ICD) for ATN G/G Router

[3] Test Plan for AMHS Technical Trial between Hong Kong, China and Japan.

[4] "Technical Memorandum of Cooperation between Engineering & Systems Division, Civil Aviation Department, Hong Kong China and Operations and Flight Inspection Division, Civil Aviation Bureau, Ministry of Land, Infrastructure and Transport, Japan: AMHS Trials and Service between Japan and Hong Kong, China", February 2003. (Amended 24 August 2004)

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3 Test Overview and Scope

3.1 A joint ATN Router Connection Test between AMHSLAND1 and AMHSLAND2 using a 9.6kbps X.25 PSDN (packet-switched data network) circuit.

3.2 An ATN Router Connection Test is scheduled to verify the connectivity, interoperability, data relaying/routing and redundancy capabilities (where applicable) of the ATN Ground-Ground routers in AMHSLAND1 and AMHSLAND2.

3.3 The ATN Router Connection Test will also confirm that the functions of the AMHSLAND1 and AMHSLAND2 ATN routers were configured in preparation for more than 2 routers tests.

3.4 The system configuration for the test is shown in Figure 3. routers in AMHSLAND1 and AMHSLAND2 are linked by an X.25 virtual circuit (VC) over a leased line connection (e.g.64 kbps).

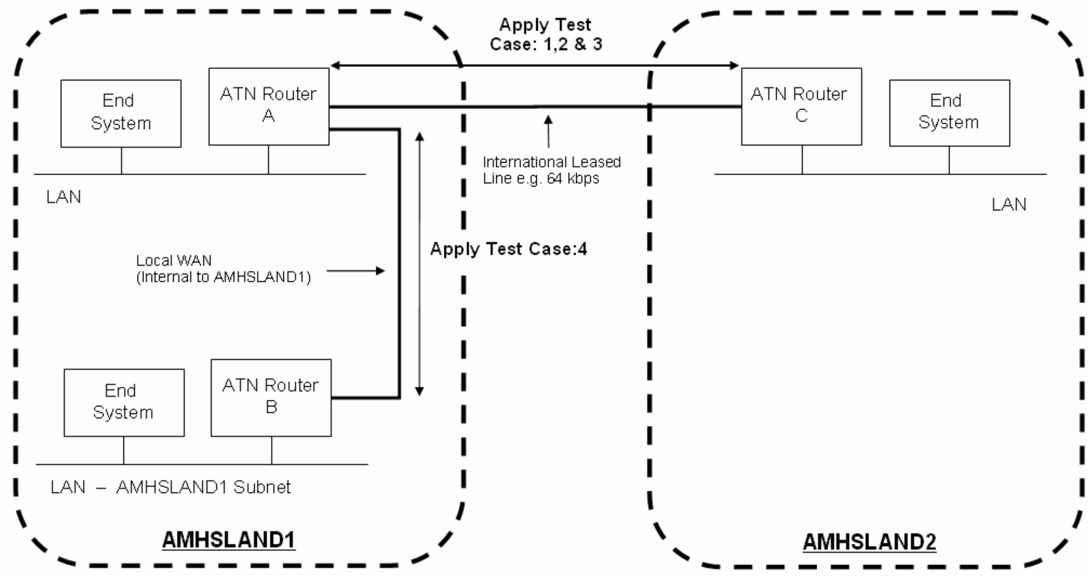


Figure 3 ATN Router Connection Test Configuration

3.5 To test data relay and routing functions, CLNP Echo Request (ERQ) Network Protocol Data Units (NPDU) will be generated by the routers and End Systems. To support these tests, all Intermediate Systems shall be capable of generating CLNP ERQ PDUs, and all Intermediate Systems and End Systems shall be capable of transmitting CLNP Echo Response (ERP) PDUs in response to the receipt of ERQ PDUs. Further, it is desirable that End Systems be capable of generating CLNP ERQ PDUs. Execution of some test items is contingent on End Systems' capabilities.

3.6 Since both AMHSLAND1 and AMHSLAND2 are ATN backbone sites, the proper updating of their routing tables should be tested in detail. This will ensure that the router could relay the data received from its counterpart to another router either within or outside its own domain/ATN site.

3.7 A summary of test items for the ATN Router Connection Test is shown in Table 5.

Table 5 Summary of Test Items for ATN Router Connection Test

No.	Test Item	Details
1	Router Connection Establishment and Maintenance	Establish LAPB, X.25 VC and IDRP connections between routers. Exchange of KEEPALIVE PDUs to maintain IDRP connection.
2	NPDU Relay	Tests to confirm CLNP Echo function of routers, correct NPDU relay, and validation of handling of PDUs with invalid security option parameter.
3	Router end-to-end tests	IDRP route addition/deletion, carrier medium failure/restoration and router failure/recovery.
4	ATN router environment tests	Multiple router route addition/deletion, carrier medium failure/restoration and router failure/recovery in three-domain configurations.

Communication Parameters

4.1 The proposed communication parameters for the connection between the routers of AMHSLAND1 and AMHSLAND2 are listed in Table 6.

4.2 The proposed CLNP communication parameters for the End Systems are listed in Table 7. It is proposed to use the NSAP addresses of the AMHS systems that will be used in actual operation for the ES NSAP addresses.

Schedule and Test Item Overview

5.1 The test items and planned schedule are shown in Table 8.

Table 6 Router Communication Parameters

Protocol	Item No.	Item	Parameter		Notes
			Router (AMHSLAND1)	Router (AMHSLAND2)	
	1.1	NSAP/NET	ROUTER A: 47.0027.81.81524A.00.010101.0302.000000000000.00 ROUTER B: 47.0027.81.854b00.00.010101.0302.000000000000.00	ROUTER C: 47.0027.81.815648.00.010101.0202.0202.012A.0100.00	1
CLNP (RPDU)	2.1	Priority	14	14	2
IDRP	3.1	NLRI	ROUTER A: 47.0027.81.81524A.00.010101 ROUTER B: 47.0027.81.854b00.00.010101	ROUTER C: 47.0027.81.815648.00.010101	
	3.2	RDI	ROUTER A: 47.0027.81.81524A.00.010101 ROUTER B: 47.0027.81.854b00.00.010101	ROUTER C: 47.0027.81.815648.00.010101	
	3.3	SecurityRegistrationID	06 04 2B 1B 00 00	06 04 2B 1B 00 00	2
	3.4	Tag Set Name	07 (ATSC Class Security Tag Set)	07 (ATSC Class Security Tag Set)	2
	3.5	ATSC Class	Class C	Class C	2
	3.6	Holding Time	180 sec	180 sec	2
	3.7	KEEPALIVE Send Timer	60 sec	60 sec	2, 3
	3.8	OPEN PDU Transmission	ROUTER A: AMHSLAND1-AMHSLAND2 : OPEN-PDU send ROUTER A: local circuit: OPEN-PDU send ROUTER B: OPEN-PDU receive	ROUTER C: AMHSLAND2 -AMHSLAND1: OPEN-PDU receive ROUTER C: local circuit: OPEN-PDU send	

Note 1: Compliant with Asia/Pacific ATN addressing plan.

Note 2: For all routers used in tests.

Note 3: The value of the KEEPALIVE send timer is the holding timer value divided by 3.

Table 6 Router Communication Parameters (continued)

Protocol	Item No.	Item	Parameter		Notes
			Router (AMHSLAND1)	Router (AMHSLAND2)	
X.25	4.1	DTE Address	ROUTER A AMHSLAND1-AMHSLAND2 : 44442000023903 ROUTER A local circuit: 44442000023903 ROUTER B local circuit: 44440110110202	ROUTER C AMHSLAND1-AMHSLAND2 : 48404701021800 ROUTER C local circuit: local matter	
	4.2	LCGN	0	0	4
	4.3	LCN	10	10	4
	4.4	Packet Size	1024	1024	4
	4.5	Window Size	7	7	4
	4.6	Window Size Negotiation	Yes	Yes	4
	4.7	CR Packet Transmission	ROUTER A AMHSLAND1-AMHSLAND2 : Caller (CR send) ROUTER A local circuit: Caller (CR send) ROUTER B local circuit: Called (CR receive)	ROUTER C AMHSLAND1-AMHSLAND2 : Called (CR receive) ROUTER C local circuit: Caller (CR send)	
	4.8	Use of SQ	Yes	Yes	4
	4.9	Packet Sequence	Modulo 8	Modulo 8	4
	4.10	Packet Negotiation	Yes	Yes	4
	4.11	D Bit	OFF	OFF	4
	4.12	M Bit	Yes	Yes	4
	4.13	Restart Request Retransmission Count (R20)	1	1	4
	4.14	Reset Request Retransmission (R22)	1	1	4
	4.15	Clear Request Retransmission Count (R23)	1	1	4
	4.16	Restart Request Timer (T20)	180 sec	180 sec	4
	4.17	DTE Call Request timer (T21)	200 sec	200 sec	4

	4.18	Reset Confirmation Timer (T22)	180 sec	180 sec	4
	4.19	DTE Clear Confirmation Timer (T23)	180 sec	180 sec	4

Note 4: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Table 6 Router Communication Parameters (continued)

Protocol	Item No.	Item	Parameter		Notes
			Router (AMHSLAND1)	Router (AMHSLAND2)	
LAPB	5.1	Address	ROUTER A AMHSLAND1-AMHSLAND2 : 03 ROUTER A local circuit: 03 ROUTER B local circuit: 01	ROUTER C AMHSLAND1-AMHSLAND2 : 01 ROUTER C local circuit: local matter	
	5.2	Max Outstanding Number	7	7	5
	5.3	Idle Channel State Timer (T3)	60 sec	60 sec	5, 6
	5.4	ACK Receipt Timer (T1)	3 sec	3 sec	5, 7
	5.5	Frame Retransmission Count	5	5	5
	5.6	Maximum Number of bits in I-Frame (N1)	8248	8248	5, 8
	5.7	Frame Sequence	Modulo 8	Modulo 8	5
Physical	6.1	Interface	X.21/V.11 (Line Speed: 64 kbps)	V.11 (Line Speed: 64 kbps)	5
	6.2	Clock	Local Matter	Local Matter	5

Note 5: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Note 6: APAC ROUTER ICD (ref. [1]) specifies router A: 18–60 seconds, router B: 12–60 seconds.

Note 7: APAC ROUTER ICD (ref. [1]) specifies 6 sec, based on 9,600bps line speed and 256 byte packets.

Note 8: Value depends on the max. X.25 packet size. N1 = packet header size (3) + packet size (bytes) + LAPB address part (1) + LAPB control part (1) + LAPB FCS part (2) in BITS. So if the packet size is 1024 bytes, then N1 is (3 + 1024 + 1 + 1 + 2) * 8 = 8248 bits.

Table 7 End System CLNP Communication Parameters

Protocol	Item No.	Item	Parameter	
			End System (AMHSLAND1)	End System (AMHSLAND2)
	7.1	NSAP	AMHSLAND1 ES: 470027.81.81524a.00.010101.0302.128001091001.01 Third domain ES: 470027.81.854b00.00.010101.0302.000000010051.01	AMHSLAND2 ES: 47.0027.81.815648.00.010101.0202.0202.8002.0100.01
CLNP	7.1	Traffic Type	1 (ATSC/No Traffic Type Policy Preference)	1 (ATSC/No Traffic Type Policy Preference)
	7.2	Security Class	1 (Unclassified)	1 (Unclassified)
	7.3	Priority	8	8
	7.4	Partial Route Recording	No	No

Table 8 Test Items and Schedule

Schedule (UTC)		Test Item No.			Description
Day	Time				
		1			**Router Connection Establishment and Maintenance**
			1	1～2	Data link establishment
			2	1～4	X.25 VC establishment
			3	1～2	IDRP connection establishment
			4	1～2	Exchange of routing information (UPDATE PDU transmission)
			5	1～2	Maintenance of IDRP connection (KEEPALIVE PDU transmission)
		2			**NPDU Relay**
			1	1～3	ERQ/ERP NPDU transmission /reply from AMHSLAND1 router to AMHSLAND2 router
			2	1～3	ERQ/ERP NPDU transmission /reply from AMHSLAND2 router to AMHSLAND1 router
			3	1～3	ERQ/ERP NPDU transmission/reply from AMHSLAND1 ES to valid destination in AMHSLAND2 domain
			4	1～3	ERQ/ERP NPDU transmission from AMHSLAND2 ES to valid destination in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
			5	1～2	ERQ NPDU transmission from AMHSLAND1 ES to unreachable ES in AMHSLAND2 domain
			6	1～2	ERQ NPDU transmission from AMHSLAND2 ES to unreachable ES in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
			7	1～2	Routing process in AMHSLAND1 router for NPDU with invalid security option parameter
			8	1～2	Routing process in AMHSLAND2 router for NPDU with invalid security option parameter (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
		3			**Router end-to-end tests**
			1	1～5	Manual router disconnection at AMHSLAND1 router and route deletion
			2	1	Route activation from AMHSLAND1 router
			3	1～5	Manual router disconnection at AMHSLAND2 router and route deletion
			4	1	Route activation from AMHSLAND2 router
			5	1～3	Carrier medium failure and route deletion at AMHSLAND1 router
			6	1	Carrier medium restoration and route addition at AMHSLAND1 router

Schedule (UTC)		Test Item No.			Description
Day	Time				
			7	1～3	Carrier medium failure and route deletion at AMHSLAND2 router
			8	1	Carrier medium restoration and route addition at AMHSLAND2 router
			9	1～2	Failure and recovery of AMHSLAND1 router (redundant configuration)
			10	1～2	Failure and recovery of AMHSLAND2 router
		4			**ATN Router Tests: Third Domain connected to AMHSLAND1**
			1	1～5	Router connection of ROUTER B to ROUTER A (ROUTER A–ROUTER C connection already established)
			2	1～5	Manual router disconnection at ROUTER A of ROUTER A–ROUTER B route
			3	1～4	Re-activation at ROUTER A of ROUTER A-ROUTER B route
			4	1～5	Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route
			5	1～4	Re-activation at ROUTER B of ROUTER A–ROUTER B route
			6	1～5	Router connection of ROUTER C to ROUTER A (ROUTER A-ROUTER B connection already established)
			7	1～5	Manual router disconnection at ROUTER C of ROUTER C–ROUTER A route
			8	1～4	Re-activation at ROUTER C of ROUTER C-ROUTER A route
			9	1～5	Manual router disconnection at ROUTER A of ROUTER C–ROUTER A route
			10	1～4	Re-activation at ROUTER A of ROUTER C–ROUTER A route
			11	1～3	Carrier medium failure of ROUTER A–ROUTER B circuit
			12	1～4	Carrier medium recovery of ROUTER A–ROUTER B circuit
			13	1～3	Carrier medium failure of ROUTER C–ROUTER A circuit
			14	1～4	Carrier medium recovery of ROUTER C–ROUTER A circuit
			15	1～2	Failure and recovery of ROUTER C
			16	1～2	Failure and recovery of ROUTER A
			17	1～2	Failure and recovery of ROUTER B
			18	1～6	End-to-End CLNP Echo Test between end systems in ROUTER C and ROUTER B domains (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)

Test Cases

The table below shows the protocol abbreviations used in sequence diagrams.

Table 9 Protocol Abbreviations

Abbreviation	Protocol	Name
SABM	LAPB	Set Asynchronous Balanced Mode
UA	LAPB	Acknowledgement frame
SQ	X.25	Restart Request
SI	X.25	Restart Indication
SF	X.25	Restart Confirmation
CR	X.25	Call Request
CC	X.25	Call Connected
CQ	X.25	Clear Request
CF	X.25	Clear Confirmation
OPEN PDU	IDRP	OPEN Protocol Data Unit
UPDATE PDU	IDRP	UPDATE Protocol Data Unit
KEEPALIVE PDU	IDRP	KEEPALIVE Protocol Data Unit
CEASE PDU	IDRP	CEASE Protocol Data Unit
ERQ NPDU	CLNP	Echo request Network PDU
ERP NPDU	CLNP	Echo response Network PDU
ER NPDU	CLNP	Error report Network PDU

Test Case 1 : Router Connection Establishment and Maintenance

a) **Objective.**

This test is to verify the establishment of LAPB data link, X.25 Virtual Circuit and IDRP connections between the AMHSLAND2 and AMHSLAND1 routers, the exchange of routing information by UPDATE PDUs, and the maintenance of the IDRP connection by the periodic exchange of KEEPALIVE PDUs. The test configuration is shown in Figure 4.

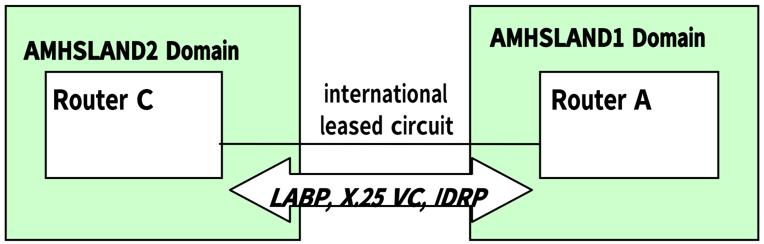


Figure 4 Configuration for router Connection & Maintenance Test

b) **Test items.**

- 1-1: Data link (LAPB) establishment
- 1-2: X.25 Virtual Circuit establishment
- 1-3: IDRP connection establishment (exchange of OPEN PDUs)
- 1-4: Exchange of routing information (exchange of UPDATE PDUs)
- 1-5: Maintenance of IDRP connection (exchange of KEEPALIVE PDUs)

Table 10 Router Connection Establishment & Maintenance Test Procedure

1. Router Connection Establishment & Maintenance		Test Item	Procedure	Result	Date/Time
Data link establishment	SABM transmission	1-1-1	Send SABM frame (address: 01) from ROUTER A and confirm ROUTER C receives it.	OK / NG	/ /
	UA transmission	1-1-2	Send UA frame (address: 03) from ROUTER C and confirm ROUTER A receives it and data link is established.	OK / NG	/ /
VC establishment	SQ transmission	1-2-1	Confirm ROUTER A sends SQ packet and ROUTER C receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	SI transmission	1-2-2	After receiving SQ packet from ROUTER A, confirm ROUTER C sends SI packet and ROUTER A receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	CR transmission	1-2-3	Confirm ROUTER A sends CR packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER C receives it.	OK / NG	/ /
	CC transmission	1-2-4	Confirm ROUTER C sends CC packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER A receives it, and VC is established.	OK / NG	/ /
IDRP connection establishment	OPEN PDU transmission from ROUTER A	1-3-1	After VC establishment, confirm ROUTER A sends an OPEN PDU. Confirm ROUTER C receives it.	OK / NG	/ /
	OPEN PDU transmission from ROUTER C	1-3-2	After receiving OPEN PDU from ROUTER A, confirm ROUTER C sends an OPEN PDU. Confirm that ROUTER A receives it, and IDRP connection is established.	OK / NG	/ /
UPDATE PDU transmission	UPDATE PDU transmission from ROUTER A	1-4-1	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and routing information for ROUTER A is added.	OK / NG	/ /

1. Router Connection Establishment & Maintenance		Test Item	Procedure	Result	Date/Time
	UPDATE PDU transmission from ROUTER C	1-4-2	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and routing information for ROUTER C is added.	OK / NG	/ /
IDRP connection maintenance	KEEPALIVE PDU transmission from ROUTER A	1-5-1	After IDRP connection established, confirm ROUTER A sends a KEEPALIVE PDU to ROUTER C every 60 seconds. At ROUTER C, confirm routing information received from ROUTER A is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /
	KEEPALIVE PDU transmission from ROUTER C	1-5-2	After IDRP connection established, confirm ROUTER C sends a KEEPALIVE PDU to ROUTER A every 60 seconds. At ROUTER A, confirm routing information received from ROUTER C is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /

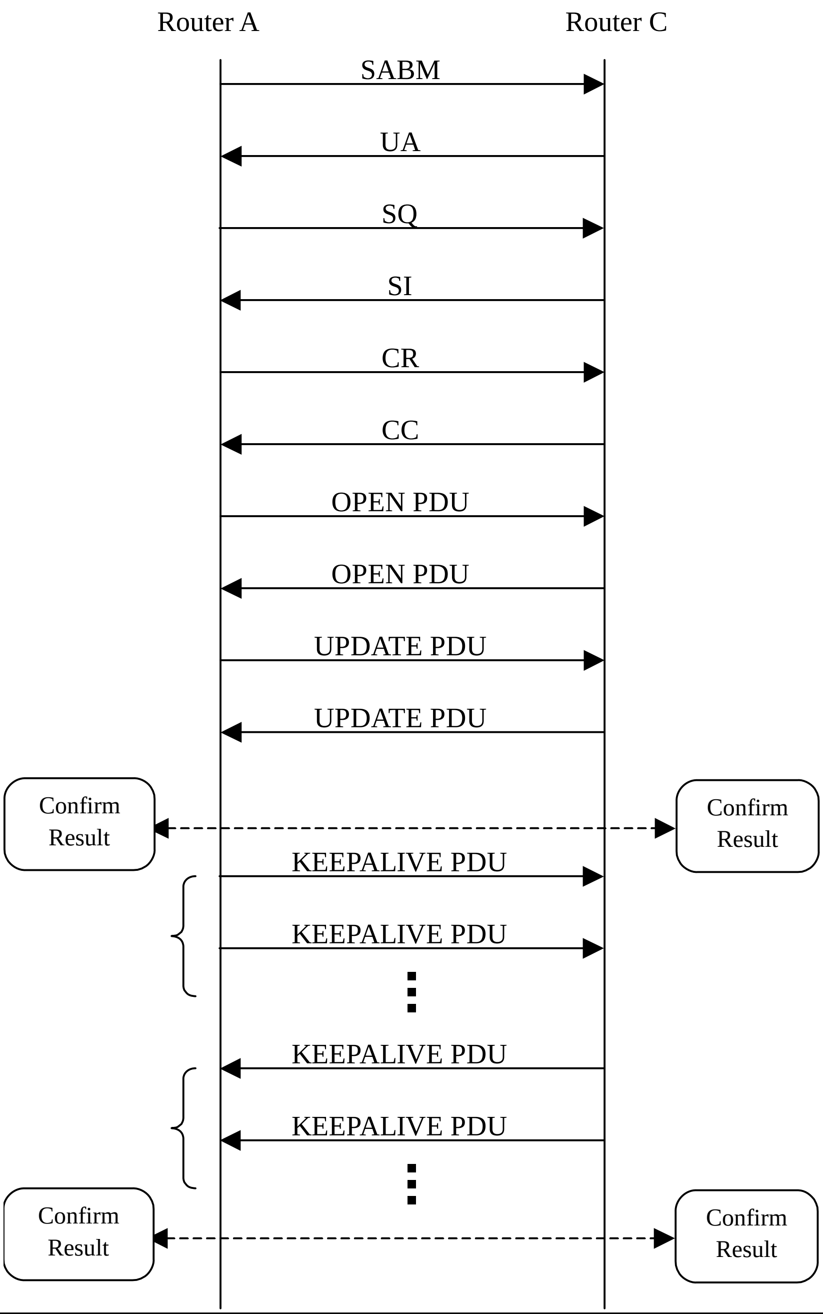
Test No.			Sequence Diagram
1	1	1	
1	1	2	
1	2	1	
1	2	2	
1	2	3	
1	2	4	
1	3	1	
1	3	2	
1	4	1	
1	4	2	
1	5	1	
1	5	2	

Figure 5 Sequence: Router Connection Establishment and Maintenance

Test Case 2 : NPDU Relay

a) **Overview.**

This test uses the CLNP Echo function to test correct relay and routing of CLNP NPDUs by the AMHSLAND2 and AMHSLAND1 routers. End Systems in both domains are used to verify end-to-end transmission of CLNP PDUs via the routers. The test configuration is shown in Figure 4. The test verifies the following:

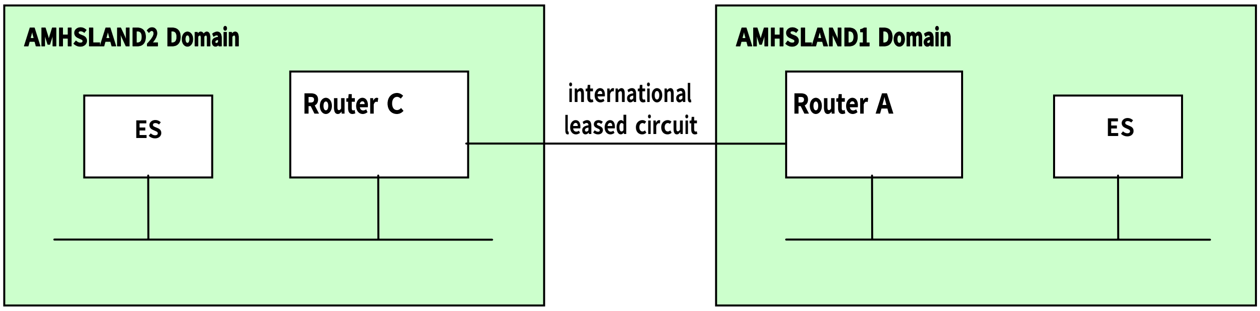
(i) CLNP Echo Request/Echo Response function of both routers.

(ii) Relay of CLNP NPDUs by routers to the peer domain.

(iii) ER-PDU returned by peer router when sending a CLNP NPDU to an unknown address in the peer domain.

(iv) Non-relay of CLNP PDUs with incorrect security parameter by own domain router .

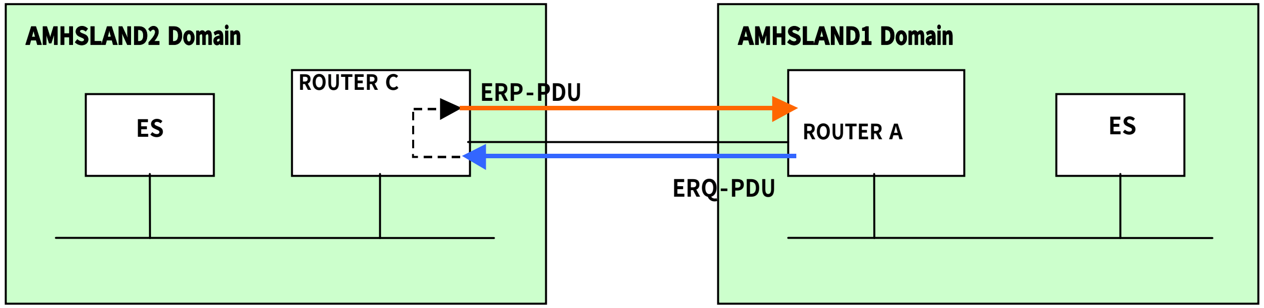
Figure 6 NPDU Transmission and Relay Test Configuration



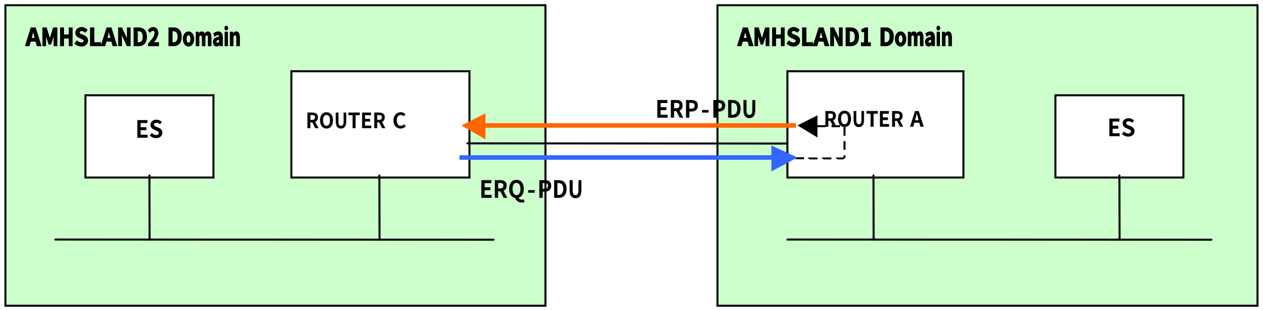
b) **Test Items.**

Note: Some of these test items may not be carried out, depending on the capability of End Systems in each domain in to transmit ERQ-PDUs.

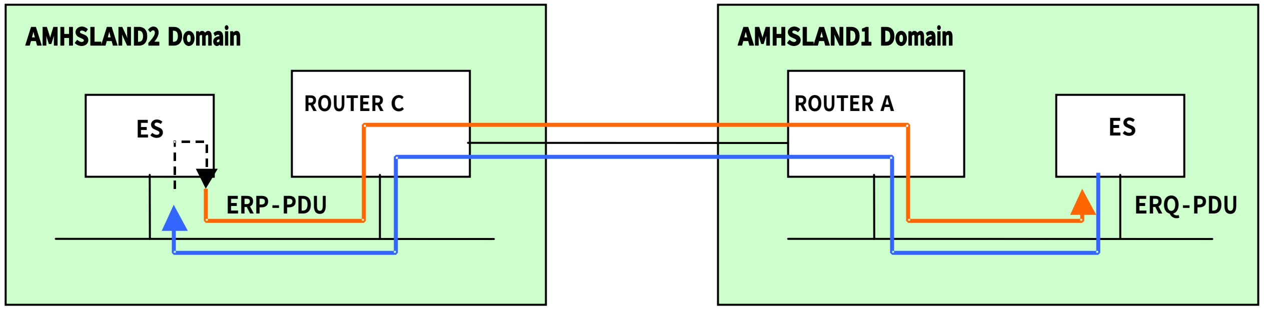
- 2-1: CLNP Echo from AMHSLAND1 router to AMHSLAND2 router.



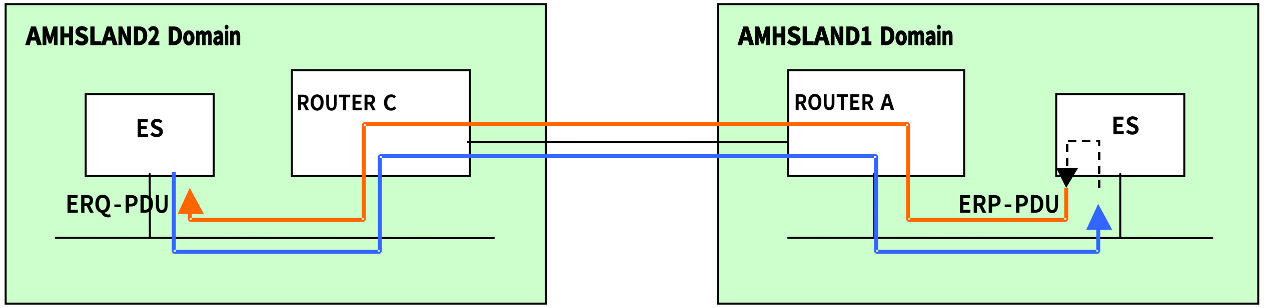
- 2-2: CLNP Echo from AMHSLAND2 router to AMHSLAND1 router .



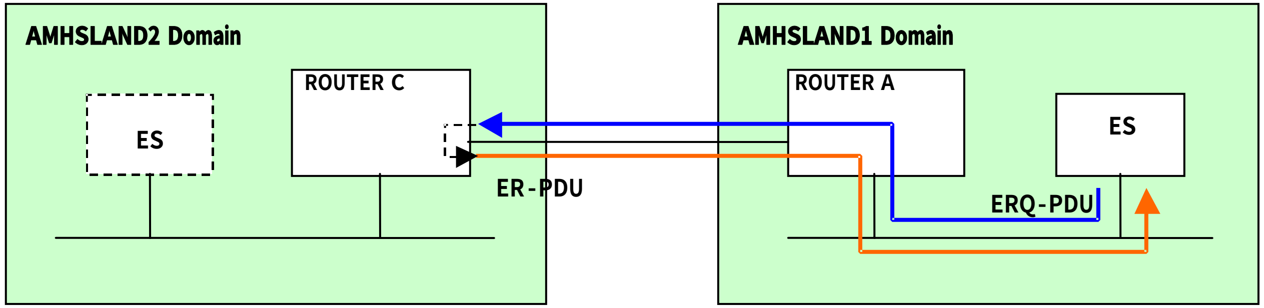
- 2-3: CLNP Echo from AMHSLAND1 End System to valid destination at AMHSLAND2.



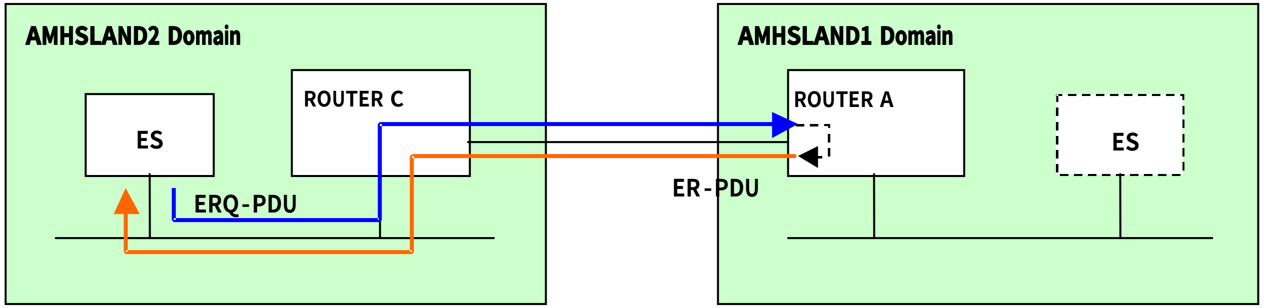
- 2-4: CLNP Echo from AMHSLAND2 End System to valid destination at AMHSLAND1.



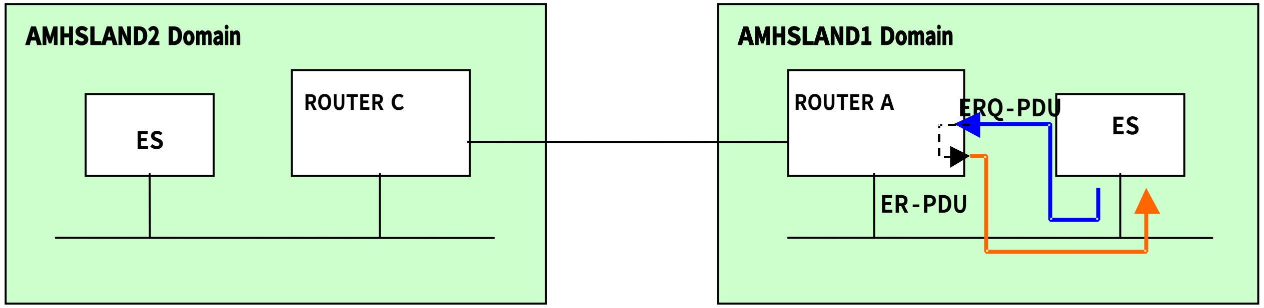
- 2-5: CLNP Echo from AMHSLAND1 End System to unreachable AMHSLAND2 End System.



- 2-6: CLNP Echo from AMHSLAND2 End System to unreachable AMHSLAND1 End System.



- 2-7: Routing process in AMHSLAND1 router for NPDU with invalid security parameter.
  Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.



- 2-8: Routing process in AMHSLAND2 router for NPDU with invalid security parameter.
  Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.

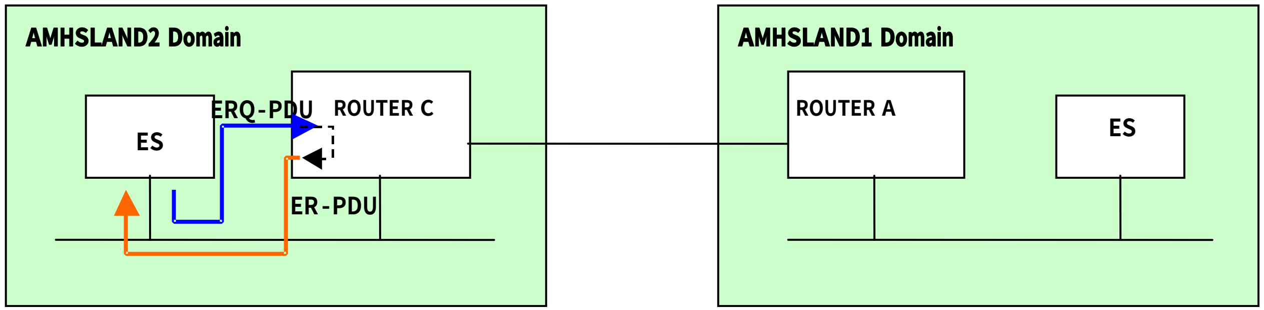


Table 11 NPDU Relay Test Procedure

2. NPDU Relay		Test Item	Procedure	Result	Date/Time
ERQ NPDU transmission from AMHSLAND 1 router	ERQ NPDU transmission	2-1-1	Send ERQ NPDU from ROUTER A to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	ERP NPDU transmission	2-1-2	After receiving ERQ NPDU, ROUTER C sends ERP NPDU to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-1-3	Repeat from 2-1-1 to 2-1-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND 2 router	ERQ NPDU transmission	2-2-1	Send ERQ NPDU from ROUTER C to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	ERP NPDU transmission	2-2-2	After receiving ERQ NPDU, ROUTER A sends an ERP NPDU to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-2-3	Repeat from 2-2-1 to 2-2-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND 1 ES	ERQ NPDU transmission	2-3-1	Send ERQ NPDU from AMHSLAND1 ES to AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	ERP NPDU transmission	2-3-2	After receiving ERQ NPDU, the AMHSLAND2 ES sends an ERP NPDU to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-3-3	Repeat from 2-3-1 to 2-3-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from	ERQ NPDU transmission	2-4-1	Send ERQ NPDU from the AMHSLAND2 ES to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /

2. NPDU Relay		Test Item	Procedure	Result	Date/Time
AMHSLAND 2 ES	ERP NPDU transmission	2-4-2	After receiving ERQ NPDU, the AMHSLAND1 ES sends an ERP NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-4-3	Repeat from 2-4-1 to 2-4-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND 1 ES to unreachable system in AMHSLAND 2 domain	ERQ NPDU transmission from AMHSLAND1 ES	2-5-1	AMHSLAND1 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND2 domain. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND2 router	2-5-2	Confirm that ROUTER C discards the ERQ NPDU from AMHSLAND1 ES. Confirm that ROUTER C sends an ER NPDU to the AMHSLAND1 ES, and that the AMHSLAND1 ES receives it.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND 2 ES to unreachable system in AMHSLAND 1 domain	ERQ NPDU transmission from AMHSLAND2 ES	2-6-1	AMHSLAND2 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND1 domain. Confirm ROUTER A receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND1 router	2-6-2	Confirm that ROUTER A discards the ERQ NPDU. Confirm that ROUTER A sends an ER NPDU to the AMHSLAND2 ES, and that the AMHSLAND2 ES receives it.	OK / NG	/ /
Routing process in AMHSLAND 1 router for	ERQ NPDU transmission from AMHSLAND1 ES	2-7-1	AMHSLAND1 ES sends an ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND2 ES. Confirm ROUTER A receives it.	OK / NG	/ /

2. NPDU Relay		Test Item	Procedure	Result	Date/Time
NPDU with invalid security option parameter	ERQ NPDU processing in AMHSLAND1 router	2-7-2	Confirm ROUTER A discards ERQ NPDU and sends an ER NPDU to AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives the ER NPDU.	OK / NG	/ /
Routing process in AMHSLAND 2 router for NPDU with invalid security option parameter	ERQ NPDU transmission from AMHSLAND2 ES	2-8-1	AMHSLAND2 ES sends ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND1 ES. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU processing in AMHSLAND2 router	2-8-2	Confirm ROUTER C discards ERQ NPDU and ROUTER C sends an ER NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives the ER NPDU.	OK / NG	/ /

Test No.			Sequence Diagram
2	1	1	
2	1	2	
2	1	3	
2	2	1	
2	2	2	
2	2	3	

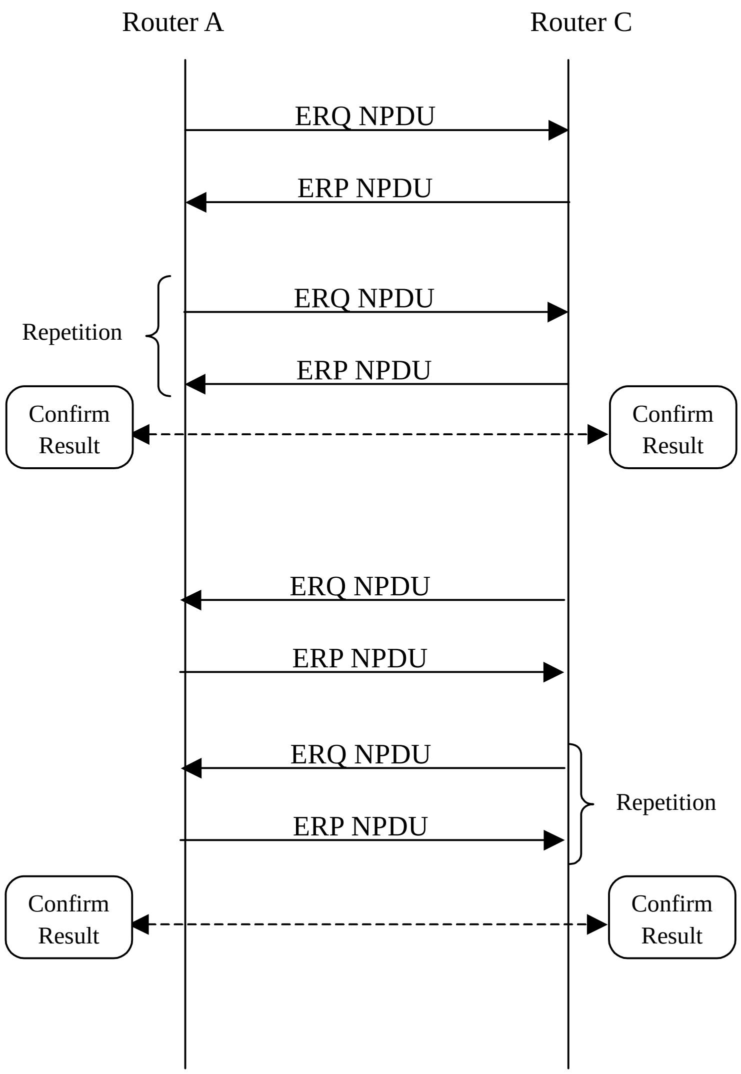


Figure 7 Sequence: NPDU Transmission between Routers

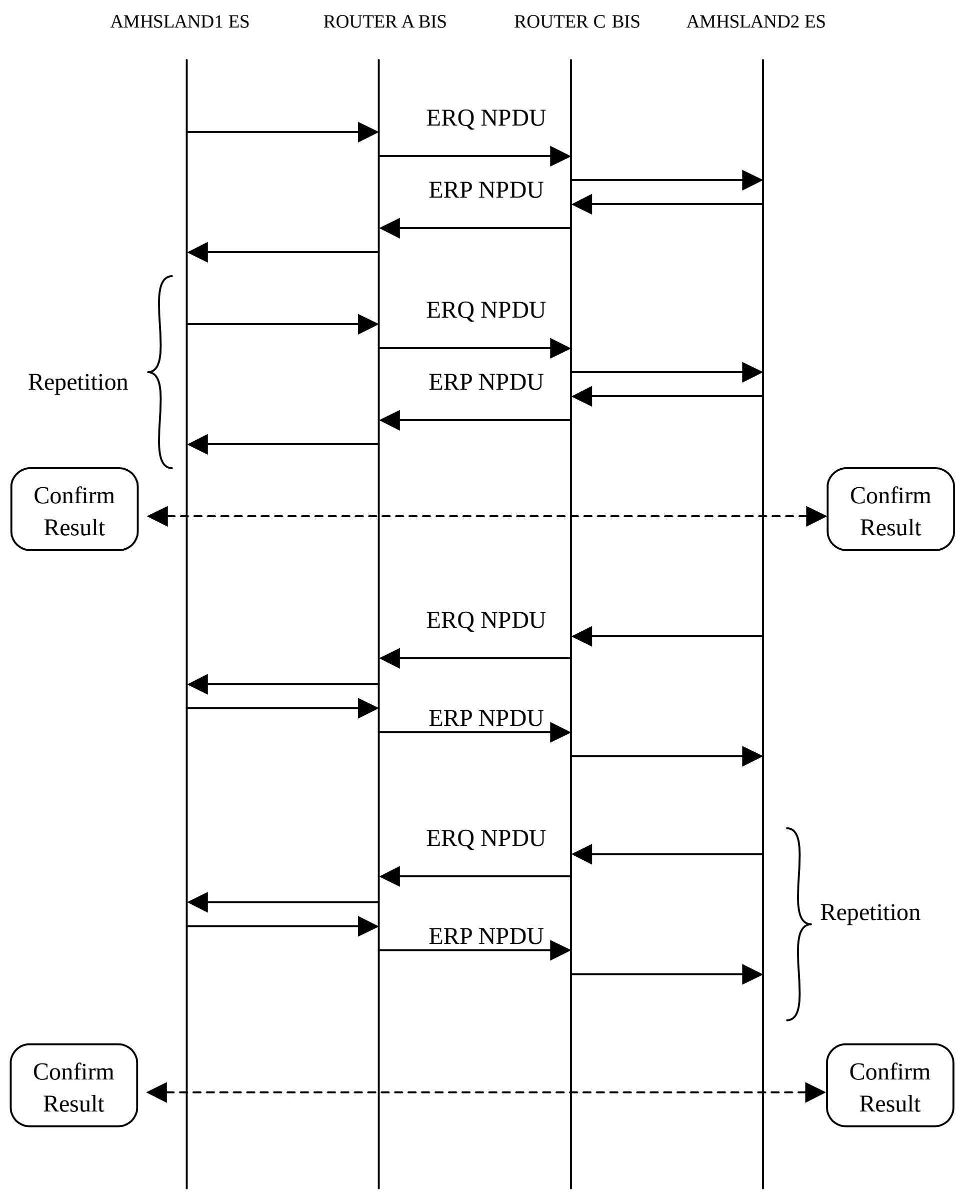
Test No.			Sequence Diagram
2	3	1	
2	3	2	
2	3	3	
2	4	1	
2	4	2	
2	4	3	

Figure 8 Sequence: NPDU Transmission between End Systems

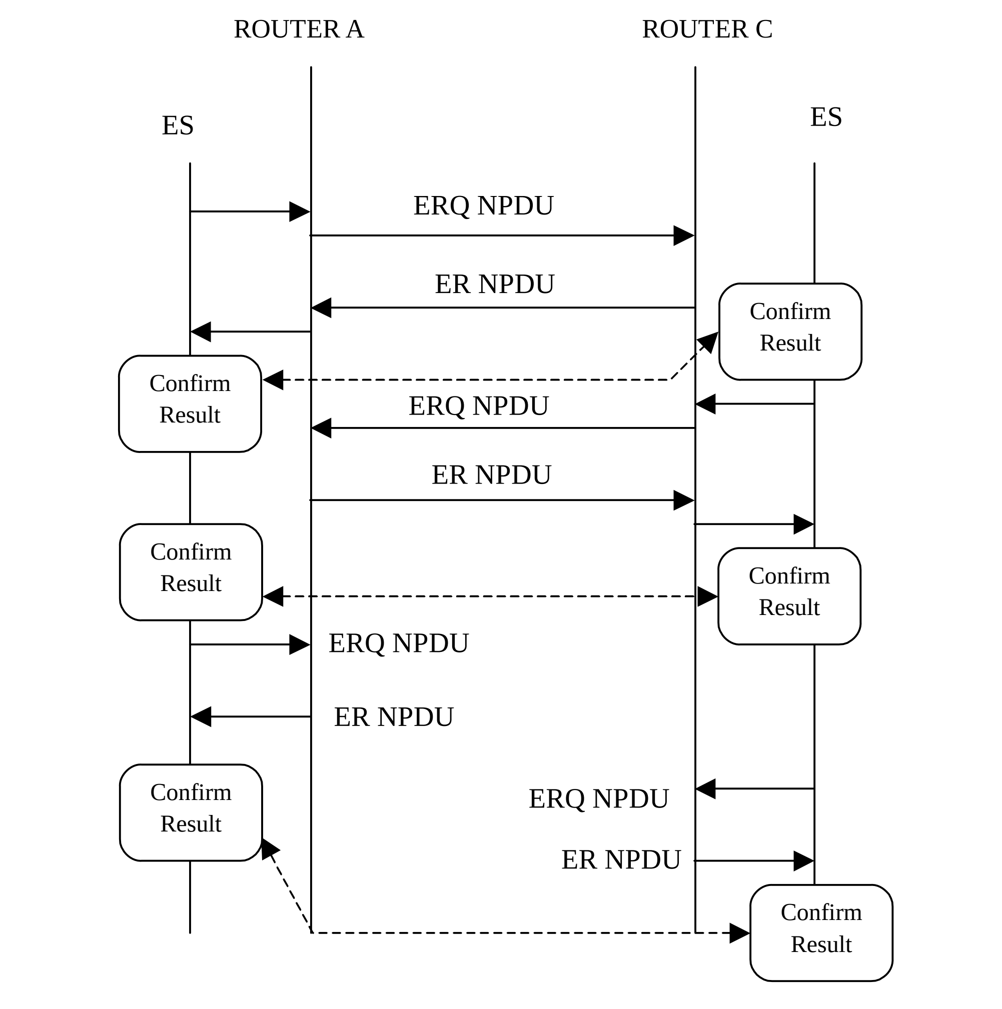
Test No.			Sequence Diagram
2	5	1	
2	5	2	
2	6	1	
2	6	2	
2	7	1	
2	7	2	
2	8	1	
2	8	2	

Figure 9 Sequence: NPDU Transmission to Unreachable ES and Handling of NPDU with Invalid Security Parameter

Test Case 3 : Router End-to-End Tests

a) **Objective**

Technical trial to verify the automatic updating of routing tables in the ATN routers through IDRP protocol with routers connecting in end-to-end configuration between AMHSLAND1 and AMHSLAND2.

b) **Test Configuration**

The configuration for this test is shown in Figure 10.

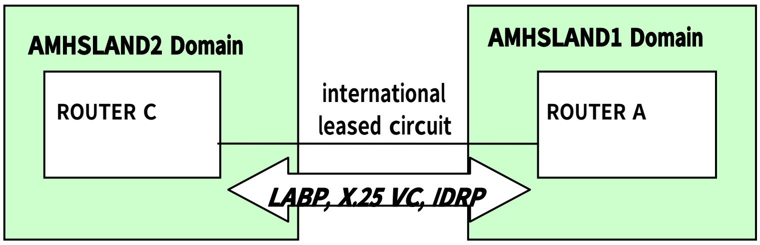


Figure 10 Router End-to-End Test Configuration

c) **Test Item Overview**

3-1: Manual router disconnection at AMHSLAND1 router and route deletion

3-2: Route addition (re-activation of connection) from AMHSLAND1 router

3-3: Manual router disconnection at AMHSLAND2 router and route deletion

3-4: Route addition (re-activation of connection) from AMHSLAND2 router

3-5: Carrier medium failure and route deletion at AMHSLAND1 router

3-6: Carrier medium restoration and route addition at AMHSLAND1 router

3-7: Carrier medium failure and route deletion at AMHSLAND2 router

3-8: Carrier medium restoration and route addition at AMHSLAND2 router

3-9: Failure and recovery of AMHSLAND1 router (redundant configuration)

3-10: Failure and recovery of AMHSLAND2 router

Note: A detailed tests of normal router connection (LAPB, X.25 VC and IDRP) is carried out in Test Items 1-1 through 1-5, and so is not repeated here.

Table 12 Router End-to-End Tests Test Procedure

3. Router End-to-End Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Manual router disconnection at AMHSLAND 1 router and route deletion	CEASE PDU transmission from AMHSLAND1 router	3-1-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends CEASE PDU.	OK / NG	/ /
	CEASE PDU transmission from AMHSLAND2 router and route deletion	3-1-2	Confirm ROUTER C receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER C sends CEASE PDU to ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND1 router	3-1-3	Confirm that ROUTER A receives CEASE PDU from ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	CQ transmission	3-1-4	After IDRP disconnected, confirm ROUTER A sends CQ packet to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	CF transmission	3-1-5	After receiving CQ packet, confirm ROUTER C sends CF packet to ROUTER A. Confirm ROUTER A receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND 1 router	Router connection restoration after disconnection	3-2-1	At ROUTER A, manually initiate router connection with ROUTER C. (VC call: originate, OPEN PDU: send.) Confirm the router connection is re-established.	OK / NG	/ /
Manual router disconnection at AMHSLAND	CEASE PDU transmission from AMHSLAND2 router	3-3-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends CEASE PDU.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
2 router and route deletion	CEASE PDU transmission from AMHSLAND1 router and route deletion	3-3-2	Confirm ROUTER A receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER A sends CEASE PDU to ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND2 router	3-3-3	Confirm that ROUTER C receives CEASE PDU from ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	CQ transmission	3-3-4	After IDRP disconnected, confirm ROUTER C sends CQ packet to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	CF transmission	3-3-5	After receiving CQ packet, confirm ROUTER A sends CF packet to ROUTER C. Confirm ROUTER C receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND 2 router	Router connection restoration after disconnection	3-4-1	At ROUTER C, manually initiate router connection to ROUTER A. (VC call: receive, OPEN PDU: receive.) Confirm the router connection is re-established.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND 1 router	Data link and VC disconnection	3-5-1	At ROUTER A, simulate a circuit failure by physically disconnecting ROUTER A from the DSU/modem. Confirm that the data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-5-2	After circuit failure, confirm IDRP connection at ROUTER A is closed.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-5-3	After circuit failure, confirm IDRP connection at ROUTER C is closed when the IDRP holding timer expires.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Carrier medium restoration and route addition at AMHSLAND 1 router	Data link, VC, and router connection re-establishment	3-6-1	At ROUTER A, restore the circuit by re-connecting ROUTER A to the DSU/modem. Confirm router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND 2 router	Data link and VC disconnection	3-7-1	At ROUTER C, simulate a circuit failure by disconnecting the leased line circuit from the modem. Confirm data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-7-2	After circuit failure, confirm IDRP connection at ROUTER C is closed when the IDRP holding timer expires.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-7-3	After circuit failure, confirm IDRP connection at ROUTER A is closed.	OK / NG	/ /
Carrier medium restoration and route addition at AMHSLAND 2 router	Data link, VC, and router connection re-establishment	3-8-1	At ROUTER C, restore circuit. Confirm the router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Failure and recovery of AMHSLAND 1 router	Failover from active to standby node	3-9-1	At ROUTER A, force failover from active node (#1) to standby node (#2) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
	Failover back to previous active node	3-9-2	At ROUTER A, force failover from active node (#2) to standby node (#1) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
Failure and recovery of AMHSLAND 2 router	Failover from active to standby node	3-10-1	At ROUTER C, force failover from active node (#1) to standby node (#2). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
	Failover back to previous active node	3-10-2	At ROUTER C, force failover from active node (#2) to standby node (#1). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

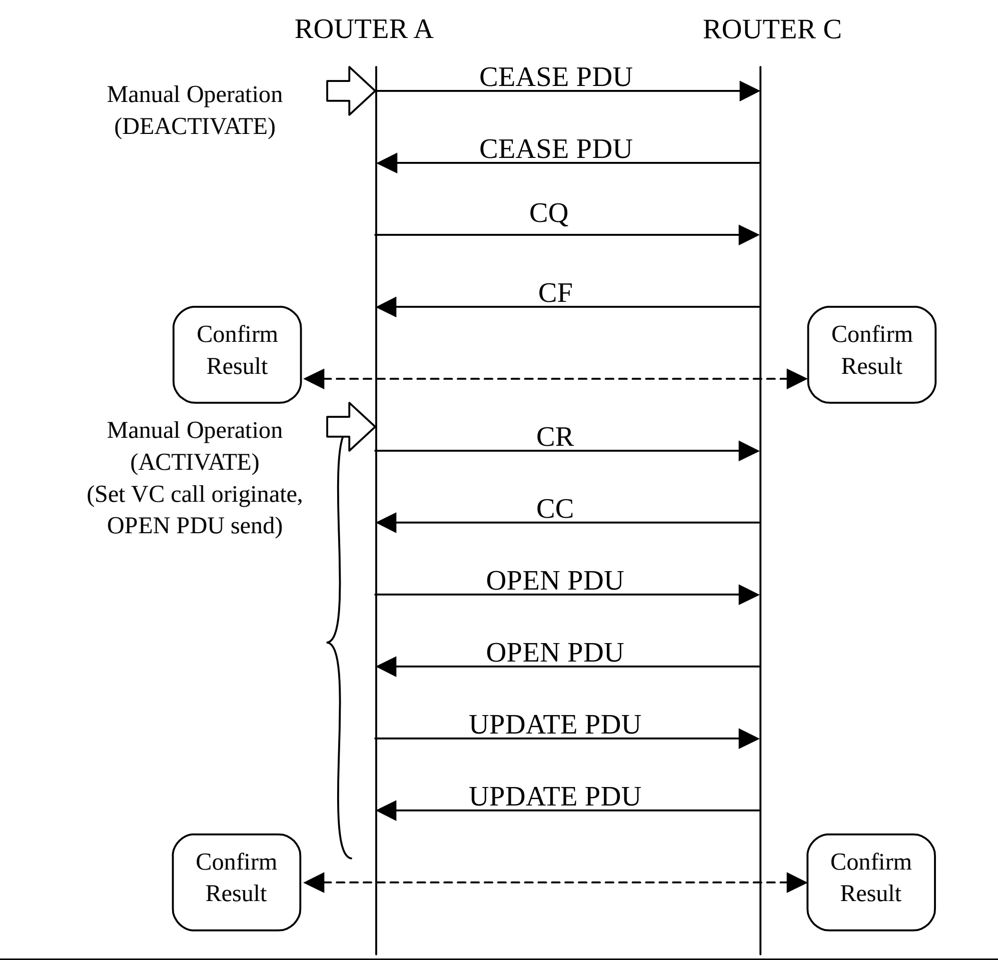
Test No.			Sequence Diagram
3	1	1	
3	1	2	
3	1	3	
3	1	4	
3	1	5	
3	2	1	

Figure 11 Sequence: Manual router Disconnection and Re-connection at AMHSLAND1 router

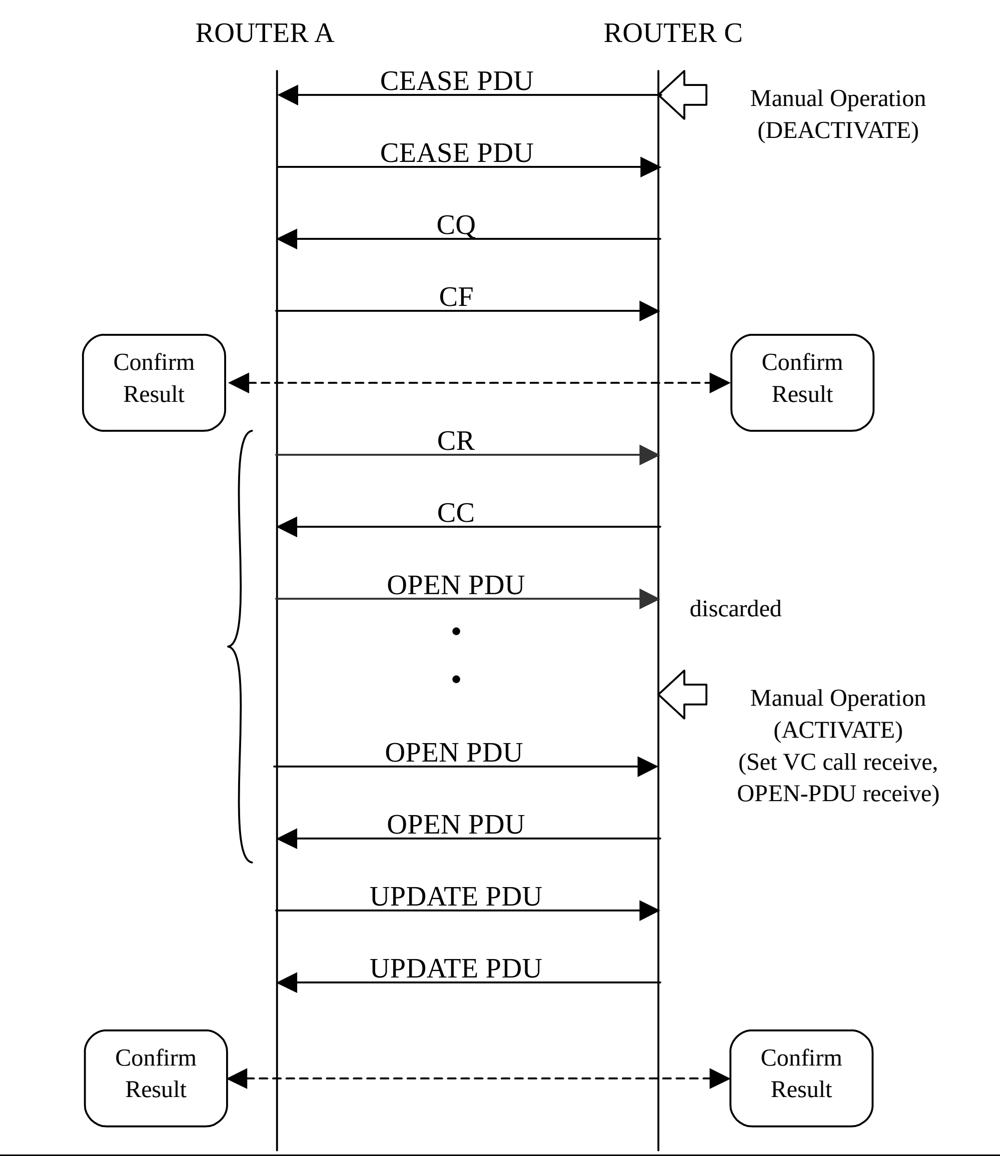
Test No.			Sequence Diagram
3	3	1	
3	3	2	
3	3	3	
3	3	4	
3	3	5	
3	4	1	

Figure 12 Sequence: Manual router Disconnection and Re-connection at AMHSLAND2 router

Test No.			Sequence Diagram
3	5	1	
3	5	2	
3	5	3	
3	6	1	

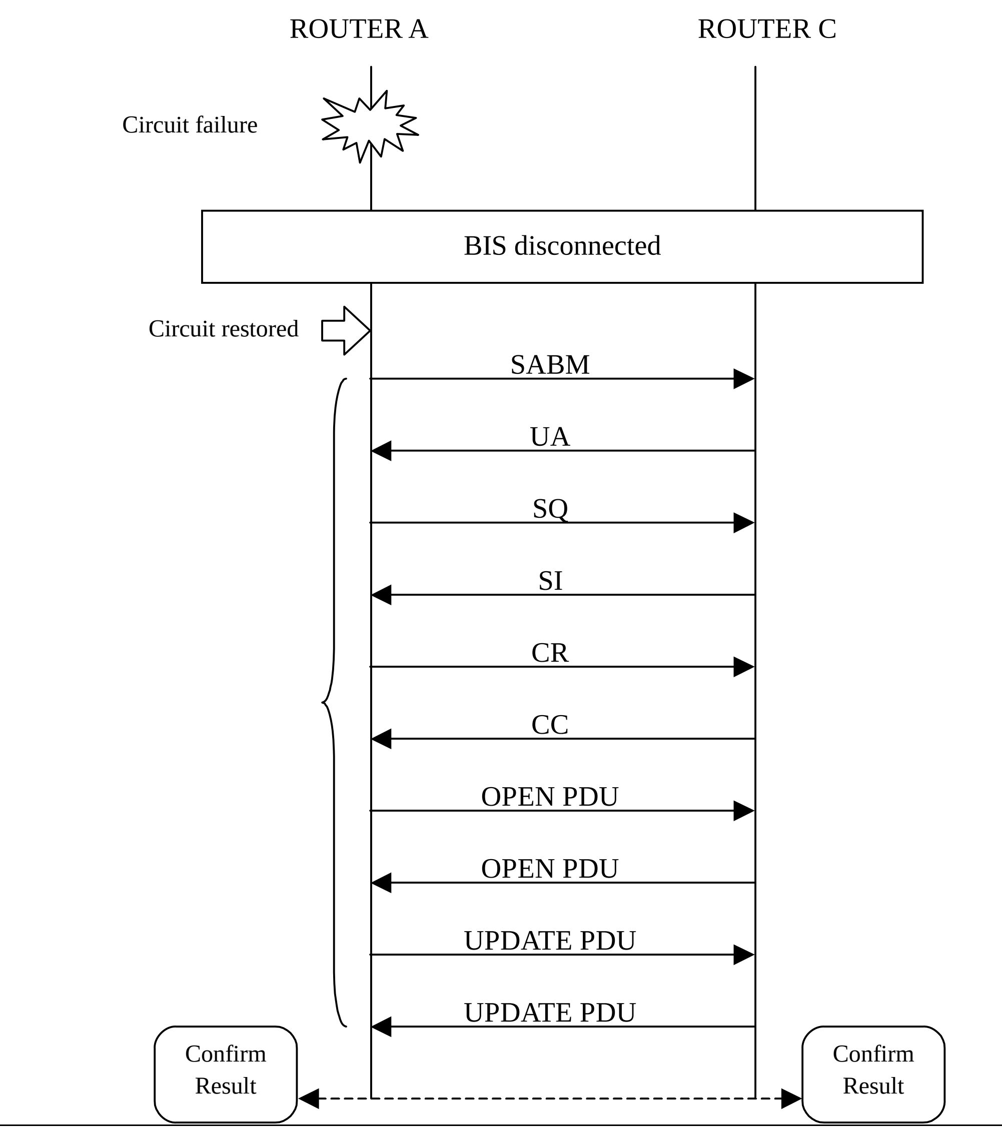


Figure 13 Sequence: Carrier medium failure and recovery at AMHSLAND1 router

Test No.			Sequence Diagram
3	7	1	
3	7	2	
3	7	3	
3	8	1	

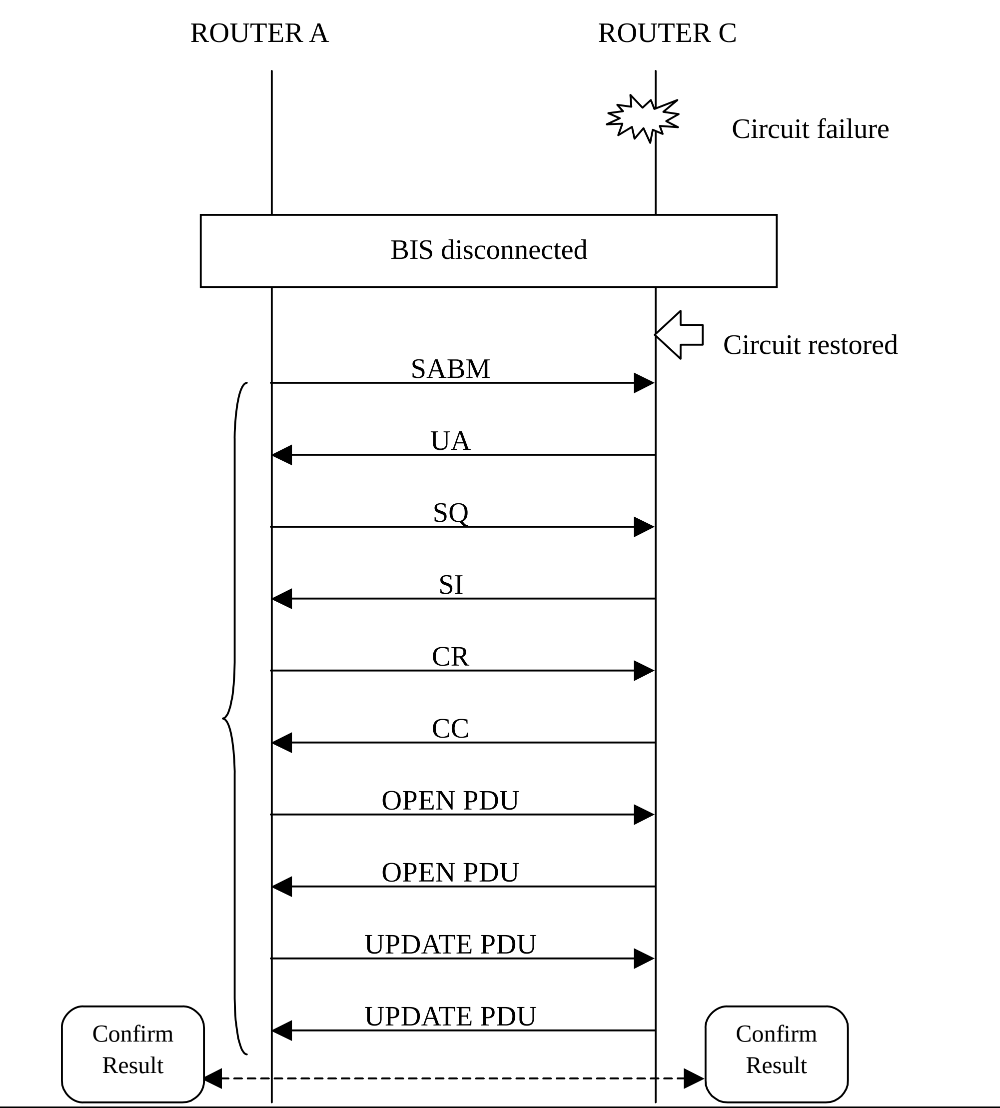


Figure 14 Sequence: Carrier medium failure and recovery at AMHSLAND2 router

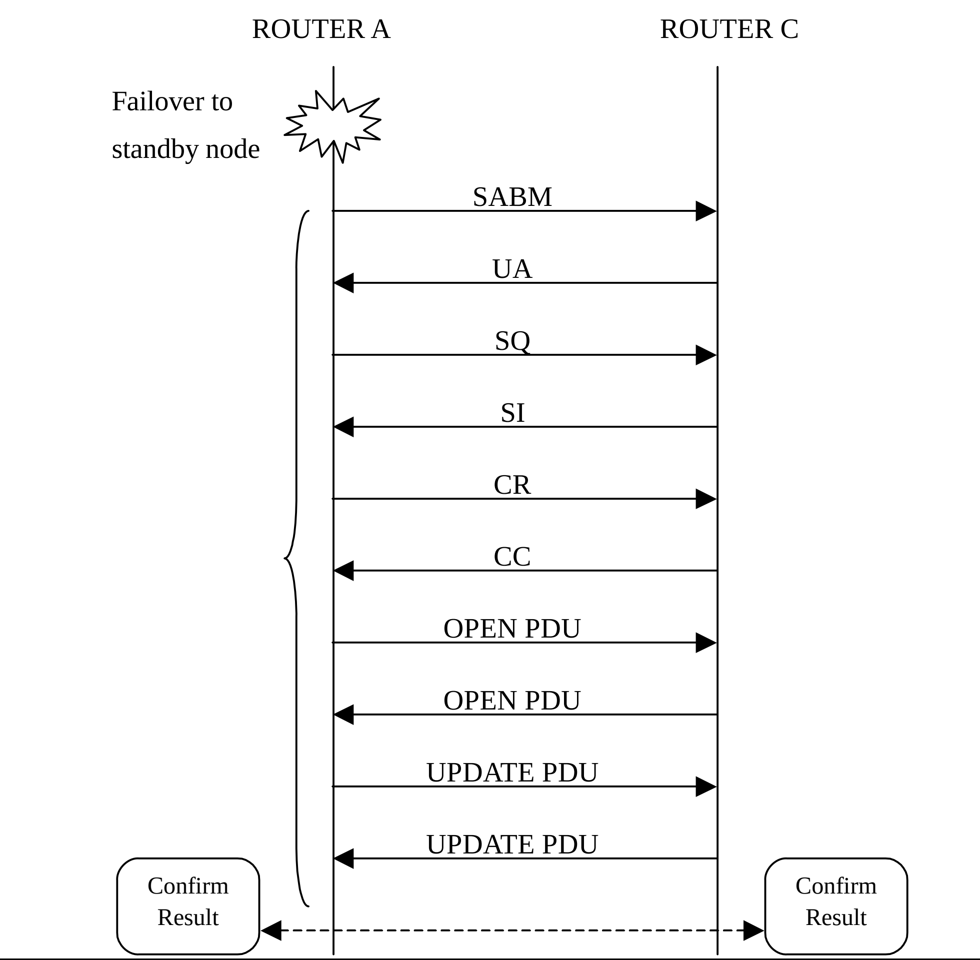
Test No.			Sequence Diagram
3 3	9 9	1 2	

Figure 15 Sequence: AMHSLAND1 router Failure and Recovery

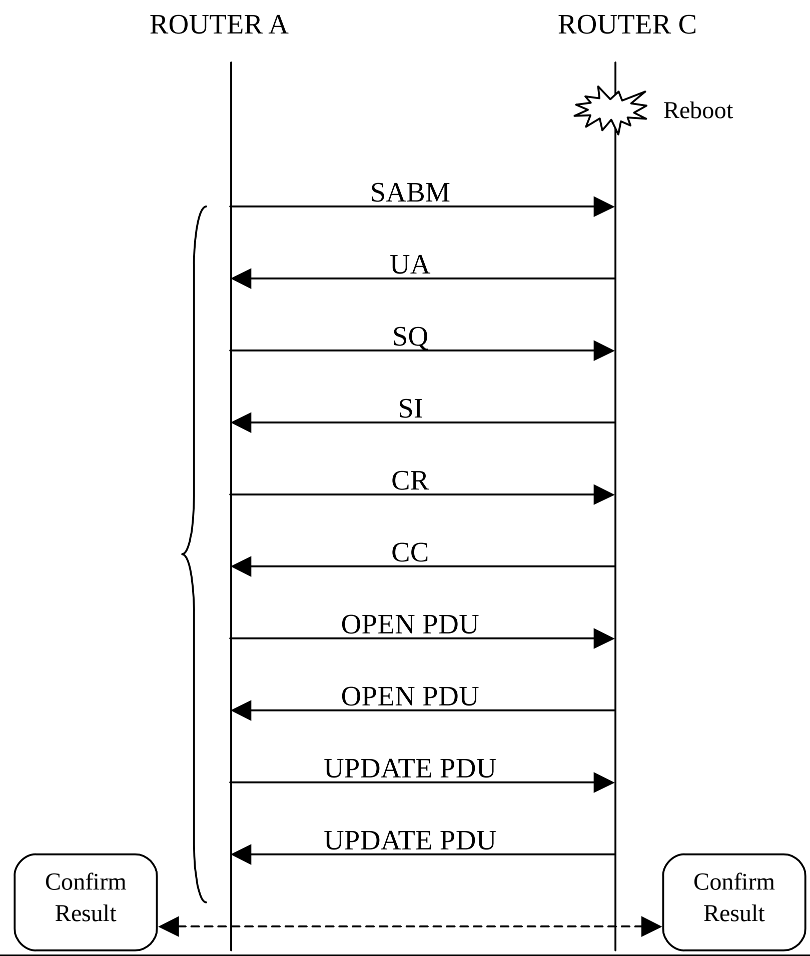
Test No.			Sequence Diagram
3	10	1	
3	10	2	

Figure 16 Sequence: AMHSLAND2 router Failure and Recovery

Test Case 4 : ATN Router Tests (This cover additional tests for subnetwork)

a) **Objective**

Technical trial to verify the automatic updating of routing tables in ATN routers through the IDRP protocol with routers connected in 3routers configurations between AMHSLAND1, AMHSLAND2 and simulated third domains connected to AMHSLAND1 and AMHSLAND2. The test configurations are shown below.

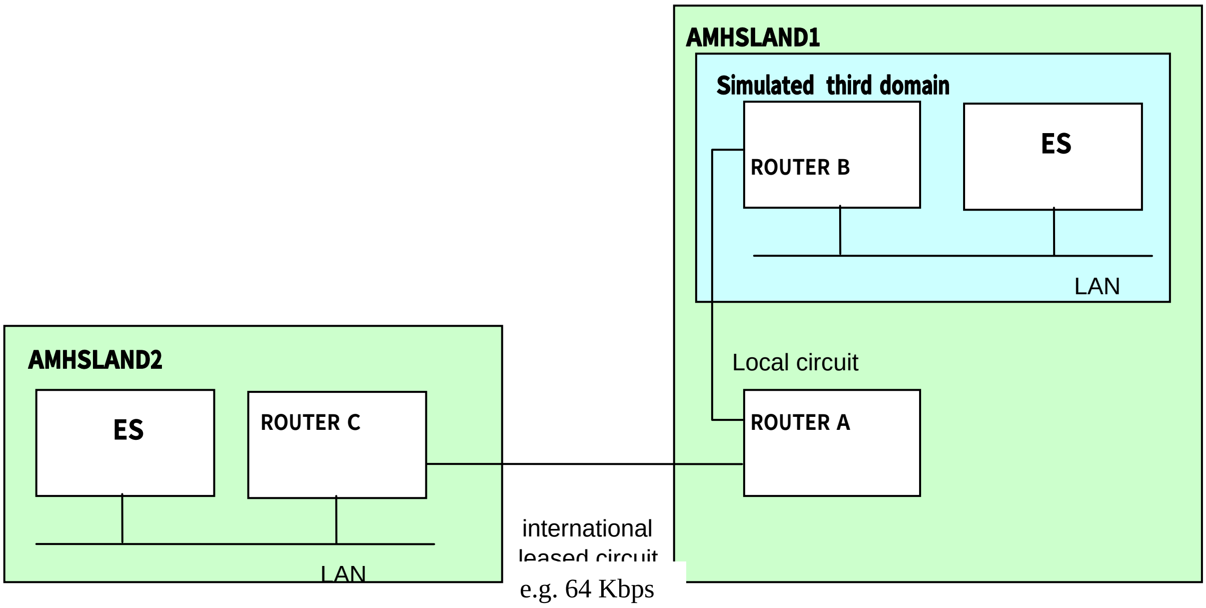


Figure 14 Test Configuration: Simulated Third Domain connected to AMHSLAND1

c) **Test Overview**

(i) Simulated third domain connected to AMHSLAND1.

ROUTER CONNECTION, DISCONNECTION AND RE-ACTIVATION

4-1: Router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C already established).

4-2,3: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.

4-4,5: Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.

4-6: Router connection of ROUTER C to ROUTER A (ROUTER B-ROUTER A already established).

4-7,8: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation.

4-9,10: Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation.

COMMUNICATION CIRCUIT FAILURE AND RECOVERY

4-11,12: Failure and recovery of ROUTER A-ROUTER B circuit.

4-13,14: Failure and recovery of ROUTER C-ROUTER A circuit.

ROUTER FAILURE AND RECOVERY

4-15: Failure and recovery of ROUTER C.

4-16: Failure and recovery of ROUTER A.

4-17: Failure and recovery of ROUTER B.

END-TO-END DATA RELAY

4-18: End-to-End CLNP Echo Test between End Systems in ROUTER C and ROUTER B domains. (Subject to End System ERQ-PDU transmission capabilities.)

Table 9 Router Connection, Disconnection and Re-activation Test Procedure: ROUTER A-ROUTER B

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Router connection of ROUTER B to ROUTER A	Data link establishment between ROUTER A and ROUTER B	4-1-1	With VC and IDRP connections established between ROUTER C and ROUTER A, switch on ROUTER B to initiate router connection. Check and confirm data link and VC are established between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP connection establishment between ROUTER A and ROUTER B	4-1-2	After VC establishment, check and confirm IDRP connection established between ROUTER A and ROUTER B by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-1-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-1-4	After IDRP connection established, confirm ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check and confirm route information of ROUTER B is updated correctly.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-1-5	At ROUTER A, after receiving UPDATE PDU from ROUTER B, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received, and that route information of ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER A	4-2-1	At ROUTER A, manually close the router connection to ROUTER B. Confirm ROUTER A sends a CEASE PDU to ROUTER B.	OK / NG	/ /
	CEASE PDU transmission from ROUTER B and route deletion	4-2-2	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER A	4-2-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /
	VC disconnection between ROUTER A and ROUTER B	4-2-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-2-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-3-1	At ROUTER A, manually initiate router connection to ROUTER B (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-3-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-3-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, check that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-3-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that route information to ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER B	CEASE PDU transmission from ROUTER B	4-4-1	At ROUTER B, manually close the router connection to ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER A and route deletion	4-4-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B. Confirm ROUTER A sends CEASE PDU to ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /
	Route deletion at ROUTER B	4-4-3	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /
	VC disconnection between ROUTER A and ROUTER B	4-4-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-4-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER B	Router connection re-activation from ROUTER B	4-5-1	At ROUTER B, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-5-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-5-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-5-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /

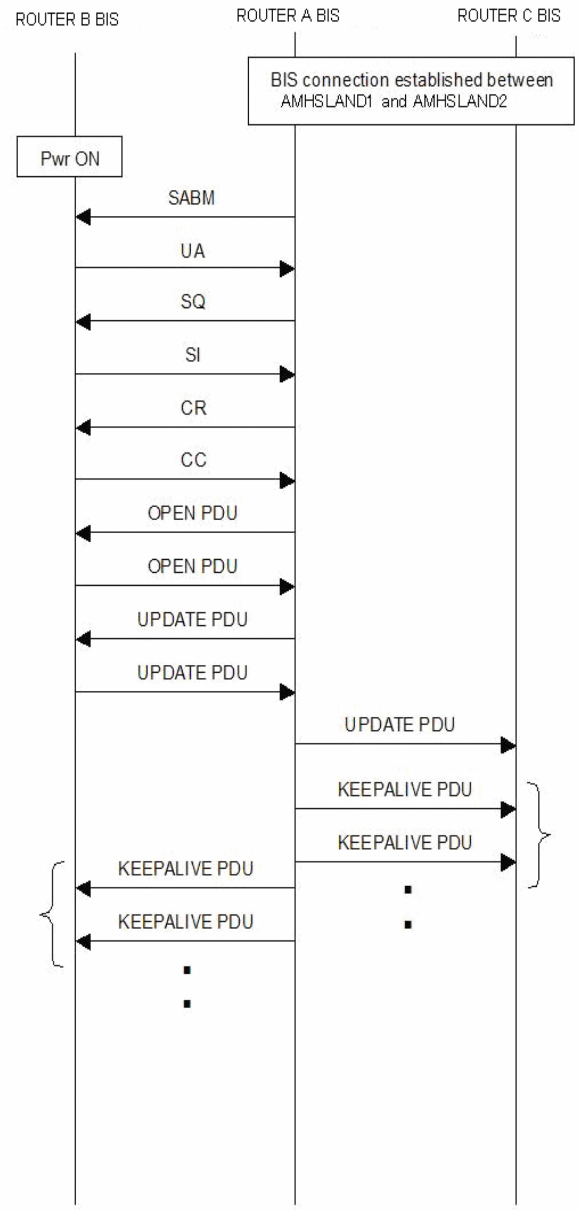
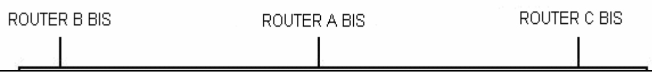
Test No.			Sequence Diagram
4	1	1	
4	1	2	
4	1	3	
4	1	4	
4	1	5	

Figure 15 Sequence: router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C already established)

Test No.			Sequence Diagram

4	2	1	
4	2	2	
4	2	3	
4	2	4	
4	2	5	
4	3	1	
4	3	2	
4	3	3	
4	3	4	

Figure 16 Sequence: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.

Test No.			Sequence Diagram
			

4	4	1	
4	4	2	
4	4	3	
4	4	4	
4	4	5	
4	5	1	
4	5	2	
4	5	3	
4	5	4	

Figure 17 Sequence: Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.

Table 10 Router Connection, Disconnection and Re-activation Test Procedure: ROUTER C-ROUTER A

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Router connection of ROUTER C to ROUTER A	Data link establishment between ROUTER C and ROUTER A	4-6-1	With VC and IDRP connections established between ROUTER A and ROUTER B, at ROUTER A, initiate router connection to ROUTER C. Check and confirm data link and VC are established between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP connection establishment between ROUTER C and ROUTER A	4-6-2	After VC establishment, check and confirm IDRP connection established between ROUTER C and ROUTER A by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-6-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-6-4	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm route information of ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-6-5	At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, confirm that route information of ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER C	4-7-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	4-7-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C. Confirm ROUTER A sends CEASE PDU to ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER C	4-7-3	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-7-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-7-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER C	Router connection re-activation from ROUTER C	4-8-1	At ROUTER C, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-8-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-8-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-8-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER A	CEASE PDU transmission from ROUTER A	4-9-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends a CEASE PDU to ROUTER C.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER C and route deletion	4-9-2	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	Route deletion at ROUTER A	4-9-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-9-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-9-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-10-1	At ROUTER A, manually initiate router connection to ROUTER C (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-10-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-10-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-10-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /

Test No.			Sequence Diagram
4	6	1	
4	6	2	
4	6	3	
4	6	4	
4	6	5	

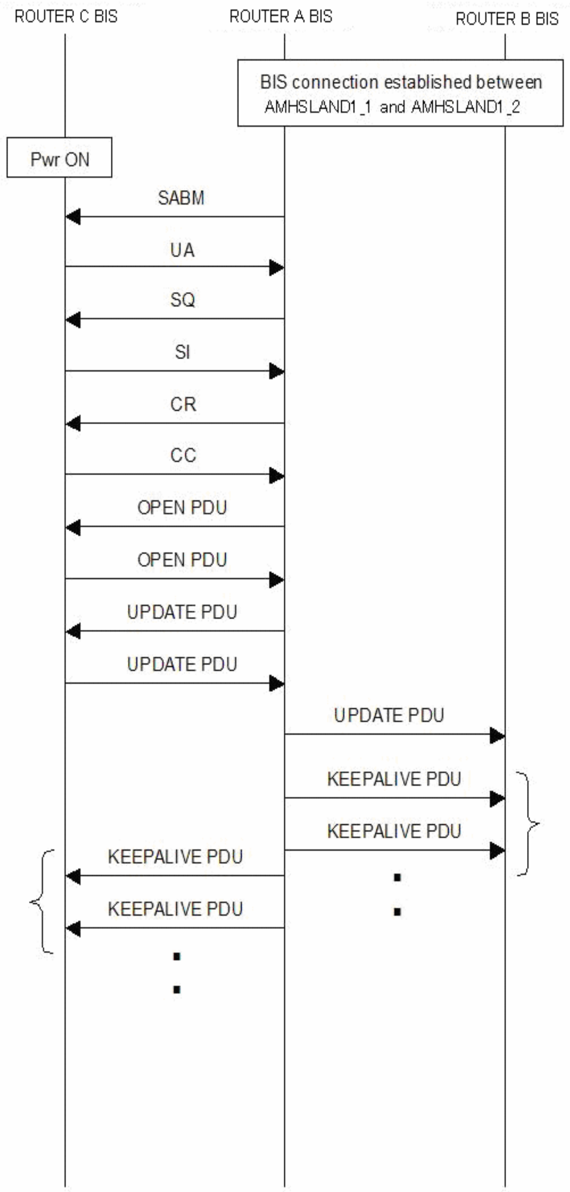


Figure 18 Sequence: Router connection of ROUTER C to ROUTER A (ROUTER B-ROUTER A already established)

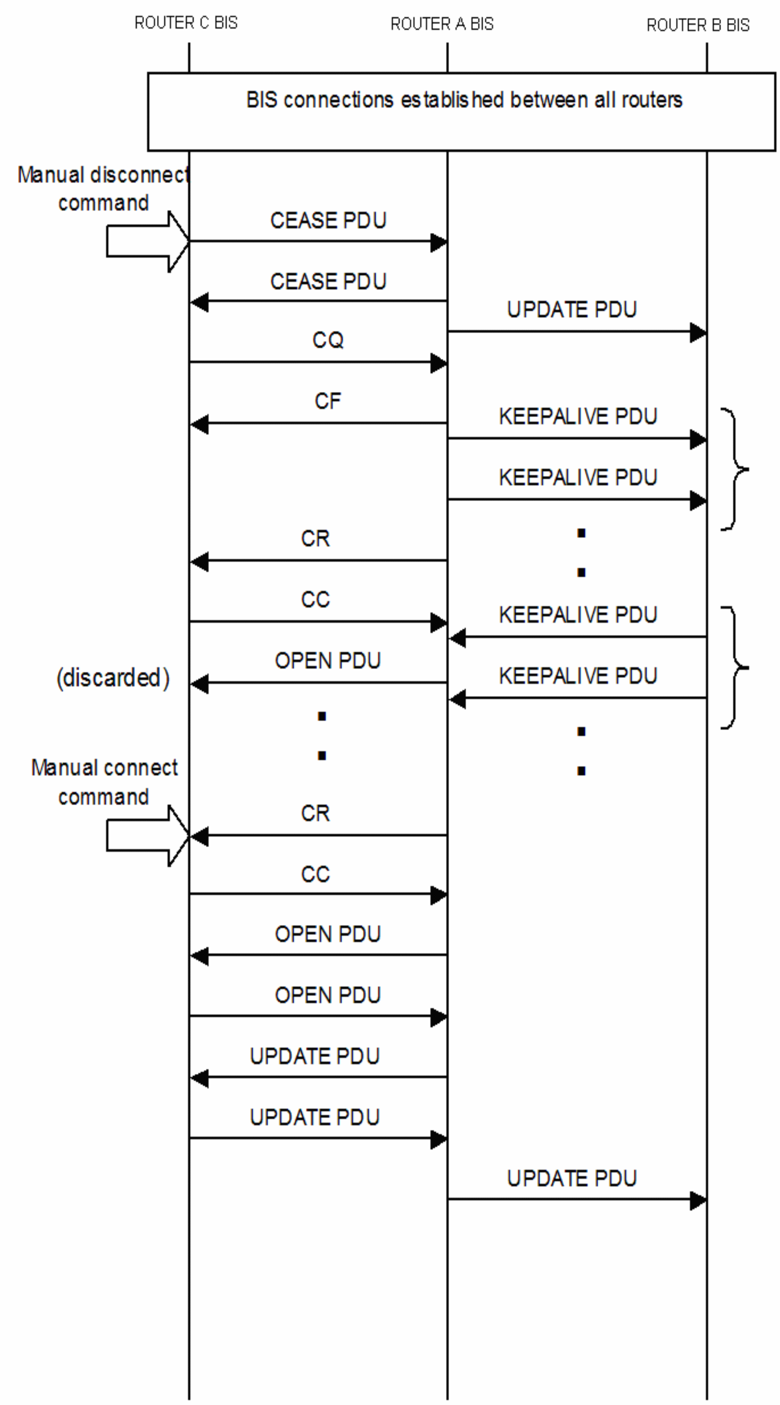
Test No.			Sequence Diagram
4	7	1	
4	7	2	
4	7	3	
4	7	4	
4	7	5	
4	8	1	
4	8	2	
4	8	3	
4	8	4	

Figure 19 Sequence: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation

Test No.			Sequence Diagram
4	9	1	
4	9	2	
4	9	3	
4	9	4	
4	9	5	
4	10	1	
4	10	2	
4	10	3	
4	10	4	

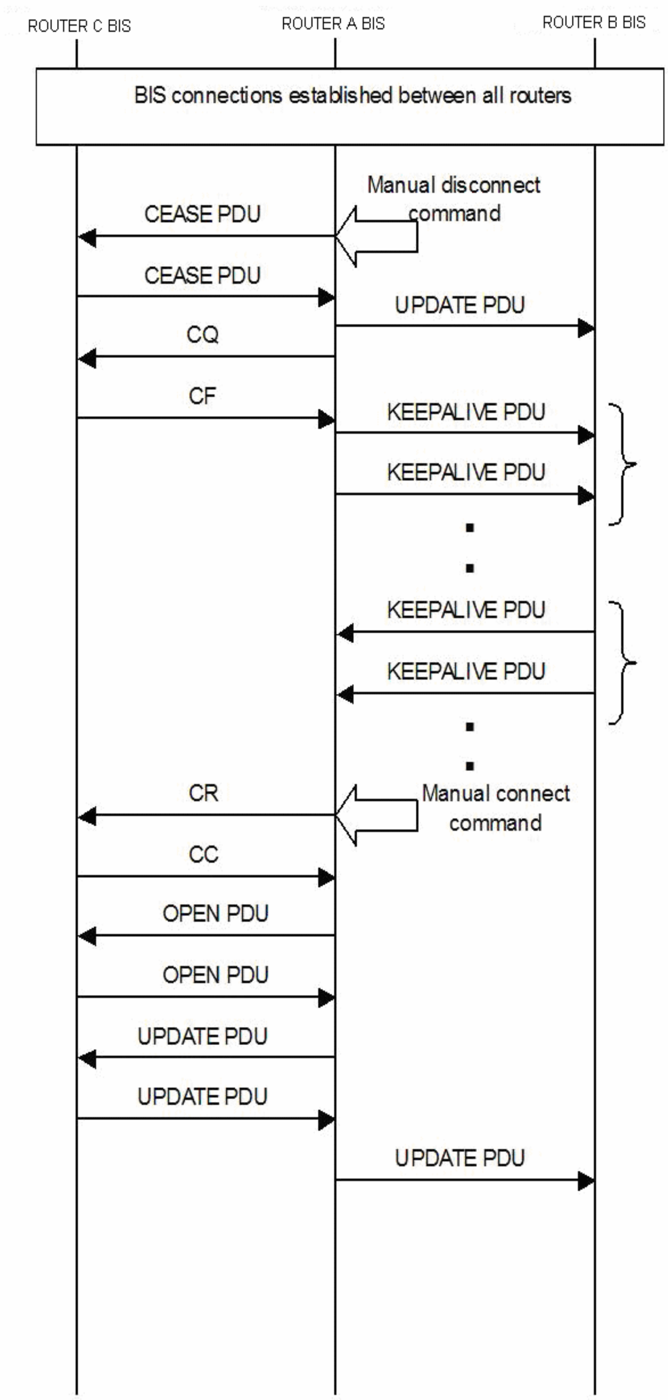


Figure 20 Sequence: Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation

Table 11 Communication Circuit Failure and Recovery Test Procedure: Third Domain connected to AMHSLAND1

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Carrier media failure of ROUTER A-ROUTER B circuit and route deletion	Data link and VC disconnection	4-11-1	Simulate carrier medium failure between ROUTER A and ROUTER B by disconnecting WAN cable from ROUTER B. Check and confirm data link and VC are disconnected between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP disconnection and route update	4-11-2	Check and confirm that IDRP connection between ROUTER A and ROUTER B is closed. At ROUTER A, check that route information for ROUTER B is deleted. At ROUTER B, check that route information for ROUTER A and ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-11-3	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER A-ROUTER B circuit and route addition	Data link, VC, and router connection re-establishment	4-12-1	Restore the ROUTER A-ROUTER B router connection. Confirm router connection is re-established between ROUTER A and ROUTER B.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-12-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B	4-12-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check that route information is added for ROUTER B.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	UPDATE PDU transmission from ROUTER A	4-12-4	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER B.	OK / NG	/ /
Carrier media failure of ROUTER C-ROUTER A circuit and route deletion	Data link and VC disconnection	4-13-1	Simulate carrier medium failure between ROUTER C and ROUTER A by disconnecting WAN cable from ROUTER C. Check and confirm data link and VC are disconnected between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP disconnection and route update	4-13-2	Check and confirm that IDRP connection between ROUTER C and ROUTER A is closed. At ROUTER C, check that route information for ROUTER A and ROUTER B are deleted. At ROUTER A, check that route information for ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-13-3	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER C-ROUTER A circuit and route addition	Data link, VC, and Router connection re-establishment	4-14-1	Restore the ROUTER C-ROUTER A router connection. Confirm router connection is re-established between ROUTER C and ROUTER A.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-14-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C	4-14-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, check that route information is added for ROUTER C.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	UPDATE PDU transmission from ROUTER A	4-14-4	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER C.	OK / NG	/ /

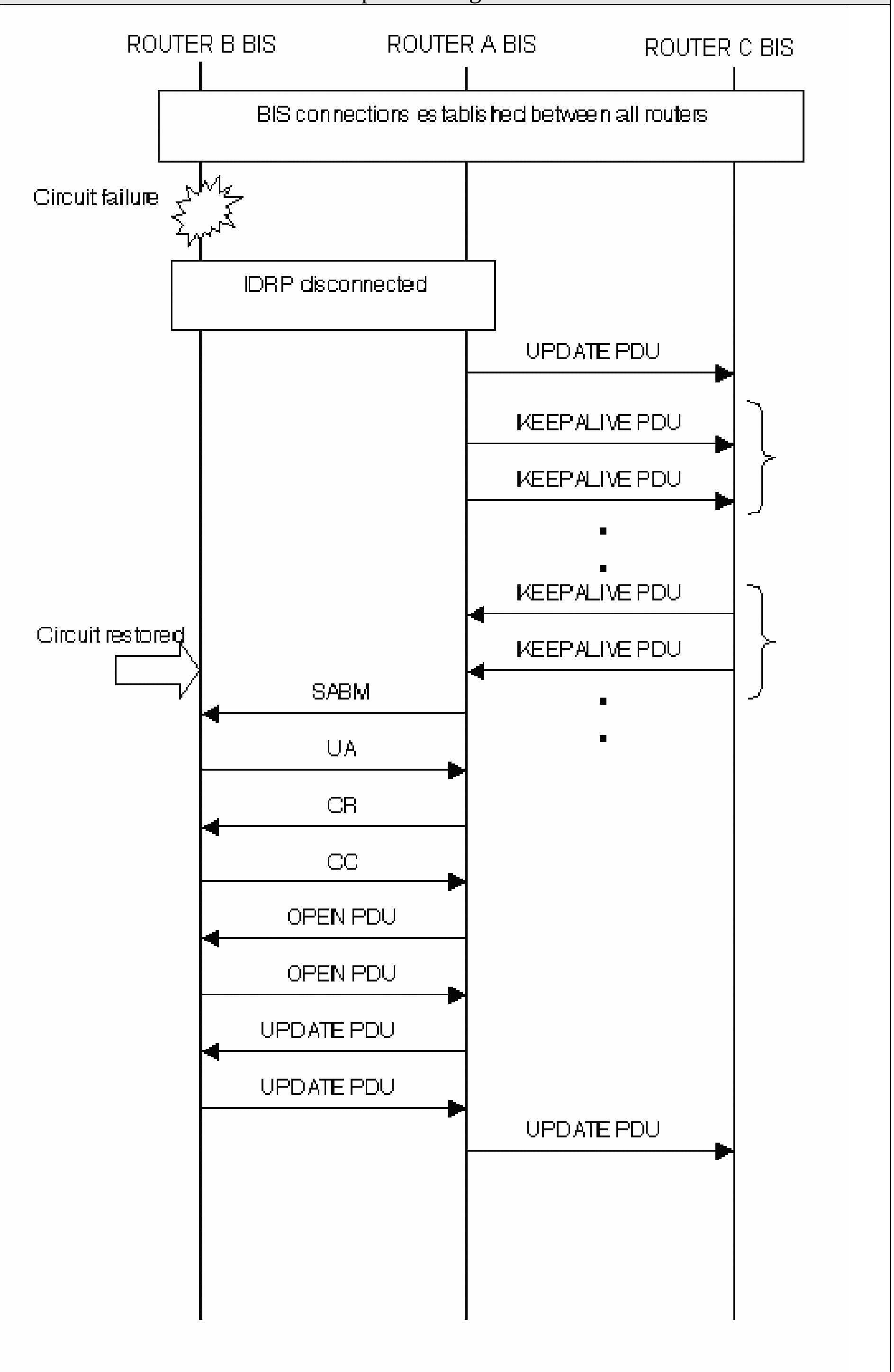
Test No.			Sequence Diagram
4	11	1	
4	11	2	
4	11	3	
4	12	1	
4	12	2	
4	12	3	
4	12	4	

Figure 21 Sequence: Failure and recovery of ROUTER B-ROUTER A circuit

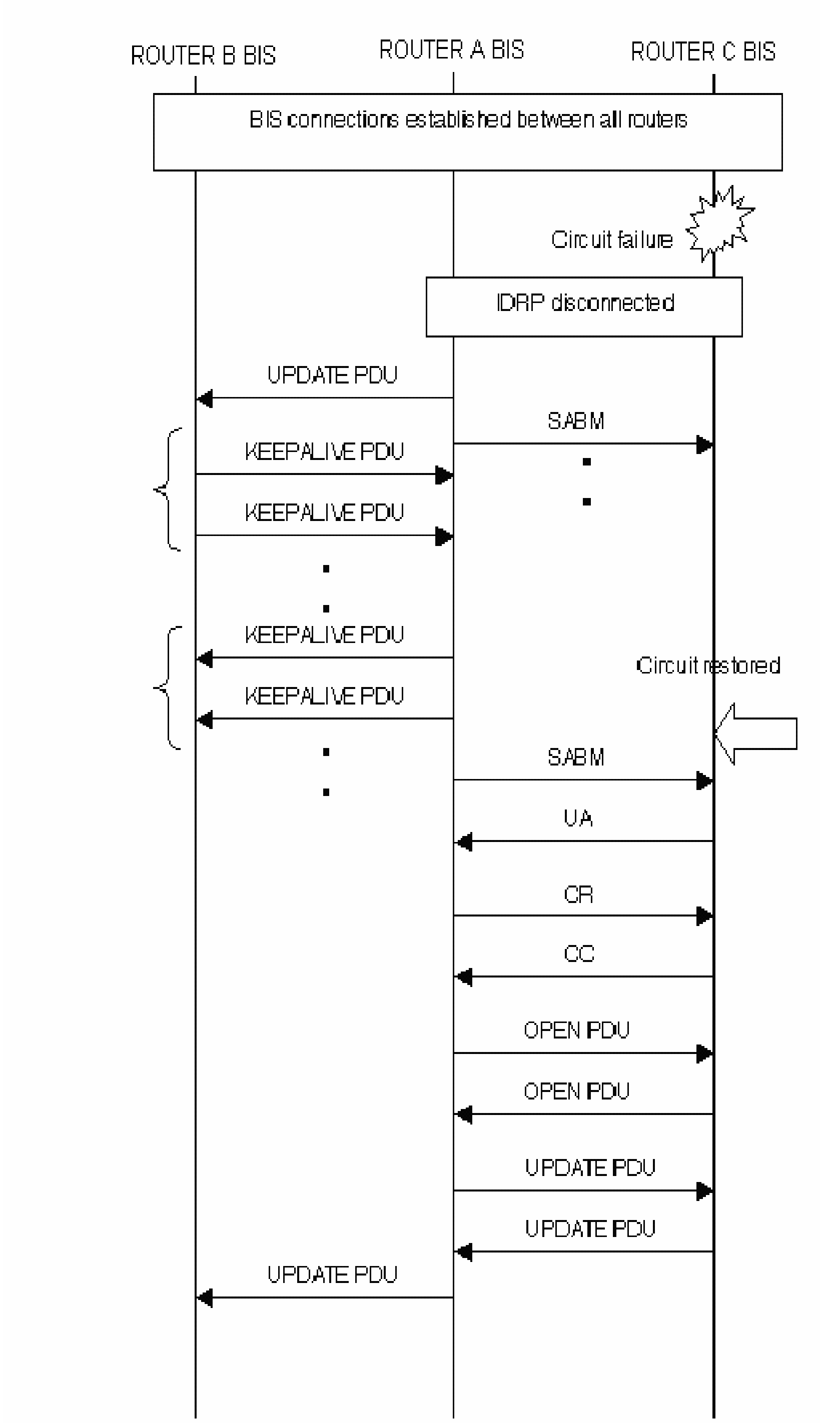
Test No.			Sequence Diagram
4	13	1	
4	13	2	
4	13	3	
4	14	1	
4	14	2	
4	14	3	
4	14	4	

Figure 22 Sequence: Failure and recovery of ROUTER C-ROUTER A circuit

Table 12 Router Failure and Recovery Test Procedure

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
Failure and recovery of ROUTER C	Failure of ROUTER C	4-15-1	Simulate failure and recovery of ROUTER C by rebooting the router. At failure: ・ At ROUTER A, check that routing information for ROUTER C is deleted. ・ At ROUTER B, check that routing information for ROUTER C is deleted.	OK / NG	/ /
	Recovery of ROUTER C	4-15-2	Check that the ROUTER C-ROUTER A router connection is automatically re-established after ROUTER C recovers. After recovery: ・At ROUTER A, check that routing information for ROUTER C is added. ・At ROUTER B, check that routing information for ROUTER C is added.	OK / NG	/ /
Failure and recovery of ROUTER A	Failure of ROUTER A	4-16-1	Simulate failure and recovery of ROUTER A by forcing failover. At failure: ・At ROUTER B, check that routing information for ROUTER A and ROUTER C are deleted ・At ROUTER C, check that routing information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Recovery of ROUTER A	4-16-2	Check that the ROUTER C-ROUTER A and ROUTER A-ROUTER B router connections are automatically re-established after ROUTER A recovers. After recovery: ・At ROUTER A, check that routing information is added for ROUTER C and ROUTER B. ・At ROUTER B, check that routing information for ROUTER C and ROUTER A are added. ・At ROUTER C, check that routing information for ROUTER A and ROUTER B are added.	OK / NG	/ /
Failure and recovery of ROUTER B	Failure of ROUTER B	4-17-1	Simulate failure and recovery of ROUTER B by rebooting the router. At failure: ・ At ROUTER A, check that routing information for ROUTER B is deleted. ・ At ROUTER C, check that routing information for ROUTER B is deleted.	OK / NG	/ /
	Recovery of ROUTER B	4-17-2	Check that the ROUTER A-ROUTER B router connection is automatically re-established after ROUTER B recovers. After recovery: ・ At ROUTER A, check that routing information for ROUTER B is added. ・ At ROUTER C, check that routing information for ROUTER B is added. ・ At ROUTER B, check that routing information for ROUTER A and ROUTER C are added.	OK / NG	/ /

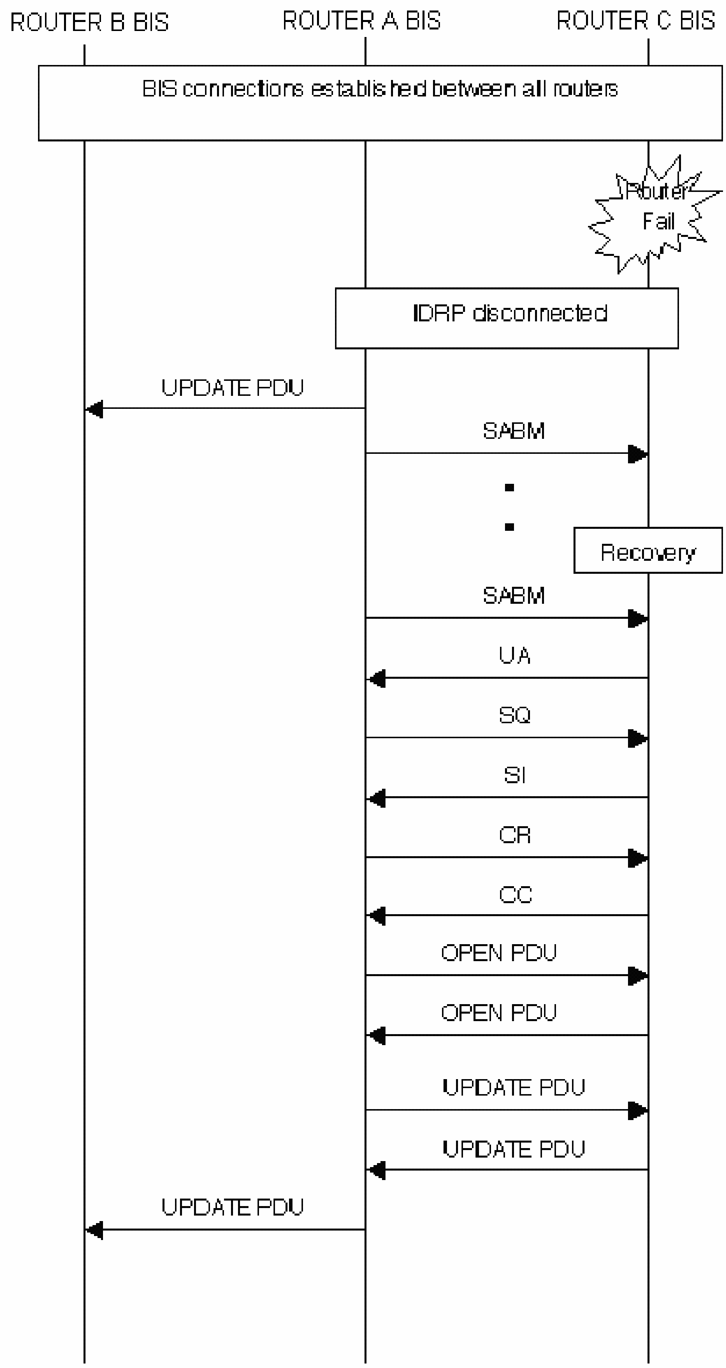
<table>
<tr><th colspan="3">Test No.</th><th>Sequence Diagram</th></tr>
<tr><td>4</td><td>15</td><td>1</td><td rowspan="2">
</td></tr>
<tr><td>4</td><td>15</td><td>2</td></tr>
</table>

Figure 23 Sequence: Failure and Recovery of ROUTER C

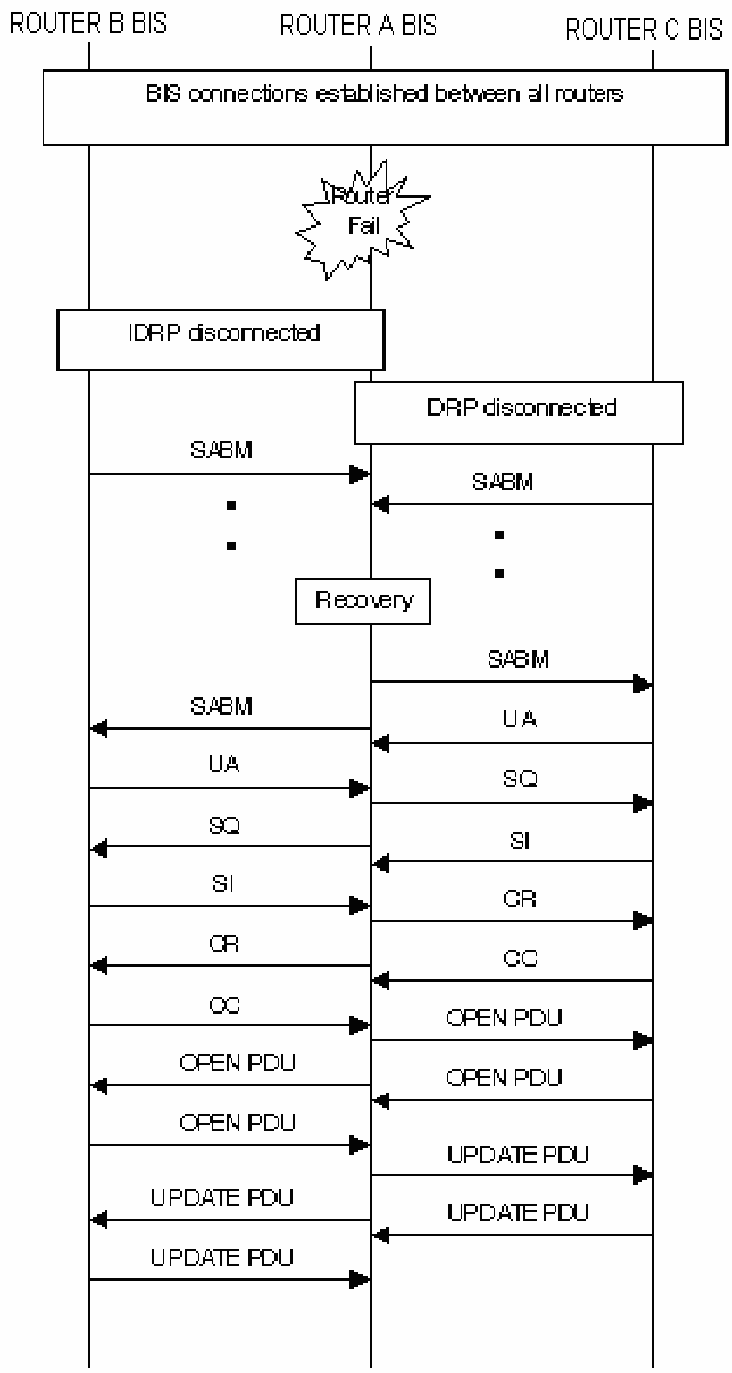
Test No.			Sequence Diagram
4	16	1	
4	16	2	

Figure 24 Sequence: Failure and Recovery of ROUTER A

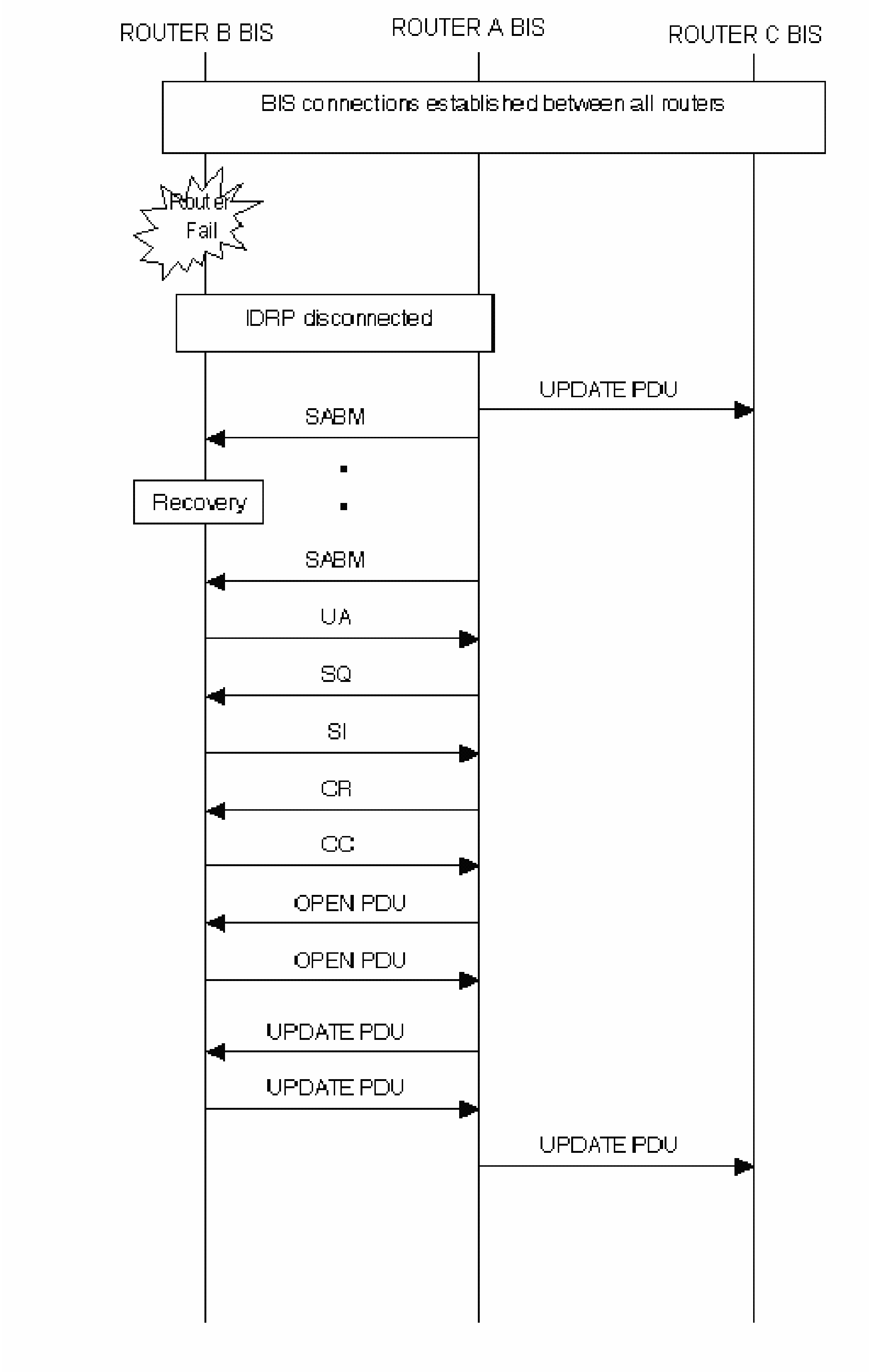
Test No.			Sequence Diagram
4	17	1	
4	17	2	

Figure 25 Sequence: Failure and Recovery of ROUTER B

Table 13 End-to-End CLNP Echo Test Procedure

4. ATN Router Tests		**Test Item**	**Procedure**	**Result**	**Date/Time**
End-to-End CLNP Echo Test between end systems in ROUTER C domain and ROUTER B domain	ERQ transmission	4-18-1	Send ERQ PDU from ES in ROUTER C domain to ES in ROUTER B domain. Confirm receipt of ERQ PDU at ES in ROUTER B domain.	OK / NG	/ /
	ERP transmission	4-18-2	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-3	Repeat 4-18-1 to 4-18-2 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /
	ERQ transmission	4-18-4	Send ERQ PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERQ PDU at ES in ROUTER C domain.	OK / NG	/ /
	ERP transmission	4-18-5	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-6	Repeat 4-18-4 to 4-18-6 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /

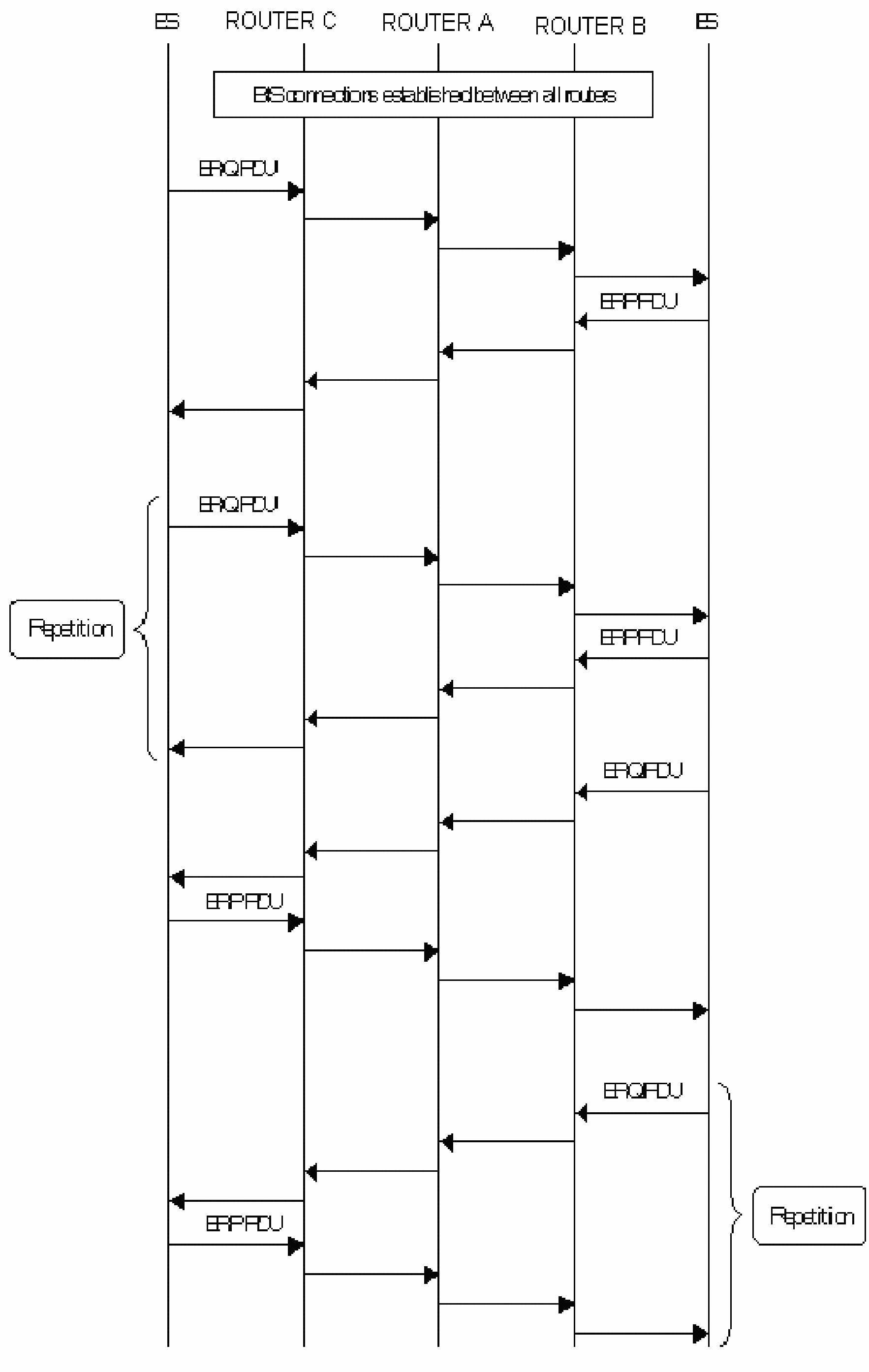
Test No.			Sequence Diagram
4	18	1	
4	18	2	
4	18	3	
4	18	4	
4	18	5	
4	18	6	

Figure 26 Sequence: End-to-End CLNP Echo Tests

Annex D

AMHS Testing Requirements

Annex D

To

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	22/06/2007	Creation of the document.	all

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1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional requirements for AMHS testing procedures.

1.2 Scope of the Document

Based on known principles of testing and general assumptions on an AMHS test scenario, the scope of testing for an "AMHS Conformance Test" is specified. Elements of the specifications are generic test groups and related test configurations. Special attention is given to the “provocation” of an AMHS implementation with incorrect protocol behavior (“negative testing”) to analyze its stability (robustness) in out-of-line situations.
Further requirements are specified in terms of configuration parameters (as number of ATS Message Servers and AMHS users represented by test equipment) and the components of AMHS and AFTN information objects to be handled.
In principle, these groups are also valid for interoperability tests. But especially the test groups dealing with “negative testing” cannot be performed by real systems due to the nature of an implementation to avoid such exception situations.

1.3 Document Structure

Chapter 2 is concerned with general aspects of conformance testing and identifies the principal differences to interoperability testing. Key elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment. References are made to ISO/IEC 9646 which provides a general concept of conformance testing and to deliverables of the ACCESS study concerning AMHS testing.

Chapter 3 deals with the scope of AMHS functions to be tested and identifies reference points at AMHS implementations which should be accessible for testing. In addition, the used transport service for AMHS communications is identified and the interface with AFTN at the implemented AFTN/AMHS Gateway is detailed.

Chapter 4 defines AMHS test groups for comprehensive conformance testing of AMHS native communications and gateway operations with the AFTN. Related test configurations are added with explanations on sequences of exchanged AMHS and AFTN information objects. In addition, principles for definitions of test cases are set up including the consideration of so-called “negative testing”.

Chapter 5 specifies the range of parameters values supported in test configurations which place quantitative requirements on the testing equipment as the number of represented adjacent ATS Message Servers and handled AMHS and AFTN users.

Finally, *chapter* 6 identifies the used AMHS and AFTN test data. In particular, the elements of AMHS information objects and their sub-components (as message and message transfer envelope) to be supported are specified in detail.

1.4 References

[1] ICAO DOC 9705-AN/956: The Manual of technical provisions for the ATN, Sub-volume III, Section 3.1 –Edition 3 (2002) – Referred to as AMHS SARPs

[2] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures

[3] ISO/IEC 10021-2 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 2: Overall architecture

[4] ISO/IEC 10021-4 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 4: Message Transfer System: Abstract service definition and procedures

[5] ISO/IEC 10021-7 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 7: Interpersonal Messaging System

[6] ISO/IEC ISP 10611-3 – International standardized profile AMH1n – Message Handling Systems – Common Messaging –AMH11: Message transfer (P1)

[7] ISO/IEC ISP 12062-2 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH21: IPM content

[8] ISO/IEC ISP 12062-3 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH22: IPM requirements for message transfer (P1)

[9] ISO/IEC 9646-1 – Conformance testing methodology and framework – Part 1: General concept (1994)

2 Conformance Testing

The chapter provides an introduction to general aspects of conformance testing and identifies the principal differences to interoperability testing. Elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment.
References are made to ISO/IEC 9646.

2.1 Objectives

Generally, conformance testing attempts to determine whether a given implementation matches a specification. The implementation to be tested is referred to as the *implementation under test (IUT).* A tester provides the IUT with defined inputs and observes the resulting outputs. – ISO/IEC 9646-1 provides a general concept of OSI conformance testing and definitions of related key terms.

Note. – According to ISO 9646-1, the term Implementation Under Test (IUT) refers to an implementation of one or more OSI protocols, being part of a real open system which is to be studied. The System Under Test (SUT) is the real open system in which the IUT resides. – In the following, the term IUT is used when referring to the AMHS implementation to be tested in consideration that only the AMHS aspects within an given (real) ATS communication system are addressed.

ISO/IEC 9646-1 distinguishes three types of standardised conformance testing:

- *Basic interconnection tests*, that is to determine whether or not there is sufficient conformance to the relevant protocols for interconnection to be possible without trying to perform thorough testing.

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- *Capability tests*, which are used to verify the existence of one or more claimed capabilities of an IUT (*static* conformance requirements).

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- *Behaviour tests* deal with *dynamic* conformance requirements, which specify the observable behaviour of an implementation. Behaviour tests include tests for valid behaviour of the IUT for both valid and invalid inputs by the tester.

The AMHS testing requirements specified in this document focus on *behaviour tests*, i.e. test exercises address implemented AMHS functions in a way as they should be used. *Basic interconnection tests* are an appropriate means to check the correctness of a test configuration before starting detailed test exercises.

The discussed AMHS conformance testing relates to that scope of functions which is typically implemented in an *International Communication Centre*, i.e.

1) AMHS message transfer,
2) AMHS submission and delivery operations with attached AMHS user terminals and
3) Intercommunication with the AFTN/X.25 by means of the AFTN/AMHS Gateway.

The interface to the AFTN (X.25) is only taken into account in the extent as specified in the AMHS SARPs. For example, the AMHS SARPs do not assume AFTN routing by the gateway. – The Basic ATS Message Handling Service is assumed as the service level supported by the IUT.

The conformance testing equipment acting as peer system of the AMHS IUT is referred to the *AMHS Test Tool*. The AMHS Test Tool provides the IUT with inputs, records and evaluates responses of the IUT.

The specified testing requirements refer to an initial functionality of the AMHS Test Tool. Potential future extensions are indicated in the context of the specified sub-items of the test tool.

2.2 Specific aspects of AMHS testing

The AMHS (MHS) functions to be tested reside in the *application layer* of the ISO/OSI reference model. The underlying layers provide supporting communication services, however, are not primary subject of testing.

The context of AMHS conformance testing:

(a) the testing of complete systems ("black boxes") and

(b) the testing of individual protocol layers, in particular the application layer.

In case (a) only external interfaces which are part of the IUT are used by the conformance testing equipment. In case (b), on the other hand, the IUT has to be "opened up", providing the layer to be tested. For this purpose special software modules have to be provided within the IUT for control and observation of the lower and upper service boundary at the layer under test (see ISO/IEC 9646-1).

Recommendations for AMHS conformance testing are:

- the individual components and protocol layers of the IUT not be visible to the conformance testing equipment;

- access to the IUT by the test equipment is only via standard interfaces; and

- human readable terminal interfaces (as the Control Position of an AMHS gateway) are not accessed by the test equipment.

This recommended testing approach forms the baseline for the functional requirements placed on the AMHS Test Tool, as follows:

- The AMHS Test Tool will be interconnected with the IUT's external interfaces as far as they are standardised by the AMHS SARPs. Such standardised interfaces are the *AMHS transfer ports* and the *AFTN/X.25 interface*. The IUT is treated as a *black box*.

- Originations and receptions at user terminals have to be performed and observed by an operator who is familiar with the implemented HMI. From that follows that conformance testing needs certain operator assistance at the IUT. (The made assumptions on interfaces which are available at individual IUTs will be outlined by means of an IUT model.)

3 Assumed Test Scenario

3.1 AMHS Functionality of the IUT

3.1.1 AMHS SARPs provisions

The assumption is made that the IUT to be tested provides completely or partially the AMHS functionality as specified by the SARPs in support of the *Basic* ATS Message Handling Service. Figure 1 identifies the key elements of the AMHS which are addressed by SARPs. The figure shall also indicate that the majority of the AMHS functionality is specified by references to the MHS standard series ISO/IEC 10021 and the related profile documentation ISO/IEC ISP 10611 (Common Messaging) and ISP 12063 (Interpersonal Messaging).

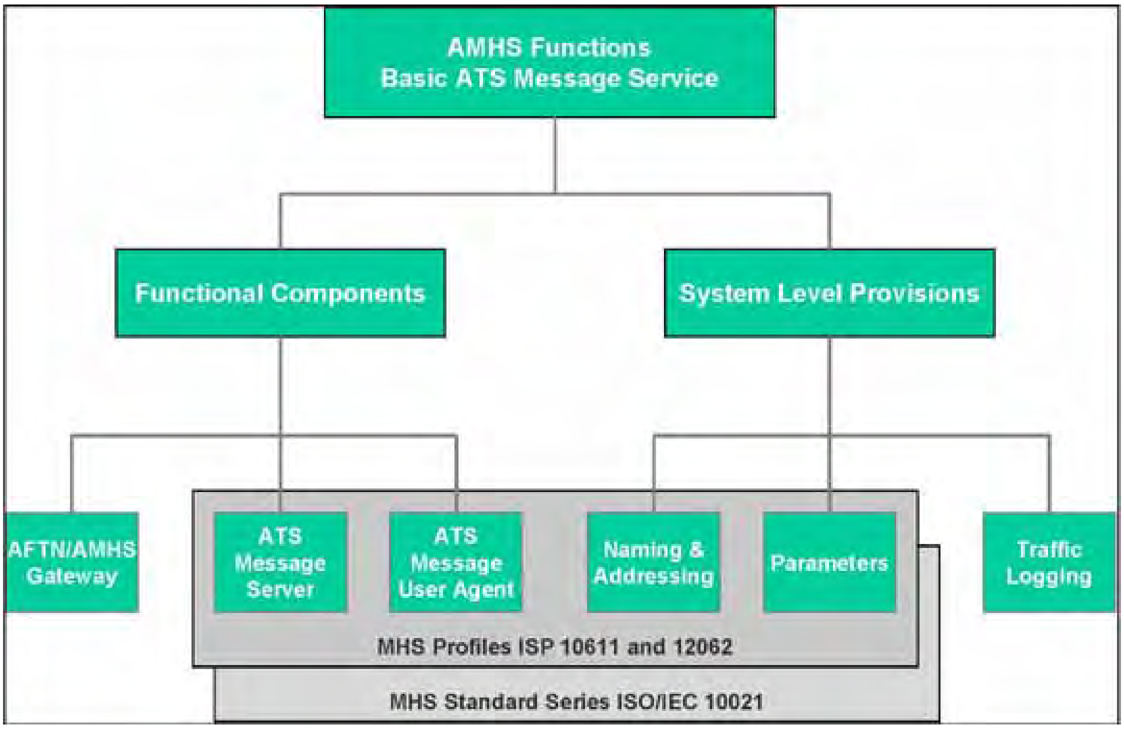

Figure 1: AMHS functionality specified by SARPs

The nucleus of the AMHS is formed by its three functional components:

- *ATS Message Server* performing *transfer* operations with adjacent ATS Message Servers (and AMHS gateways) by means of its inherent (MHS) Message Transfer Agent (MTA). In addition, *submission* and *delivery* operations are performed with one or more attached ATS Message User Agents. Optional (MHS) Message Stores (MS) may provide retrieval services for ATS Message User Agents in connection with message delivery.

- *ATS Message User Agents* each including a (MHS) User Agent (UA) as key component. An ATS Message User Agent interacts on one side with a (local) AMHS user interface and accesses on the other side the transfer level of the AMHS by performing *submission* and *delivery* operations with the superordinated ATS Message Server. Communications between ATS Message User Agents (via ATS Message Servers) are end-to-end and have to comply with the IPM content as specified for the (MHS) Interpersonal Messaging System (IPMS).

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- *AFTN/AMHS Gateway* supporting interworking between users of the AMHS and AFTN. The gateway includes for operations with the transfer level of the AMHS and MTA. The mapping functions of the gateway reside in the Message Transfer and Control Unit (MTCU). The operations with AFTN are performed with the AFTN components. Exception handling which needs operator assistance is moved to the Control Position.

The above listed functional components are typically implemented in International Communication Centres performing AMHS message transfers, AMHS message submission and delivery operations with attached AMHS user terminals and intercommunications with the AFTN. However, an AFTN/AMHS Gateway may be also implemented as stand-alone facility allowing existing AFTN communication facilities access to the AMHS.
In addition, the AMHS SARPs address some aspects relating to the system level of an AMHS environment. The key ingredients at the system level of the AMHS are:

- *Naming and addressing* relating to the unambiguously identification of AMHS users and entities at upper layers protocols as needed for communications between AMHS systems. The specifications are based on MHS O/R addressing and ISO/OSI upper layer conventions. Examples are: the Common AMHS Addressing Scheme, Application Process Titles and Transport/Session/Presentation addresses.

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- *Parameters* define specific AMHS conventions in the framework of the MHS standard. Examples are: The limitation of Receipt Notifications for IPMs with the *importance* value “high” and the definition of the ATS-Message-Header in the IPM body part.

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- *Traffic logging* in functional components in support of message tracking across the AMHS.

The manner of implementation of the above identified AMHS functionality in the IUT is irrelevant for testing (*black-box* view). The above functional outline is used just as reference for the scope of conformance testing to be supported by the AMHS Test Tool.

3.1.2 Implementation specific AMHS features

Typically, an AMHS implementation includes features which are either beyond the scope of the SARPs or seen as local issue. Examples are: User interfaces (HMI) for local submissions and deliveries, proprietary MTS access protocol and provisions for systems management (including statistics and diagnostic means).
Such features will not be subject of conformance testing, however, may be used in support of conformance testing. Example: IPM submission at local user terminals for verification of correct generation of the related P1 message.

3.2 Modelling of the test environment

Figure 2 illustrates the intended operational environment of the IUT at the level of messaging: Via Transfer Ports of the IUT (logical) connections are established to *n* adjacent ATS Message Servers which in turn provide connectivity to *m* distant ATS Message User Agents. Local access to the AMHS is offered by *p* AMHS User Terminals attached to the IUT. Via the AFTN/AMHS Gateway there is a connection to an adjacent AFTN Communication Centre which in turn provides connectivity to *s* AFTN stations. – The figures *m*, *n*, *p* and *s* are seen as configuration parameters of the test configuration (see Section 5).

Note 1. – The specification of the AFTN/AMHS Gateway assumes an AFTN link to only one adjacent AFTN centre to minimise the AFTN functionality in the gateway. However, in typical implementations, the AFTN/AMHS Gateway is collocated with AFTN centre functions supporting connections to a number of adjacent centres. This aspect of multiple AFTN connections is not considered for conformance testing against the AMHS SARPs.

Note 2. – In the AISAPAC Region, AFTN communications make use of the X.25 transport service. This is taken into account for conformance testing, however, with the limitation, that only one X.25/AFTN link is established between the test tool and the IUT (see Figure 2).

Note 3. – In-depth testing of AFTN and X.25 capabilities of the IUT is not seen as subject of AMHS conformance testing.

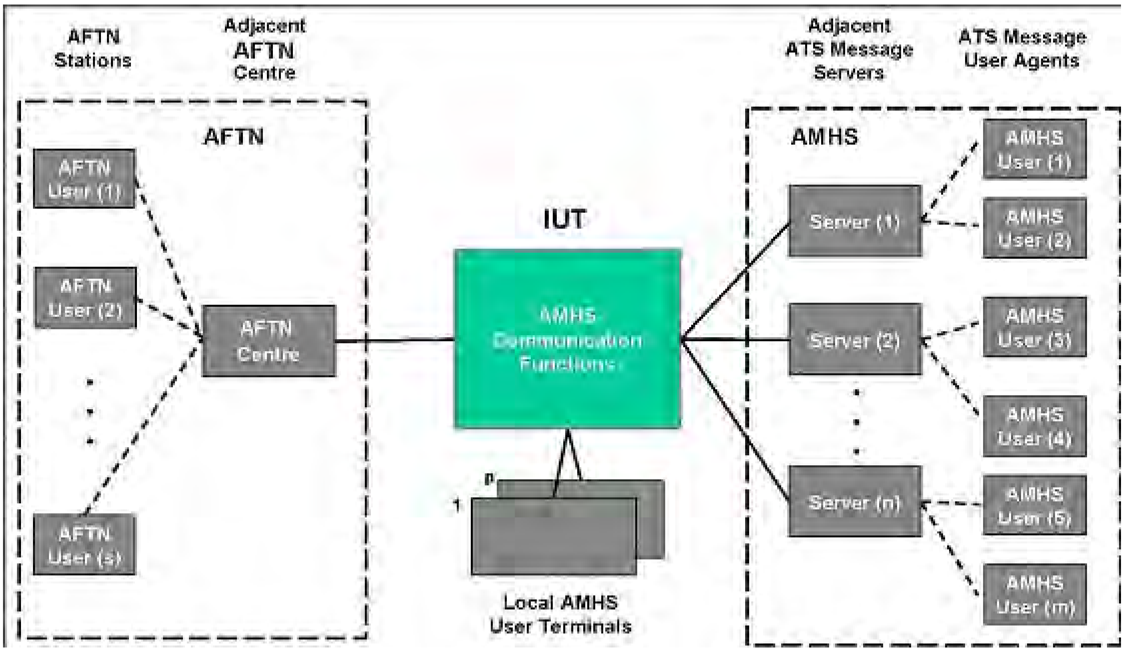

Figure 2: Assumed operational environment of the IUT

The AMHS Test Tool simulates an operational environment for the IUT as depicted in Figure 2. Figure 3 shows the corresponding model of the test configuration. The *COM Interfaces* of the test tool include *n* MTA instances representing the *n* adjacent ATS Message Servers of the IUT and an AFTN/X.25 source/sink representing the AFTN/X.25 environment. Other major functional components of the test tool are the *Test Repository* (containing predefined test scripts and associated test data), *Test Script Editor* (providing an HMI for specifications of test scripts and test data), *Test Log* (containing all the exchanged information objects) and *Test Evaluation* (performing test evaluations based on the test log against various criteria). The *Test Driver* controls the execution of test scripts and enters exchanged information objects in the test log. Finally, the component *Test Management* is tasked with the overall management and administration of the test tool.

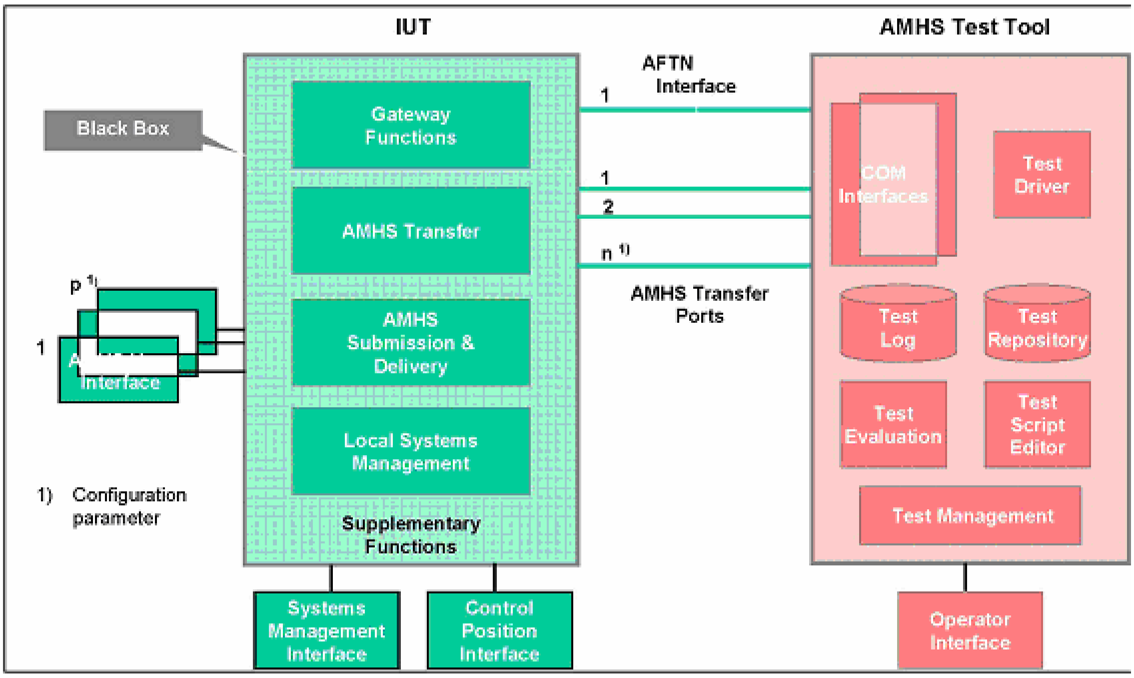

Figure 3: Model of the test environment

The IUT is represented in the modelled test configuration (*Figure 3*) by its functional components which will be subject of testing, i.e. AMHS transfer, AMHS submission/delivery and AMHS gateway functions (cf. Section 3.1). The inclusion of other indicated components of the IUT (as Systems Management Interface) will be addressed in subsequent sections.

The *n* MTA names, the addresses of the *m* ATS Message User Agents, *s* AFTN stations and *p* AMHS User Terminals are considered as configuration parameters which are jointly set up in the IUT and AMHS Test Tool.

Note. – The above outlined functional model includes an abstract, logical view on the AMHS Test Tool for the purpose of understanding the intended testing approach. The real design of the test tool is subject of separate documentation.

3.3 Used Transport Service for AMHS

According to the AMHS SARPs AMHS communications make use of the *ATN Internet Communications Service* (Layer 4). The ISO Transport Service of the class TP0 will be provided over a TCP/IP stack by using the convergence function defined with RFC 1006. The AMHS communications in the test configuration follow this approach.

Note. – Further extensions of the AMHS Test Tool may also support the ATN internet communications Service (aspect of inter-Regional or boundary centres) and TP0 over X.25.

3.4 Communication with the AFTN

The AMHS SARPs specify for the AFTN/AMHS Gateway an AFTN interface by referring to Annex 10, Volume II, i.e. the (asynchronous) *AFTN Teletypewriter Procedures* apply.

Note. – Extensions of the AMHS Test Tool may also support AFTN asynchronous communications and/or AFTN over X.25.

3.5 Points of Reference for testing

With the black-box view at the IUT, the verification of implemented functionality is limited to test inputs and examinations of resulting responses at external (open) interfaces of the IUT. Standardised interfaces of the IUT are directly interfaced by the AMHS Test Tool. At nonstandardised (proprietary) user interfaces of the IUT observations of operator inputs and displayed information are needed. Example: Origination of IPMs to be submitted or presentations of delivered IPMs at local AMHS user interfaces.
Such interfaces of the IUT which are used for conformance testing are referred to as *points of reference*. In the following, these points of reference will be detailed with reference to Figure 3.

3.5.1 Standardised points of reference

3.5.1.1 AMHS Communications

The IUT shall offer *Transfer Ports* for P1 communication with *n* adjacent ATS Message Servers. The lower protocol layers (layers 1 to 4) shall be configured as indicated below:

Layer 4	Layer 3	Layer 2	Layer 1
ISO TP0 RFC 1006 TCP	IPv4	ISO LLC1	10/100 Base T (Ethernet)

Table 1: Lower protocol layers (AMHS communications)

The Transfer Ports of the IUT and AMHS Test Tool shall be physically interconnected via a LAN (Ethernet).

3.5.1.2 AFTN/X.25 Communications

The IUT should offer a X.25/AFTN interface. That means, the IUT conveys AFTN-formatted messages by using the X.25 transport service.
Note. – If the IUT supports only AFTN asynchronous communications or AFTN over X.25 the "Extensions" of the AMHS Test Tool has to be used. The conformance testing is independent from the physical connection used.

3.5.2 Proprietary points of reference

The scope of conformance testing includes submission and delivery operations with local *AMHS user interfaces* of the IUT. Notifications for specified out-of-line situations shall be sent to the *Control Position* of the AFTN/AMHS Gateway. Further, traffic logs generated by the IUT during test exercises have to be verified against the AMHS SARPs by means of retrieval services provided at the IUT's *Operator Positions*.
The style of input and presentation of test data at the above identified three working positions is seen as a local implementation matter and is, therefore, out of scope of conformance testing. The inclusion of these working positions in testing is limited to observation and interpretation of test data.

Next, the handling of the three types of working positions will be discussed in more detail.

3.5.2.1 AMHS user interface

AMHS user interfaces provided at the IUT allow submission of IPMs and Probes and in the opposite direction delivered IPMs, IPNs and Reports have to be brought to the attention of AMHS users. The style of origination and presentation of the mentioned AMHS information objects is seen as subject of implementation. The inclusion of submission and delivery operations in conformance testing requires observations of operator interaction during test exercises.

Note. – Although the MTS access is seen as an implementation matter when supporting only the Basic ATS Message Handling Service, conformance testing shall verify the correct mapping of originated information objects onto P1 information objects; vice versa delivery operations have to map P1 information objects onto displayed objects in a correct manner.

3.5.2.2 Control Position

There is an AMHS SARPs requirement to notify the Control Position of the AFTN/AMHS gateway on specified deviations from the gateway's normal operations. Notifications may be issued for the operator information only or may require operator assistance for recovery from an occurred communication problem. How the Control Position is implemented is out of scope of the AMHS SARPs. However, the correct presentation of notifications at the IUT's Control Position is seen as subject of conformance testing. Appropriate observations have to accompany certain exercises.

3.5.2.3 Access to systems management functions

Access to IUT's systems management functions by means of a related working position shall be possible for:

- Preparation of the IUT for the test configuration, and • verification of traffic logs generated by the IUT during test exercises.

4 Supported Scope of Conformance Testing

4.1 General aspects

The scope of testing covers the (native) AMHS communications and interoperations with the AFTN/X.25 by means of the AFTN/AMHS Gateway. The AFTN/X.25 interface is tested for verification of the gateway's capability to intercommunicate with AFTN/X.25, however, is not subject of dedicated conformance testing.
Communication services at lower communication layers (as TCP/IP, X.25, LAN) support the interconnection between the AMHS system and the AMHS Test Tool. In this way, lower communication layers will be included in the test tool, however, there is no intention performing lower layer protocol testing.

The following aspects of conformance testing shall be taken into account:

- *Protocol testing*, encompassing intra-AMHS communications (MTS, IPMS) and AMHS to AFTN/X.25 mappings (and vice versa).

- *Functionality testing*, to ensure the appropriate implementation of AMHS functionality and services (as message submission, transfer, delivery) including the correct mappings between AMHS information objects and user data made visible at users' working positions.

- *Resilience testing*, particularly with regard to the stability of an AMHS implementation against external communication failures.

The reference specification for AMHS testing is the *Basic ATS Message Handling Service* as specified in the AMHS SARPs.

Note. – The incorporation of the Extended ATS Message Handling Service shall be conceptually taken into account in a later extension of the AMHS testing requirements.
Below, the scope of conformance testing will be specified by definitions of generic *test groups* and related *test cases*. These definitions should be seen as a base (minimum) set which do not exclude testing using other equivalent or extended test arrangements.

4.2 Generic test configuration

The scope of AMHS functions expected from the IUT is defined firstly by the implemented AMHS *functional components*, i.e. ATS Message Server, AFTN/AMHS Gateway and ATS Message User Agent and secondly by supplementing *system level provisions* as AMHS naming/addressing, AMHS parameters and AMHS traffic logging (see Section 3.1).
Figure 4 places the above three functional components in a fictitious AMHS communication scenario with flows of AMHS information objects between two (*direct*) AMHS users. In addition, an AFTN/AMHS Gateway supports intercommunications with AFTN users (i.e. *indirect* users of the AMHS). The position of the gateway in Figure 4 should be seen just as an example.

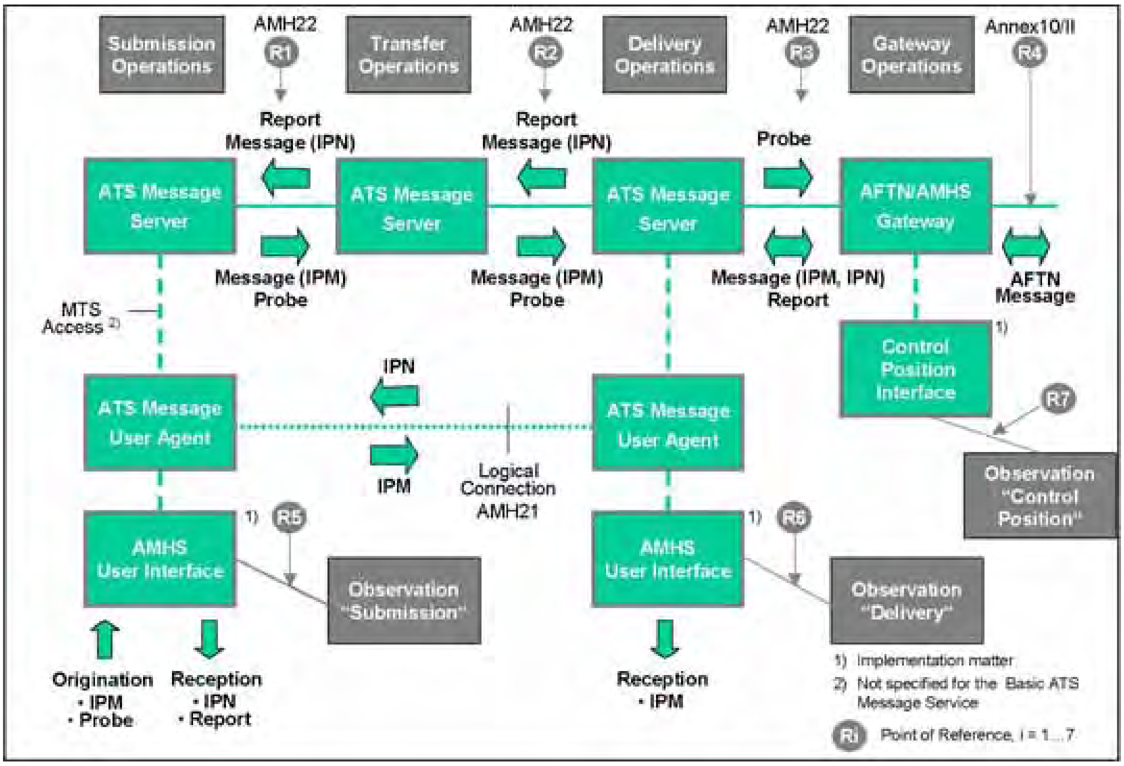

Figure 4: Generic AMHS communication scenario and used Points of Reference for conformance testing

The points of references *R1* to *R7* (in Figure 4) are allocated to the communication scenario according to the principles which have been stated in Section 3.5. The points *R1* to *R3* correspond to communication interfaces which are addressed by the MHS profiles AMH11 or AMH22, respectively [6], [8]. The exchange of IPMs and IPNs between the pair of ATS Message User Agents is subject of the MHS profile AMH21 [7]. Communications at the point *R4* follow the procedures laid down in Annex 10, Volume II, as far as applicable for the AFTN/AMHS Gateway.

The IUT is required to provide the communication functions of the ATS Message Server, ATS Message User Agent and AFTN/AMHS Gateway in any of their positions indicated in Figure 4. For related conformance testing the IUT is placed in various positions of the communication scenario (Figure 4) and the AMHS Test Tool performs the functions of the corresponding AMHS peer entity (entities). The resulting generic test configuration is depicted in Figure 5. The allocated points of reference *R1* to *R7* correspond to them of Figure 4. The reference point R8 is added for identification of the IUT's systems management interface (see Section 3.5.2.3).

Note. – In consideration of testing implementations of the Basic ATS Message Handling Service no point of reference is allocated to the MTS access.

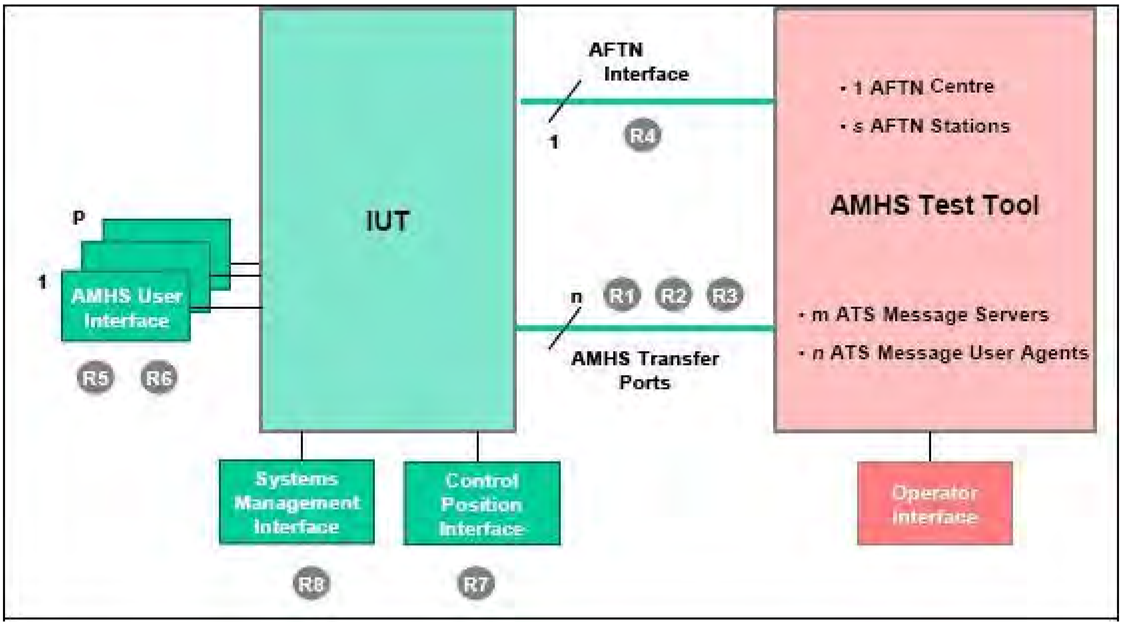

Figure 5: Generic test configuration with points of reference

Note. – In Figure 5 no AFTN user interface is forming part of the IUT. Such interfaces are outside of the scope of the specified AMHS functionality and are placed, therefore, in the IUT's test environment surrounding the IUT (see Figure 2). When testing AFTN/AMHS Gateway functions of the IUT the AFTN peer entities are always represented by the AMHS Test Tool. The AFTN related user actions should be performed by the AMHS Test Tool itself.

4.3 Definition of test groups

Generally, *test groups* provide a logical high-level ordering in test specifications (ISO 96462). Typically, a single test group addresses a particular functional area for which an IUT claims conformance. In the following, AMHS test groups are defined for the purpose of specification of high-level requirements placed on an AMHS Test Tool.

Figure 4 identifies four types of AMHS functional areas to be supported by the IUT: *Submission, Transfer, Delivery* and *Gateway* Operations. These types of AMHS operations will be constitute a first set of test groups. A second set of test groups is formed by the provisions at the AMHS system level as referred to in Section 3.1.1, i.e. *Naming & Addressing, Parameters* and *Traffic Logging*.

The defined test groups reflect the external view at the IUT's functionality and are independent of the chosen implementation model. Below, the defined test groups are handled in detail.

For each of the handled test groups the correspondent test configuration is indicated. These test configurations are of generic nature. In practice, test configurations may be combined for study of local interworking between functional areas in an IUT. Example: Combined test exercises for message submission and local gateway functions.

4.3.1 Submission operations

Subject of the test group *Submission* operations is the origination of *IPMs* and *Probes* at AMHS user interfaces at the IUT and the related generation of *P1 information objects* for transfer to adjacent ATS Message Servers; returned *Reports* and *IPNs* have to be displayed at the IUT in an appropriate manner (see Figure 4).

Figure 6 depicts the test configuration for verification of the *Submission* operations. The test configuration follows from Figure 4 and Figure 5.

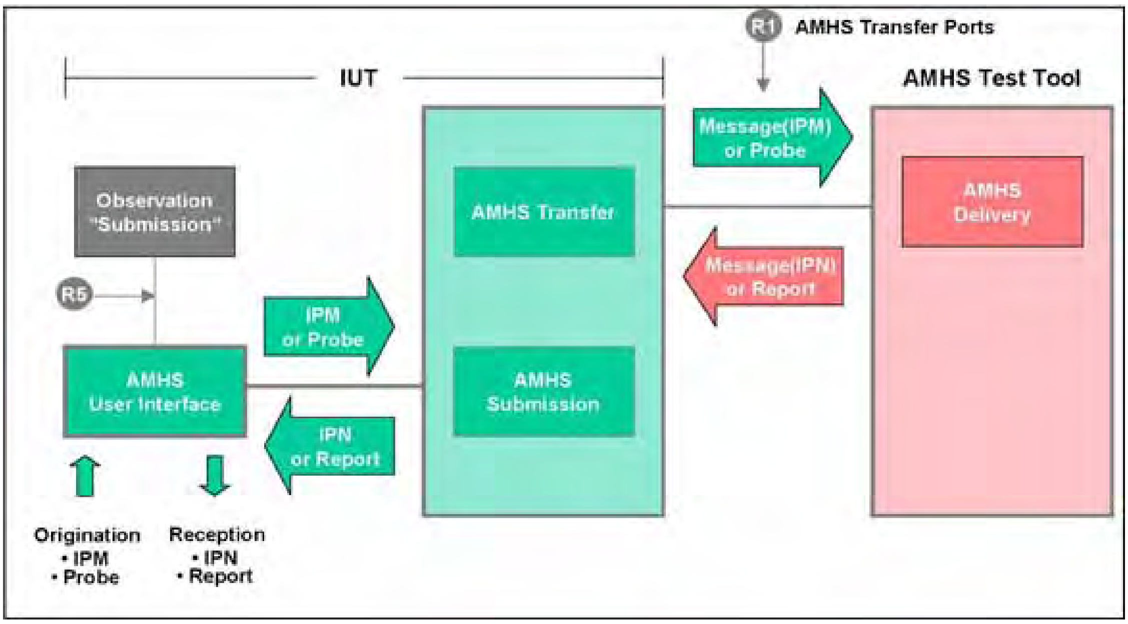

Figure 6: Test configuration "Submission"

For testing of the *Submission* operations the following actions may be performed:

- At an AMHS user interface of the IUT (reference point *R5* in Figure 6) predefined IPMs and Probes are originated for intended recipients. The AMHS Test Tool at the transfer ports of the IUT (*R1*) verifies the correct generation of the related Messages (IPMs) and Probes.

- In the opposite direction, the AMHS Test Tool responds at the transfer ports of the IUT (*R1*) with valid and invalid Messages containing IPNs (upon IPMs) and Reports (upon IPMs and Probes). The presentation of valid IPNs and Reports is observed at the originator's AMHS user interface (*R5*). Invalid responses may effect error notifications at an operator position of the IUT (fault management).

Note. – The local rejection of erroneous originations of IPMs and Probes at IUT's user interfaces is seen as a local implementation matter and is, therefore, out of the scope of conformance testing.

4.3.2 Transfer operations

Subject of the test group *Transfer* operations is the transfer of P1 information objects (i.e. Message, Report, Probe) by the IUT. Rejected transfers of messages and probes have to be indicated by returning of Non-Delivery Reports (NDR). The test group includes handling of multiple recipient addresses (multiple dissemination) and the expansion of Distribution Lists (DLs).

Figure 7 depicts the test configuration for verification of the *Transfer* operations. The test configuration follows from Figure 4 and Figure 5.

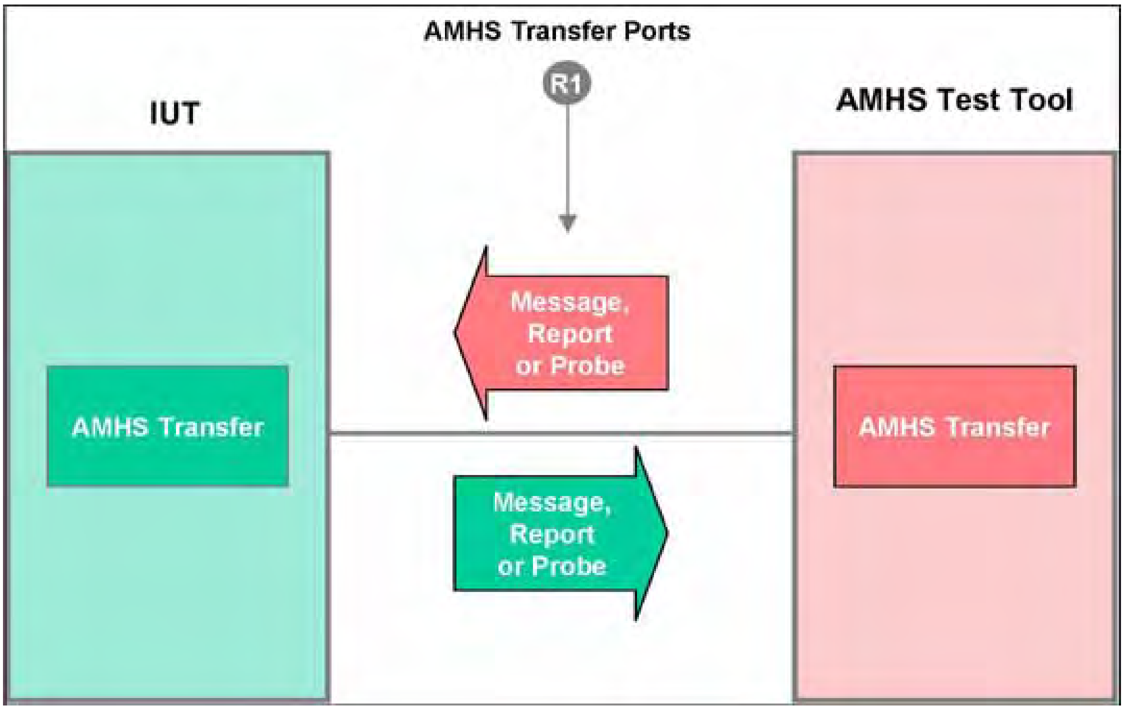

Figure 7: Test configuration "Transfer"

For testing of the *Transfer* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 7) with valid and invalid Messages (containing IPMs or IPNs), Reports and Probes with recipient addresses which are *not* local to the IUT.

- The IUT responds at its transfer ports (*R1*) with the output of one or more Messages, (due multiple dissemination and/or DL resolution), one or more Probes (multiple dissemination) or just the received Reports. The AMHS Test Tool verifies the expected IUT behaviour. Invalid information objects generated by the AMHS Test Tool may effect error notifications at an operator position of the IUT (fault management).

4.3.3 Delivery operations

Subject of the test group *Delivery* operations is the display of received Messages (IPMs) at AMHS user interfaces of the IUT. In addition, the IUT shall generate Reports (DR, NDR) and/or IPNs (RN, NRN) according to the requests contained in the received Messages and Probes.

Figure 8 depicts the test configuration for verification of the *delivery* operations. The test configuration follows from Figure 4 and Figure 5.

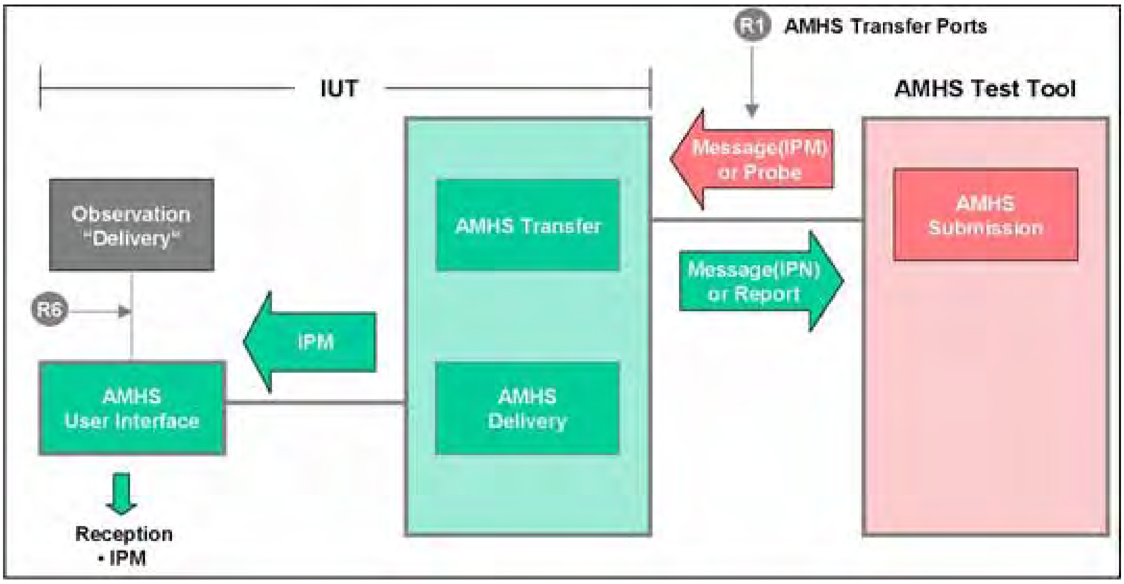

Figure 8: Test configuration "Delivery"

For testing of the *Delivery* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 8) with valid and invalid Messages (containing IPMs) and Probes, both with recipient addresses which are local to the IUT.

- The IUT may respond with one or more of the following actions:

  - Display the received IPM at the appropriate AMHS user interface (*R6*),
  - Returning a Message (IPN) at its transfer Port (*R1*) according to the given *receipt notification request* in the subject IPM,
  - Returning a Report (DR or NDR) at its transfer ports (*R1*) according to the given *report request* in the subject Message or Probe.

4.3.4 Gateway operations

Subject of the test group *Gateway* operations is the bi-directional conversion between AMHS and AFTN user messages and the handling of accompanying service information, i.e. AFTN service messages (SVC), AFTN SS acknowledgements (SS ACK), AMHS Reports and AMHS Receipt Notifications. – Cf. AMHS SARPs [1] para. 3.1.2.3.2.1.4.
Considering the functional complexity of the AFTN/AMHS Gateway, the test group is logically subdivided in three sub-groups: 1) Flow of user message from AMHS to AFTN, 2) Flow of user message from AFTN to AMHS and 3) Handling of Probes. The sub-groups 1) and 2) include the handling of accompanying service information.

4.3.4.1 User Message from AMHS to AFTN

Figure 9 depicts the test configuration for verification of the *Gateway* operations for the flow of a user message from AMHS to AFTN. The test configuration follows from the Figure 4 and Figure 5.

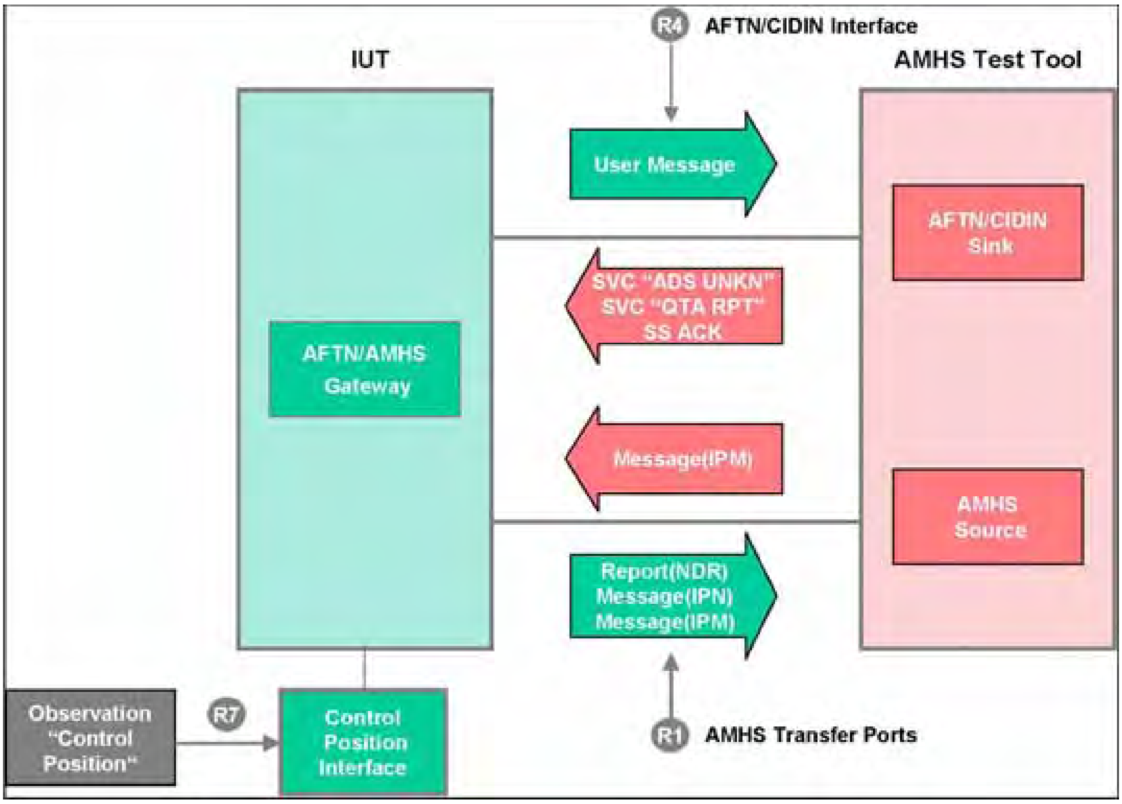

Figure 9: Test configuration "Gateway" – User message from AMHS to AFTN

The following actions may be performed with the Gateway test configuration depicted in Figure 9:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 9) with valid and invalid AMHS Messages containing IPMs. The IUT converts valid AMHS Messages in AFTN user messages which leave the IUT at its AFTN/X.25 interface (*R4*), invalid AMHS Messages are rejected by the IUT with Non-Delivery Reports (NDR) which are returned to the AMHS Test Tool using the IUT's transfer ports (*R1*).

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an AFTN SVC "ADS UNKNOWN" simulating the detection of an unknown destination address within the AFTN. The IUT converts the SVC "ADS UNKNOWN" in a Non-Delivery Report (NDR). In exceptional situation, the SVC "ADS UNKNOWN" is encapsulated by the IUT in an IPM. The NDR or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an SS ACK. The IUT converts the SS ACK in an IPN of the type Receipt Notification (RN). In exceptional situation, the SS ACK is encapsulated by the IUT in an IPM. The IPN or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an SVC "QTA RPT" requesting the repetition of an AFTN message sent before to a specified AFTN addressee. The IUT retransmits the respective AFTN message via its AFTN/AMHS interface (*R4*).

For certain out-of-line situations, which may occur during conversions in the AFTN/AMHS Gateway, the AMHS SARPs [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test exercises at the reference point *R7* in Figure 9.

4.3.4.2 User message from AFTN to AMHS

Figure 10 depicts the test configuration for verification of the Gateway operations for the flow of a user message from AFTN to AMHS. The test configuration follows from Figure 4 and Figure 5.

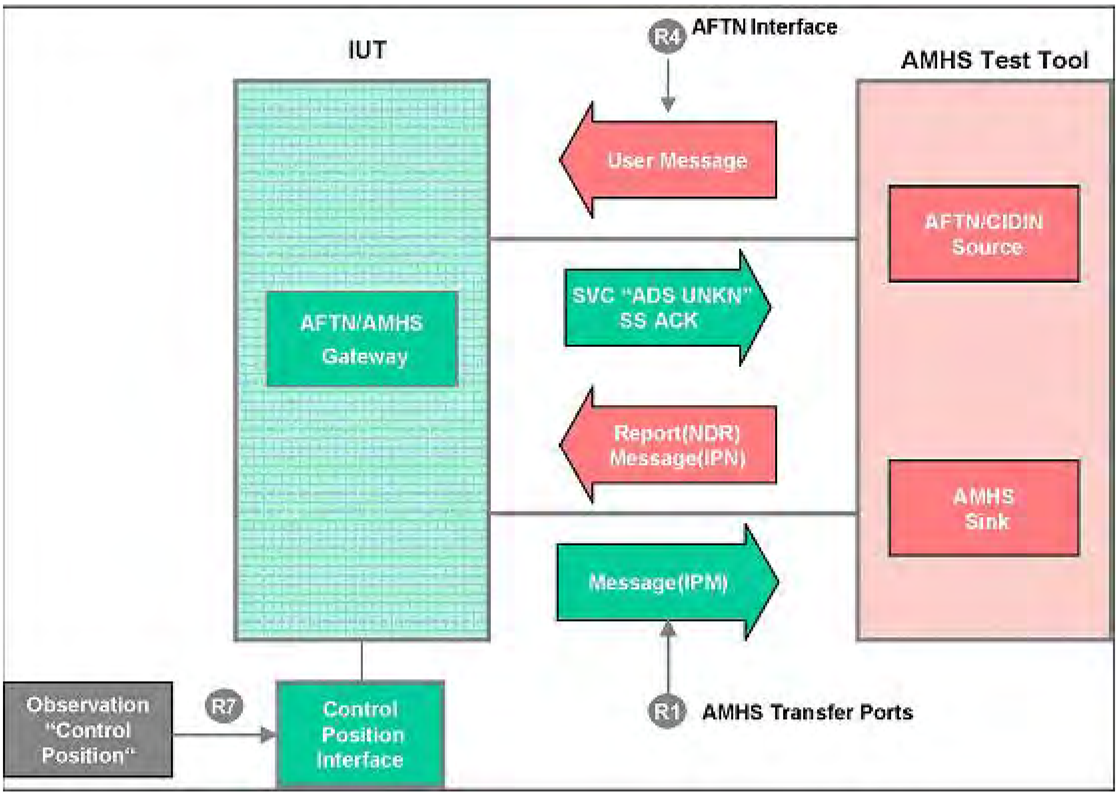

Figure 10: Test configuration "Gateway" – User message from AFTN to AMHS

The following actions may be performed with the Gateway test configuration depicted in Figure 10:

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (reference point *R4* in Figure 10) with valid and invalid AFTN user messages. The IUT converts valid AFTN user messages in AMHS messages containing IPMs which leave the IUT at its transfer ports (*R1*), invalid AFTN user messages are handled according to locally implemented procedures. When the conversion of AFTN addressee indictors fails, the IUT returns AFTN service messages of the type SVC "ADS UNKNOWN" to the AFTN (AMHS Test Tool) via its AFTN/X.25 interface (R4).

- The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with a Non-Delivery Report (NDR) simulating the detection of an unknown recipient address within the AMHS. The IUT converts the NDR in an AFTN service message of the type SVC "ADS UNKNOWN" which leaves the IUT via its AFTN/X.25 interface (*R4*).

- The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with an AMHS message containing a Receipt Notification (RN) indicating the reception of a SS-priority message at a specified AMHS recipient. The IUT converts the RN in a SS ACK which leaves the IUT via its AFTN/X.25 interface (R4).

For certain out-of-line situations which may occur during conversions in the AFTN/AMHS Gateway, the AMHS SARPs [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test exercises at the reference point *R7* in Figure 10.

4.3.4.3 Handling of Probes

Figure 11 depicts the test configuration for verification of the Gateway operations when receiving a Probe. The test configuration follows from Figure 4 and Figure 5.

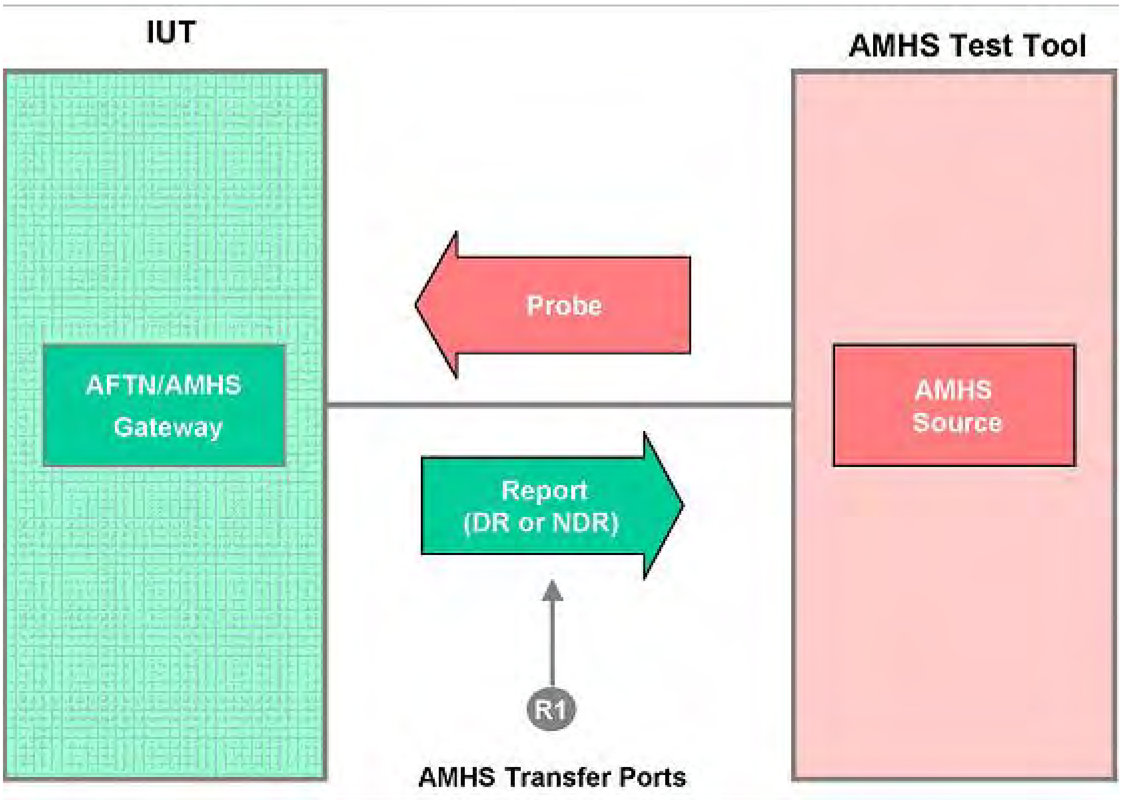

Figure 11: Test configuration "Gateway" – Handling of Probes

The following actions may be performed with the Gateway test configuration depicted in Figure 11:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 11) with valid and invalid Probes.

- The IUT verifies whether it could have effected translation in an AFTN user message by comparing certain parameters in the Probe with the capability of its gateway function. The IUT generates in dependence on the result of the verification either a Delivery Report (DR) or a Non-Delivery Report (NDR) which is returned to the AMHS Test Tool via a transfer port (R1).

4.3.5 Naming and addressing

Naming and addressing in the AMHS context relates to the unambiguously identification of 1) users to a global AMHS and 2) communication entities residing in the upper layers of the AMHS communication stack. Focus of conformance testing is the IUT's capability to handle AMHS addressing schemes for identification of users. The second aspect is covered by setting up of configuration parameters in the test configuration (see Section 5).

The AMHS SARPs specify two user addressing schemes which are collectively referred to as MF-addressing schemes: the *XF-addressing scheme* and the *Common AMHS Addressing Scheme (CAAS)*. Preference should be given to the latter. In addition, the SARPs allow to implement within an AMHS Management Domain *locally defined* schemes. The AMHS Test Tool supports the XF-addressing scheme and the CAAS. (Support of other addressing schemes may be subject of further extensions.)

The use of *directory names* is seen as a local matter when supporting the *Basic* ATS Message Handling Service (AMHS SARPs). Their support by the AMHS Test Tool may be subject of further extensions meeting the requirements of the *Extended* ATS Message Handling Service.

An IUT's capability to handle MF-addressing schemes is already implicitly verified with the operations related test groups as defined in Sections 4.3.1 to 4.3.4. However, for in-depth testing of implemented addressing features the establishment of a dedicated test group may be a suitable approach. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10.

Note. – The aspect of a dedicated test groups for in-depth testing of system level provisions applies also to the two remaining test groups defined below.

4.3.6 AMHS parameters

The AMHS SARPs [1] 3.1.2.2.3 specify a number of operational conventions which have the nature of parameters from the MHS point of view. These parameters relate to:

- Use of MF-addresses (see Section 4.3.5)
- User data conventions
  - Only single body part in IPMs
  - Ia-5 text body (Basic ATS Message Handling Service)
- Use of ATS-Message-Header in the body part of IPMs (Basic ATS Message Handling Service)
- Restriction of Notification Requests (IPMS) for SS-priority messages. In-depth testing of the AMHS parameters may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10.

4.3.7 Traffic logging

The AMHS SARPs specify long-term (30 days) logging requirements for the various types of functional components of the AMHS. The requirements make it possible to perform message tracing through the AMHS, in particular when an investigation is needed. The query of the logged information is seen as a local implementation detail.

Logging requirements are placed on the following functional components of the AMHS:

- ATS Message User Agent
- ATS Message Server
- AFTN/AMHS Gateway concerning its sub-components

  - ATN component – [1] Section 3.1.2.3.2.2.6
  - Message Transfer and Control Unit (MTCU) – [1] Section 3.1.2.3.3.1
  - AFTN component – [1] Section 3.1.2.3.21.8-11.

In-depth testing of the traffic logging may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10. Verification of the logged information will make use of the local query and tracing provisions. Access is typically provided at the system management interface of the IUT (cf. reference point *R8* in Figure 5).

4.4 Definition of test cases

According to ISO 9646-2 a *test case* comprises the actions to achieve a specific test purpose. Each test case normally has a single test purpose, such as that of verifying that the IUT has a certain required capability (e.g. the capability to support certain message lengths) or exhibits a certain required behaviour when a particular event occurs (e.g. transfer of submitted messages). Typically, a set of test cases aiming at a common functional area of an IUT are arranged to a *test group* (see Section 4.3).

There may be many criteria for methodical definitions of test cases (within a test group) to achieve an envisaged confidence in a particular functional area of the IUT. Figure 12 depicts proposed two levels of high-order criteria for definitions of AMHS related test cases. The AMHS Test Tool should support conformance testing in a scope as outlined in Figure 12.

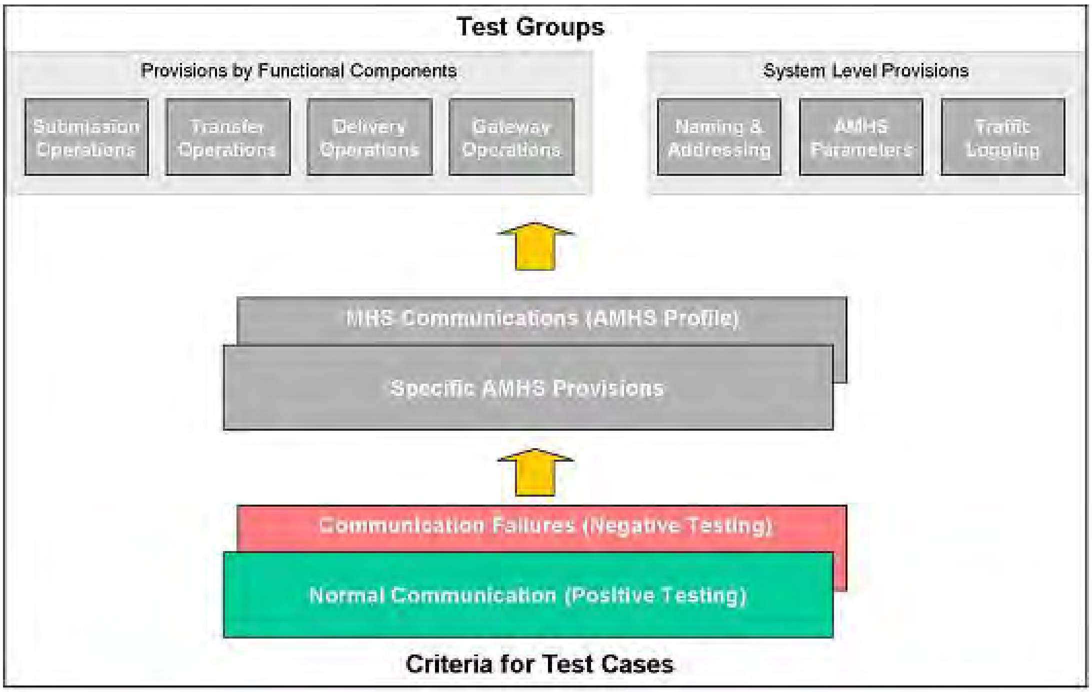

Figure 12 : Approach for definition of Test Cases

In Figure 12 a distinction is made between communication requirements which are of general nature in MHS environments and such which are specific to AMHS. The first category of requirements is addressed in the AMHS SARPs just by references to the MHS standard (ISO/IEC 10021) and related profile documentation (ISPs). No further details of MHS procedures are provided with the AMHS SARPs .

In addition, the AMHS SARPs include a number of provisions which are specific for AMHS. Such provisions may relate to supplementary functional components (as AMHS gateways) or specify conventions for which MHS implementations are transparent (e.g. limited use of notification requests). The AMHS SARPs specify the AMHS specific provisions in a “standalone” manner.

Note. – An example of the above made distinction between specific AMHS requirements and underlying MHS features are the AMHS traffic logging requirements: The traffic logging requirements at an ATS Message Server refer to the last element of the trace-information (AMHS SARPs). The trace-information itself (forming part of the message-transfer-envelope) is specified in ISO/IEC 10021-4, 12.3.1. – It is up to the organisation which will operate an AMHS system to limit conformance testing to the SARPs specific elements or to extend testing to the referenced trace-information as defined with the MHS standard.

As second level criteria for definition of test cases a distinction is made between normal MHS/AMHS communications (*positive* testing) and enforcing fault situations (*negative* testing). Figure 13 details this further logical ordering of testing.

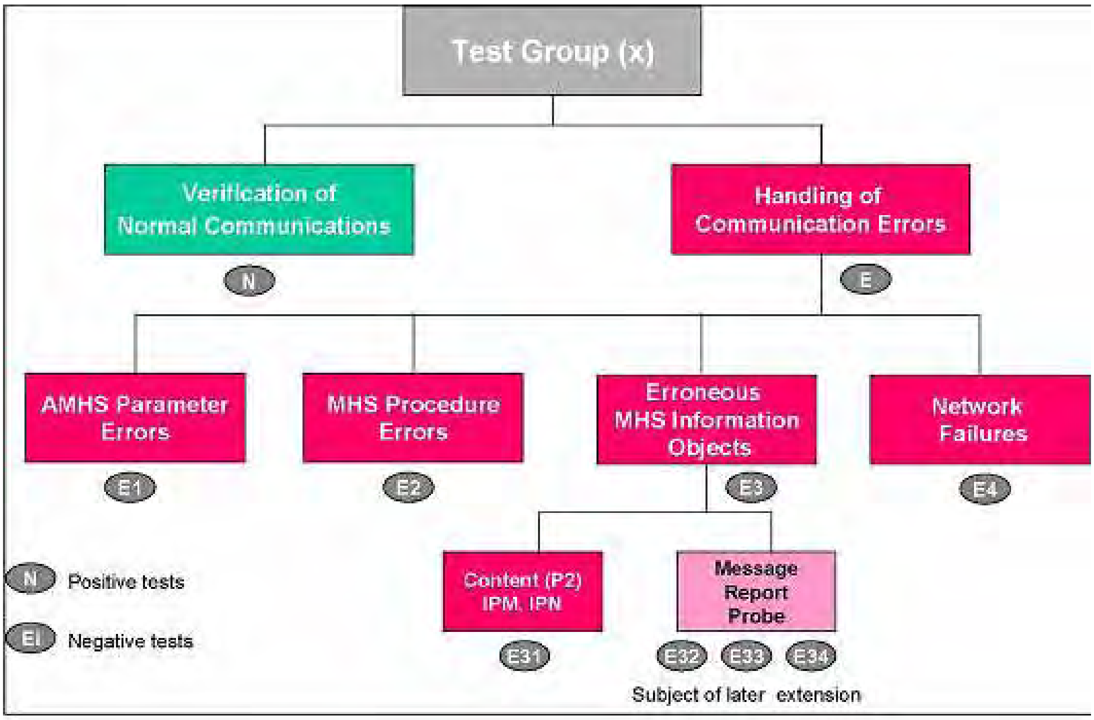

Figure 13: Classes of “Negative Tests”

The test categories indicated in Figure 13 are based on the following definitions:

Normal communications (N). – The AMHS Test Tool provides the IUT with correct inputs and the related responses (behaviour) of the IUT should be in compliance with the AMHS SARPs. It should be noted that a correct response of the IUT not always equals to a successful transmission of an AMHS information object. Example: If the service element *DL-expansion-prohibited* has been set then a DL expansion will not occur.

Erroneous AMHS parameters (E1). – The AMHS SARPs, Parameters, specify a number of specific AMHS conventions as use of MF-addresses, ATS-Message-Header, notification requests and single body part IPMs. It should be noted that violations of such AMHS conventions are not equal with faults in the MHS communication.

MHS procedural errors (E2). – The AMHS Test Tool does not act in compliance with the MHS procedures or the arrangements made in the test configuration. Examples:

1) The IUT is requested to send a message with a Report request, however, the AMHS Test Tool does not return any Report.
2) 2) The AMHS Test Tool uses a recipient address which is unknown in the test configuration.

Erroneous MHS information objects (E3). – That means arguments have not allowed values or information objects are corrupted. A distinction is made between the levels of IPMS and MTS:

- IPMS (E31). – IPMs and IPNs sent to the IUT are not correctly encoded (syntax or semantic errors). Example: Mandatory arguments in the IPM heading are missing or there is no IPM body attached to the IPM heading.

- MTS (E32), (E33), (E34). – Messages, Reports and Probes sent to the IUT are not correctly encoded. Example: In a Report the *Report Transfer Content* is missing.

Network failures (E4). – Transient interruptions of network connections during transmission of AMHS information objects. The AMHS Test Tool supports negative testing of the categories E1, E2 and E31 and E4 (Figure 13).

Note. – Negative testing of the categories E32, E33 and E34 may be subject of further extensions of the testing requirements if experience leads to this need.

A given test group may be transparent for one or more classes of "negative tests". For example, transfer operations are transparent for AMHS parameter errors (E1) and Content (IPMS) failures (E31). Table 3 indicates in a form of a matrix the valid interrelations between defined test groups and classes of negative tests. Such a testing matrix may be helpful to demonstrate the reached coverage of testing for a given set of test cases.

	Submission Ops	**Transfer Ops**	**Delivery Ops**	**Gateway Ops**	**Naming & Addressing**	**AMHS Parameters**	**Traffic Logging**
N	X	X	X	X	X	X	X
E1	X	n/a	X	X	X	X	n/a
E2	X	X	X	X	n/a	n/a	n/a
E31	X	n/a	X	X	n/a	n/a	n/a
E32-E34	X	X	X	X	n/a	n/a	n/a
E4	X	X	X	X	n/a	n/a	n/a

X = valid interrelation; n/a = not applicable

Table 3: Applicability of negative testing for test groups (testing matrix)

5 Configuration Parameters

5.1 The generic test configuration depicted in Figure 5 needs a number of quantitative adjustments before AMHS Test Tool and IUT are in a position to communicate with each other. The subjects of such adjustments are the values of *configuration parameters* which are inherent in the test configuration. Configuration parameters relate to the number of established communication links, number of simulated AMHS and AFTN users as well as to addresses associated with the various layers of communications. Below the configuration parameters are specified in the categories of AMHS and X.25/AFTN communications.

5.2 AMHS communication

5.3

5.3.1 AMHS application

- Number of transfer ports: 3
- Number of AMHS users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

5.4 Layer addresses

No.	Address Type	AMHS SARPs	Value	
			IUT	AMHS Test Tool
1	Application Process Title	3.1.2.1.5.2.1 4.3.2.2		
2	AE-Qualifier	3.1.2.1.5.2.2	ATS Message Server: AMS(7)	
			AFTN/AMHS Gateway: GWB(8)	
3	Presentation Selector	3.1.2.1.5.2.3	tbd	tbd
4	Session Selector	3.1.2.1.5.2.3	tbd	tbd
5	TSAP	3.1.2.1.5.2.3	tbd	tbd
6	TCP Port	n/a	102	
7	IP Address	n/a	tbd	MTA(1): tbd
				MTA(2): tbd
				MTA(3): tbd
8	MAC Address	n/a	tbd	MTA(1): tbd
				MTA(2): tbd
				MTA(3): tbd

Reference: Sections 3.3 and 3.5.1.1.

Table 4: Layer addresses (AMHS communications) AFTN/X.25 communication

5.4.1 AFTN application

- Number of links: 1
- Number of AFTN users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

5.5 Layer addresses

No.	Address Type	Reference	Value	
			IUT	AMHS Test Tool
1	X.25 Entry (Ae)	[3] 6.1.2.1.4.5	*tbd*	*tbd*
	X.25 Exit (Ax)	[3] 5.1.2.7	*tbd*	*tbd*
2	X.25 DTE	[3] 4.2.1.7	*tbd*	*tbd*

Reference: Sections 3.4 and 3.5.1.2.

Table 5: Layer addresses (X.25 communications)

5.6 Test Data

The test data generated and evaluated in conformance testing environments with the AMHS Test Tool comprise (cf. Figure 5):

(1) AMHS and AFTN information objects exchanged between the AMHS Test Tool and IUT. These information objects are well defined by the AMHS SARPs and Annex 10, Vol. II [2], respectively.

(2) AMHS information objects entered and presented at AMHS user interfaces of the IUT. Even if these information objects are substantially specified by the AMHS SARPs their appearance at AMHS user interfaces is specific to a given IUT. In addition, when entering AMHS information objects certain parameters may be handled by the IUT as defaults and do not appear at user interfaces at all.

(3) The AMHS SARPs specify events to be reported to the Control Position of an AFTN/AMHS Gateway. However, the style of reporting is an implementation matter.

(4) Traffic log data to be maintained by the IUT are specified in the AMHS SARPs , however, their handling and presentation is specific for each IUT.

Note :
The correct interpretation of test data of the types (2) to (4) needs insight into the IUT's User Manual.

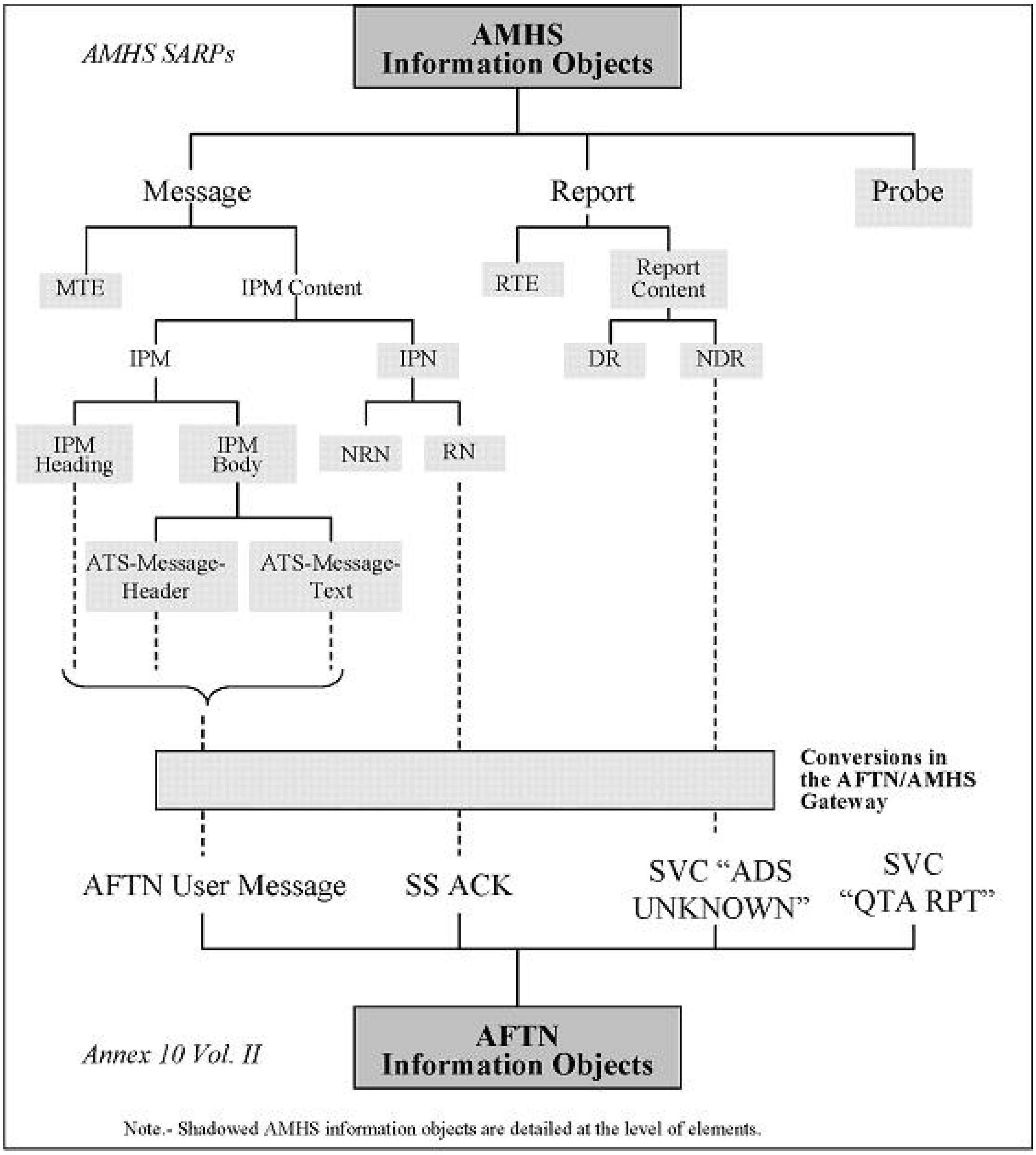

Figure 14: Information objects supported by the AMHS Test Tool

6 Recommended default values for international MTA names and passwords

6.1 Introduction

6.1.1 AMHS implementation requires the setting of the MTA names and passwords for each communication partner (MTA) connected. In a future fully meshed AMHS Network, unique identification of the MTAs would be required. Additionally, the naming should respect the knowledge and experiences of the operator staff, in order to avoid any unnecessary complications in the transition to AMHS.

6.1.2 One way to achieve this is to use a scheme, in which MTA names and passwords contain keywords which uniquely identify the MTA and facilitate recognition.

6.2 Default values for international MTA names

6.2.1 The recommended scheme of MTA names consists of:

- the term "MTA"
- the Location Indicator of the MTA location and
- a number (for future extensions if required)

6.2.2 All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

Example: In accordance with this scheme the name of the MTA in Singapore, should be: MTA-WSSS -1.

6.2.3 This scheme could be used for the national MTA naming as well.

6.3 Default values for international MTA passwords

6.3.1 Password complications arise because manufacturers deviate in the interpretation of an "empty" password. Some implementations await "nothing", some hexadecimal 00, others a single "space" character. To avoid misinterpretations during establishment of association(s) all tests could be performed with a common (known) password. Individual secure passwords could be established later, in order to ensure the necessary security of operational AMHS facilities.

6.3.2 The recommended scheme of the default password consists of:

- the term "ICAO"
- the Location Indicator of the MTA location and
- the specific number of the MTA

6.3.3 All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

Example: In accordance with this scheme the default password of the MTA in Singapore should be: ICAO-WSSS-1.

6.3.4 By following this scheme, the default passwords of future MTAs can be determined at any time. If there are no other security requirements such a scheme can simplify the integration of new MTAs in a fully meshed AMHS Network topology.

END

International Civil Aviation Organization
Asia and Pacific Office

Asia/Pacific Regional

Interface Control document (ICD) for ATS Message Handling System (AMHS)

Version 2.0 – September 2007

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DOCUMENT CONTROL LOG

Version	Revised contents	Date
1.0	Version 1.0 was endorsed by the APANPIRG/13	13 September 2002
2.0	Version 2.0 was endorsed by the APANPIRG/18	7 September 2007

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    2.1 Guidance for Optional Parameters
    2.2 AMHS Specifications
    2.3 Upper Layer Specifications
    2.4 Lower Layer Specifications

Appendix: PICS of AMHS

<References>

1) ICAO Doc 9705/AN-956, “MANUAL OF TECHNICAL PROVISIONS FOR THE AERONAUTICAL TELECOMMUNICATION NETWORK (ATN)”, SECOND EDITION (Effective 10 December 1999)
    a) Sub-Volume I : 1.1 “DEFINITIONS AND REFERENCES”
    b) Sub-Volume III : 3.1 “ATS Message Handling Services (ATSMHS)
    c) Sub-Volume V : “Internet Communication Service”

2) ICAO Doc 9739/AN-961 Comprehensive ATN Manual (Edition 1)

3) ICAO Annex 10, Vol. II, Fifth edition (July 1995)

NOTE 1: This ICD does not include the additional features such as CIDIN/AMHS Gateway, Security and Directory Service which are added in ICAO Doc 9705/AN-965, THIRD EDITION. This ICD may be enhanced to include such additional features in the future.

NOTE 2: This ICD includes supporting CAAS

1. Guidance for AMHS specification

1.1 Introduction

1.1.1 This document is the Interface Control Document (ICD) based on which the AMHS is to be implemented in the Asia/Pacific Region. It is essential that the implementation of the AMHS be fully compliant with ICAO ATN SARPs (Doc9705) as well as this ICD, in order to preserve interoperability between States and ensure that future ATN applications are accommodated. To assist the reader, the following clauses serve as an overview of the AMHS and its underlying network protocols.

1.2 AMHS Functions

1.2.1 The AMHS defines two End Systems, these being an AFTN/AMHS Gateway and an ATS Message Server (with ATS Message User Agent). It is expected that early implementations of AMHS will require the use of an AFTN/AMHS Gateway as during the transitional process to full AMHS AFTN may need to operate concurrently with AMHS either within or between outside States. However, it is also possible to replace AFTN with ATS Message Server (with User Agent) all at once, in this situation there will be no need for AFTN/AMHS Gateways as AFTN will not be required to coexist with AMHS.

NOTE: ATN Pass-Through Service (AFTN/ATN Type A Gateway) should not be implemented since it cannot be connected with AFTN/AMHS Gateway nor ATS Message Server. The description concerning the ATN Pass-Through Service has been deleted in the Third Edition of ICAO ATN SARPs. In addition, CIDIN/AMHS Gateway has been added as a new End System of AMHS in the Third Edition SARPs.

1.2.2 Even in the case that all the AFTN connections within States (i.e. domestic communication) are replaced with X.400 (MHS and NOT AMHS) connections, the connections outside State (i.e. international communication using ATN Routers) are to be complied with ICAO ATN SARPs and this ICD. When the domestic communication is implemented prior to the international communication, the domestic MHS Server may be so modified as to comply with ATN.

1.3 Network Configuration

1.3.1 The network configuration will grow according to the level of implementation of AMHS. The followings are the typical phases of AMHS implementation. The network configuration of each phase is shown in Figure 1.

1) Phase-1
AFTN connections are currently used for both all the domestic communication within State and all the international communication with other States.

2) Phase-2
AFTN/AMHS Gateways and ATN Routers are implemented for the international communication between at least two States.

3) Phase-3
Domestic AFTN connections are replaced with AMHS connections within State. AFTN/AMHS Gateway is enhanced to ATS Message Server. However, AFTN/AMHS Gateway System/Function remains for the AFTN connections (like State C in Figure). There may be AMHS-AMHS direct international communication (via ATN Routers) with the other States.

NOTE: It is a local matter whether to implement ATS Message Server and AFTN/AMHS Gateway in separated computer systems or in one computer system.

4) Phase-4
All the States in the Region implement either ATS Message Server or AFTN/AMHS Gateway and all the international communications are done by AMHS. There may be AMHS-AMHS direct international communication (via ATN Routers) with the other States.

5) Phase-5
AMHS connections are fully applied to both the domestic communication within States and the international communication with all the neighbor States.

6) Phase-6
Full ATN connection is applied within the Region. All the data of ATN applications including AMHS are exchanged through ATN Routers.

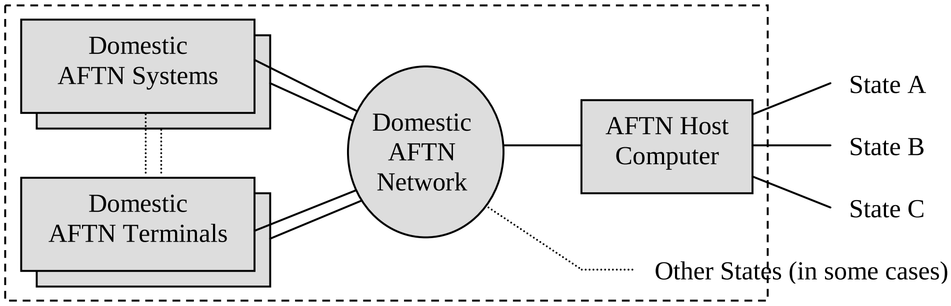
1.3.2 The systems in Figure 1 are as follows;

AMHS Gateway : AFTN/AMHS Gateway

AMHS Server : ATS Message Server (enhanced from AFTN/AMHS Gateway)

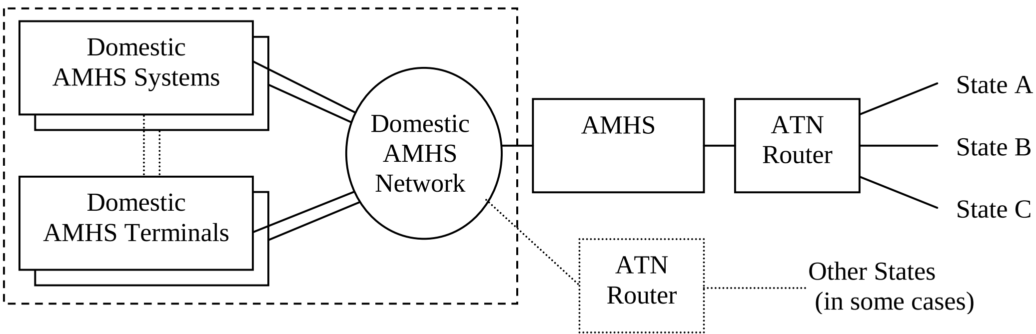
End Systems of ATN Applications
: End Systems of ATN applications including Air/Ground applications such as CM (Context Management), ADS (Automatic Dependent Surveillance), CPDLC (Controller and Pilot Data Link Communication) or FIS (Flight Information Service), whose ground to ground data is forwarded through the same ground network using ATN routers. The system may consist of computer(s) and/or equipment for ATN application for communication, ATM application, Human Machine Interface and maintenance.

AFTN System : AFTN host computer, domestic AFTN network and distributed AFTN systems/terminals (as shown below for an example)

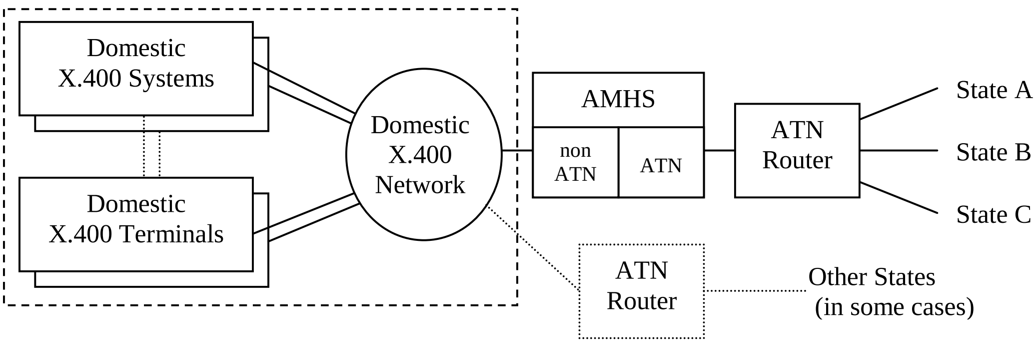


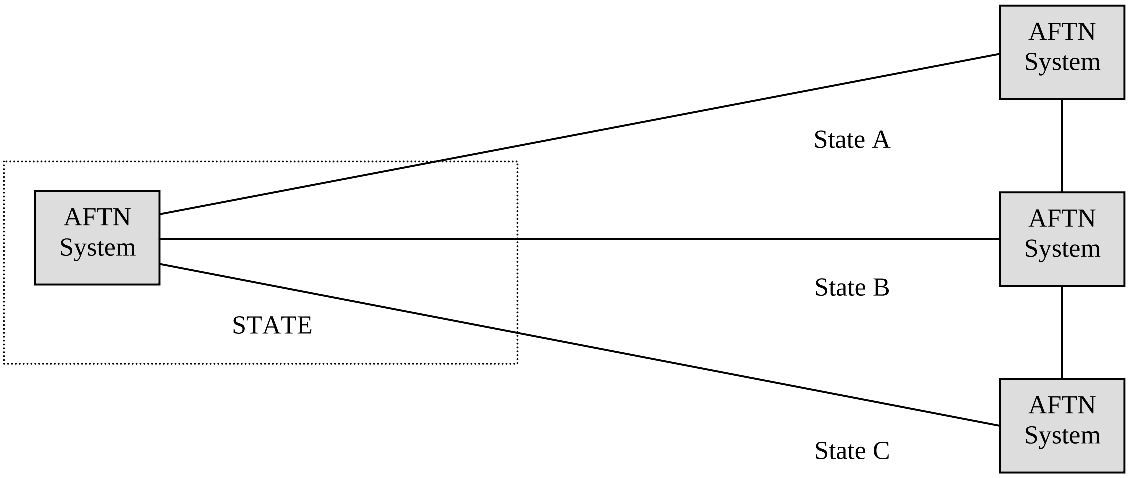
AMHS System : domestic AMHS (or X.400 MHS) network, distributed AMHS (or X.400 MHS) systems/terminals (User Agents) and AMHS (or X.400 MHS) local servers if necessary (as shown below for an example)

AMHS domestic connections

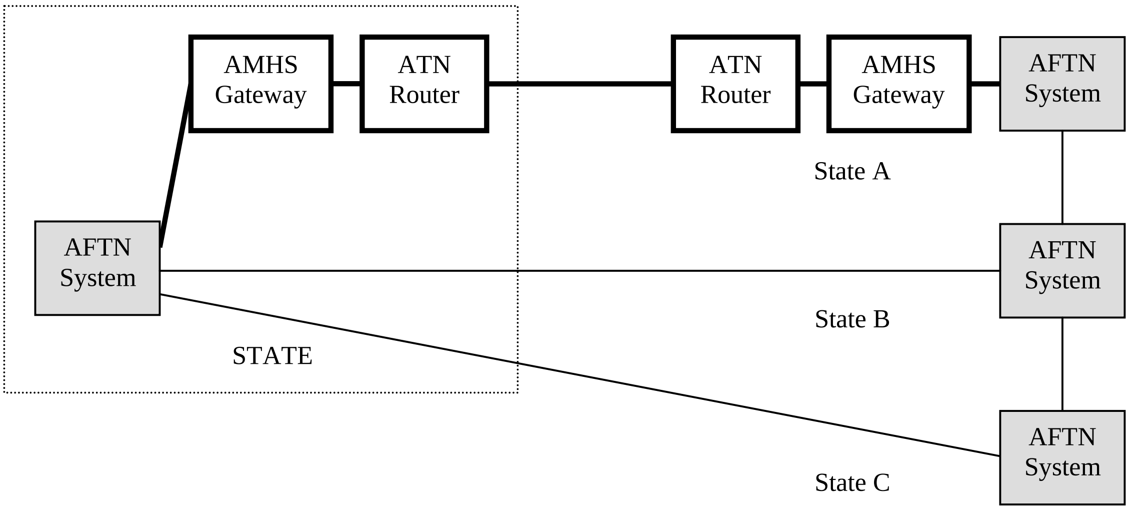


X.400 MHS domestic connections



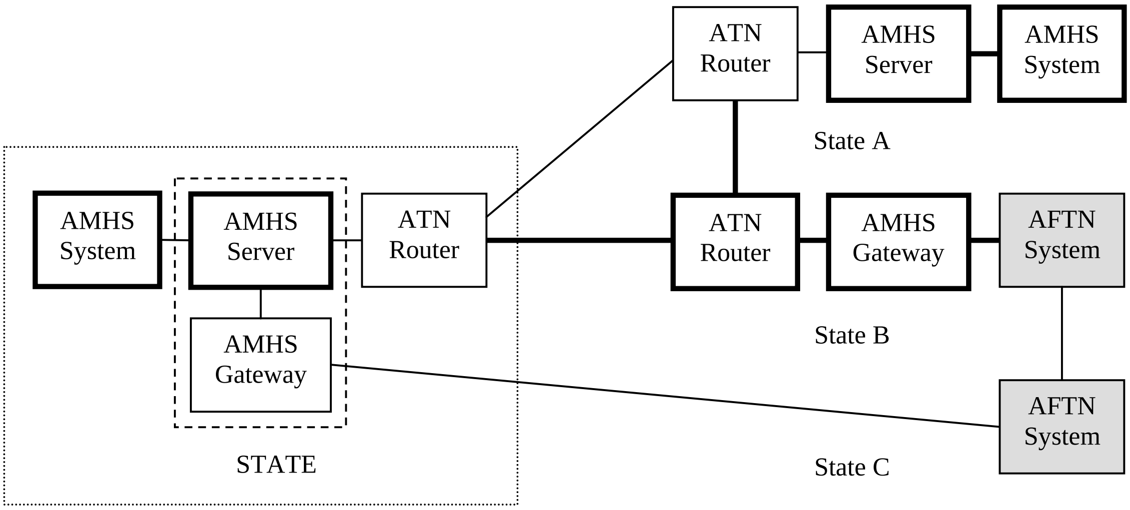


(1) Phase-1
Current AFTN connections

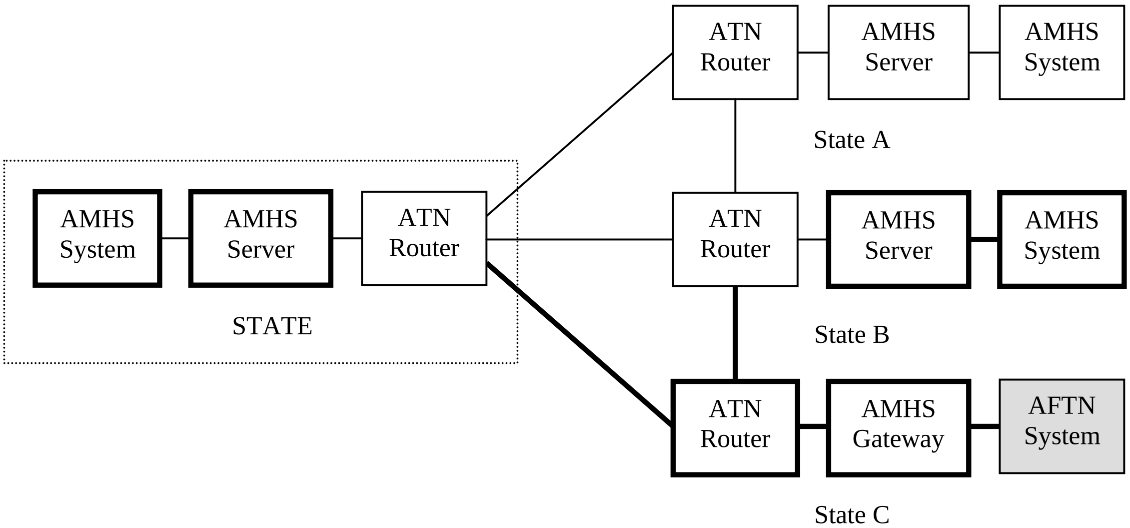


(2) Phase-2
Implementation of AFTN/AMHS Gateways and ATN Routers

Figure 1. AMHS Network Configuration (to be continued)

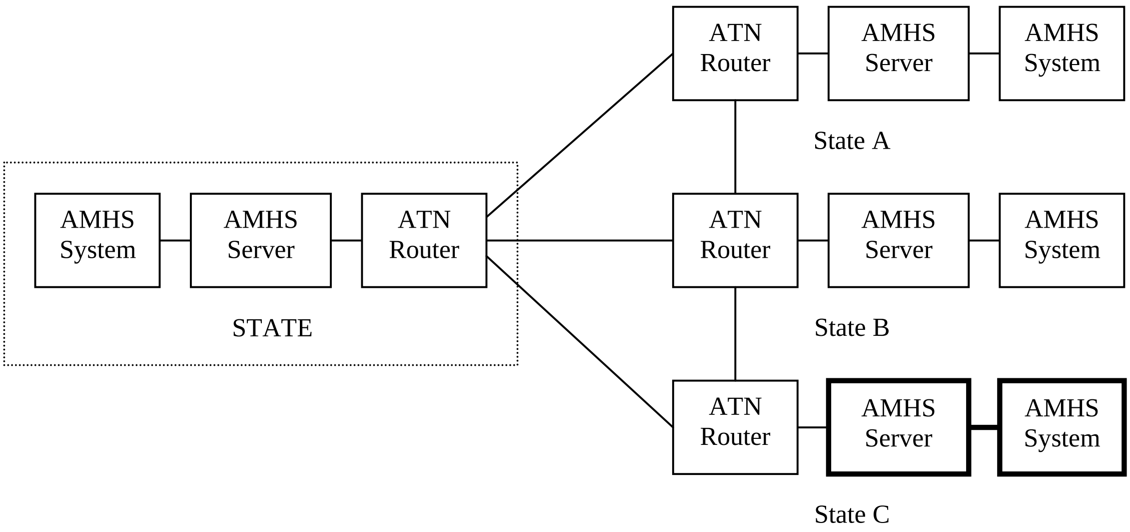


(3) Phase-3
Implementation of ATS Message Server and AMHS connections within State

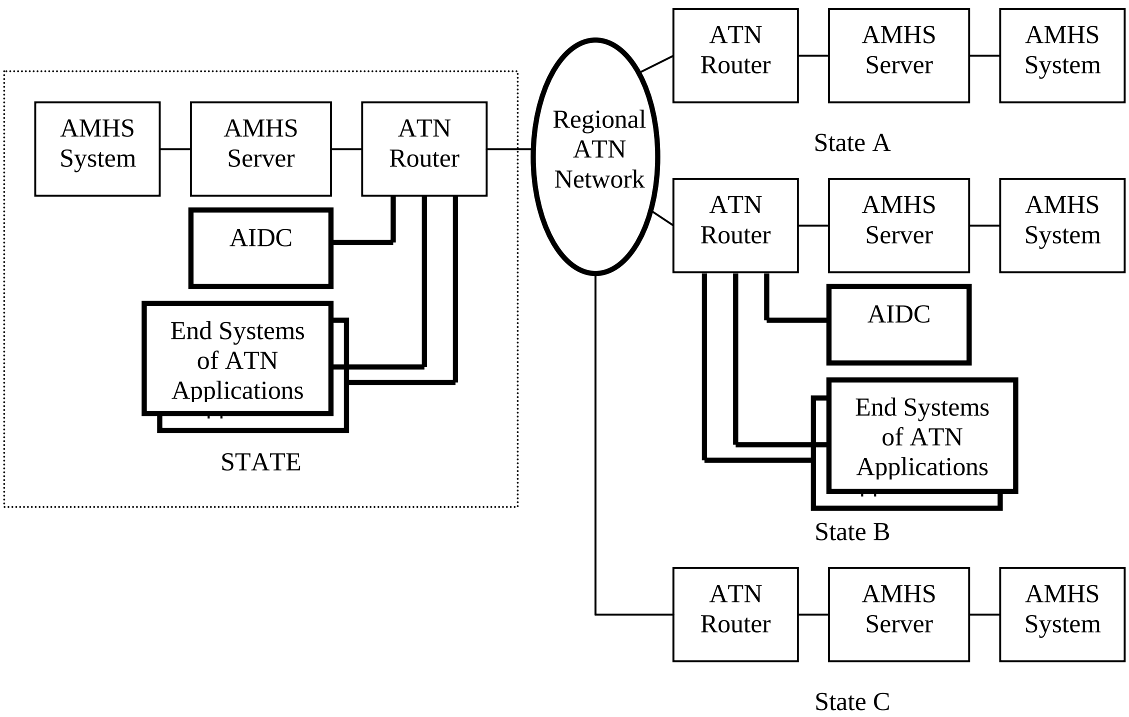


(4) Phase-4
Full AMHS international connections

Figure 1. AMHS Network Configuration (to be continued)



(5) Phase-5
Full AMHS connections



(6) Phase-6
Full ATN connections

Figure 1. AMHS Network Configuration

1.4 Protocol Specification Overview

1.4.1 Protocol Stack of AMHS and ATN Router

1.4.1.1 The following figure shows the OSI protocol stack of ES and IS in the ATN. AMHS is ES and ATN Router is IS.

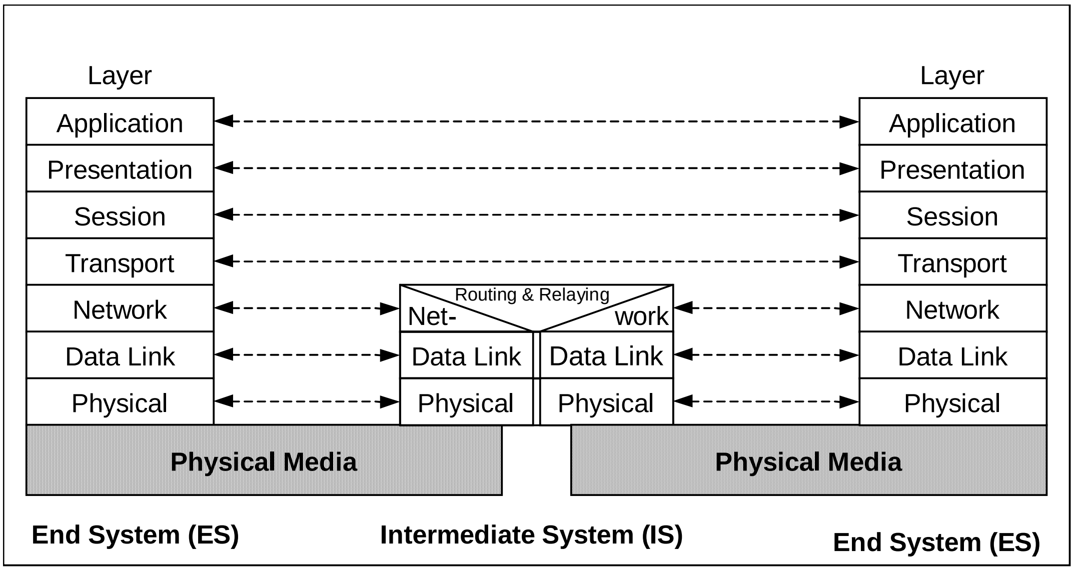


Figure 2. OSI Protocol Stack of ES and IS

1.4.2 AMHS Protocol Specification

1.4.2.1 The followings are the standards and/or ICAO Doc 9705/AN-956 descriptions of protocols at each OSI protocol layer, with which AMHS should comply.

(1) Application Layer

Application Layer is composed of MHS, RTSE, and ACSE.

MHS should comply with ITU-T X.400 (1988) and the additional requirements specified in 3.1 “ATS MESSAGE HANDLING SERVICE” of ICAO Doc 9705/AN-956. MHS supports all the mandatory elements of AMH11 and AMH21, and also supports the DL functional group.

RTSE should comply with ISO 9066-2 and support the mandatory services listed below among the services specified in ISO/IEC ISP 10611-2.

RT-OPEN
RT-CLOSE
RT-TRANSFER
RT-P-ABORT
RT-U-ABORT

ACSE should comply with ISO 8650 and support the mandatory functions of normal mode specified in ISO/IEC 10611-2. Moreover, the application-context name, which is used as a parameter of A-ASSOCIATE, should comply with ISO/IEC 10021-6.

(2) Presentation Layer

Presentation Layer should comply with ISO 8823 and support mandatory functions of normal mode specified in ISO/IEC ISP 10611-2.

~~(4)~~ (3) Session Layer

Session Layer should comply with ISO 8327 and support functional units listed below which are specified in ICAO Comprehensive ATN Manual and ISO/IEC ISP 10611-2.

Kernel
half duplex
exceptions
minor synchronize
activity management

(4) Transport Layer

COTP (Connection Oriented Transport Protocol) specified in ICAO Doc 9705/AN-956 should be used. COTP should comply with ISO/IEC8073 Class 4 and 5.5 “TRANSPORT SERVICE AND PROTOCOL SPECIFICATION” of ICAO Doc 9705/AN-956. The following functions should be supported as specified mandatory by ICAO Doc 9705/AN-956.

Both Initiating CR TPDU and Responding to CR TPDU	
Function of Non-use of checksum	
CR/CC/DR/DC/DT/ED/AK/EA/ER TPDUs	
Optional Parameters of CR/CC TPDUs	
	TSAP-ID (Transport-Selector designation)
	Additional option selection parameter
	Priority
	Acknowledgment time Negotiation
	Inactivity timer Negotiation
Optional Parameters of AK TPDU	
	Flow control confirmation
	Subsequence number

(5) Network Layer

The connection between AMHS and ATN Router ~~may be~~ is a local matter. However, CLNP (Connectionless Network Protocol) should be used ~~for~~ as the ~~communication~~ network ~~of subnetwork~~ protocol below the ~~with~~ Transport Layer.

CLNP should comply with ISO/IEC 8473 and 5.6 “INTERNETWORK SERVICE AND PROTOCOL SPECIFICATION” of ICAO Doc 9705/AN-956. The following functions should be supported as specified mandatory by ICAO Doc 9705/AN-956.

Security Parameter
Partial Route Recording
Priority
QoS Maintenance Information
Congestion Notification

CLNP uses an SNDCF (Subnetwork Dependent Convergence Function) over the ~~underlying~~ subnetwork. (Typically an ISO/IEC 8802 LAN is used for subnetwork between the AMHS and ATN router.) The SNDCF should comply with 5.7 “SPECIFICATION OF SUBNETWORK DEPENDENT CONVERGENCE FUNCTIONS” of ICAO Doc 9705/AN-956, and the appropriate standard corresponding to the subnetwork below:

- ISO/IEC 8802 Local Area Network : the SNDCF should comply with ISO/IEC 8473-2.
- ISO/IEC 8208: the SNDCF should comply with ISO/IEC 8473-3~~ and 5.7 “SPECIFICATION OF SUBNETWORK DEPENDENT CONVERGENCE FUNCTIONS” of ICAO Doc 9705/AN-956~~.

Only ES-IS in compliance with ISO/IEC9543 is used for addressing. ~~Routing protocol IDRP will not be supported.~~

(6) Data Link Layer

The connection between AMHS and ATN Router ~~may be~~ is a local matter.

(7) Physical Layer

The connection between AMHS and ATN Router ~~may be~~ is a local matter.

2. AMHS Specification

2.1 Guidance for Optional Parameters

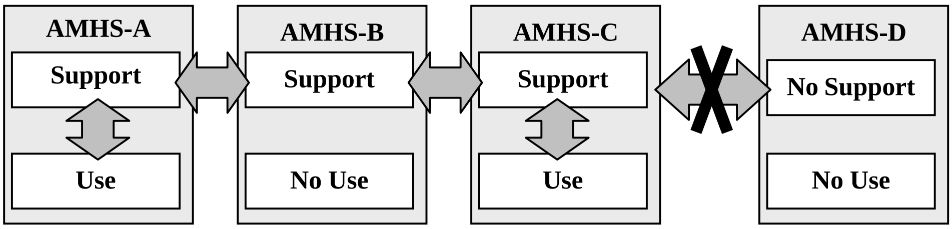
2.1.1 In the ICAO ATN SARPs (Doc 9705) as well as the International Standards, there are two kinds of parameters specified as “Mandatory” and “Optional”.

“Mandatory” parameters are the requirements that all the AMHS must handle the parameters.
“Optional” parameters are specified as local matters and the handling must be decided locally; within State or Region.

2.1.2 In addition, each handling of parameter is specified by two profiles: “AMHS Support” and “AMHS Use”.

“AMHS Support” means that the AMHS can receive or transfer the parameter.
“AMHS Use” means that AMHS uses the functionality specified by the parameter.

Conversely, “No Support” means that the AMHS cannot receive nor transfer the parameter, and “No Use” means that AMHS does not use the functionality.



AMHS-B does not use the optional parameter, however it can transfer the parameter.
AMHS-D does not support the optional parameter, therefore it cannot receive the parameter.
There is no combination of “No Support” with “Use”.

When AMHS-B receives the parameter, no action will be performed.
When AMHS-D receives the parameter, there may be some error, which will depend on the system.

2.1.3 In order to keep the interoperability within the State and/or Region, it is necessary to unify the handling of the optional parameters by specifying the “AMHS Support” and “AMHS Use” uniformly.

2.1.4 As for the Inter-Regional AMHS connection, it is also preferable to unify the specification between the regions. However, in case there will be difference, handling of such difference will be done at either of the following AMHSs:

1) AMHS in the region who wants to communicate directly with the AMHS in the other region.
   (This is the case when direct routing by BISs will be applied, where direct AMHS connection can be made.)

2) AMHS in the State who has Inter-Regional Trunk Connection by Backbone BIS.
   (This is the case when AMHS routing will be applied, where all the connection of the AMHS in the region with the other region will be made, all the time, via the AMHS in the said State.)

NOTE : The detail of the handling for the difference deeply depends on which parameter will be concerned and how. Therefore, it is recommended to discuss the issue in the region when it becomes revealed. It is also recommended to watch the status in the other regions.

2.2 AMHS Specifications

2.2.1 Set up condition of each parameter for both AFTN/AMHS Gateway and ATS Message Server is specified in the appendix in the form of PICS. (Appendix: PICS of AMHS)

2.2.2 When only ATS Message Server without AFTN/AMHS Gateway is implemented, some part (the column “AMHS Action”) in the PICS can be ignored.

2.3 Upper Layer Specifications

2.3.1 Protocol Specification

The meaning of the each column in the tables is as follows:

(1) PICS Proforma Reference

The first letter of the column identifies the specific PICS proforma.
A : ACSE – ISO/IEC 8650-2
P : Presentation – ISO/IEC 8823-2
S : Session – ISO/IEC 8327-2

The characters from the second character to the solidus (/) form a reference to the specific sub clause in annex A of that PICS proforma which contains the table in question.

The number after the solidus references the row number in the table.

(2) Name of Item

(3) Normative reference

It is the referenced clause number in the ISO/IEC ISP 11188-1(1995).

(4) Status

Support Level is specified below:
m : mandatory support
o : optional support
o.n : optional with at least one of the marked items with the same number “n” being selected
c : conditional support
i : out of scope
– : not applicable

Where the status entry contains two classifications separated by a comma, these reference the sending and receiving capabilities respectively.

(5) Profile

The profile column reflects the requirement of this part of ISO/IEC ISP 11188. Each entry in this column is chosen from the following list:
m : mandatory support
C : conditional support
i : out of scope

Where the profile entry contains two classifications separated by a comma, these reference the sending and receiving capabilities respectively.

The value of “Cxx” is “m” or “i” according to the specified condition described below the each table.

NOTE: The definition of the value of “Cxx” is made by the following procedures:

a) Confirm the item of reference number.
b) If AMHS supports referenced item, the item is “m” (mandatory).
c) If AMHS does not support referenced item, the item is ”i” (out of scope).

<Example> The following is an example in the case of “support operation of Session version 2” for ACSE in the next clause 2.3.1.1.

1) Condition
C11: if A.A.7/1 (1st row in the table of A.7 of ISO/IEC 8650-2) then m else I

2) Procedures
a) The 1st row in the table of A.7 of ISO/IEC 8650-2 is the “Normal mode”.
b) If AMHS supports “Normal mode”, “support operation of Session version 2” is” m” (mandatory).
c) If AMHS does not support “Normal mode”, “support operation of Session version 2” is “i” (out of scope).

(6) AMHS Use

The column “AMHS use” states whether each item is “used (yes)” or “not used (no)”.

2.3.1.1 ACSE

2.3.1.1.1 ACSE should comply with ISO 8650 and support the level specified in ISO/IEC ISP 11188-1(1995).

PICS Proforma Reference	Name of Item	Normative reference	Status	Profile	AMHS Use
A.A.7/4 (4th row in the table of A.7 of ISO/IEC 8650-2)	support operation of Session version 2	9.2.1	o	C11	Yes

C11 : if A.A.7/1 (1st row in the table of A.7 of ISO/IEC 8650-2) then m else i

NOTE: The relation between the Initiator/responder roles of ACSE, presentation and session in specified in 2.2.2 and 2.2.3.

2.3.1.2 Presentation PRL

2.3.1.2.1 Presentation PRL should comply with ISO 8823 and should support the level specified in ISO/IEC ISP 11188-1(1995) and AMHS Requirements.

Table 1 ISO/IEC ISP 11188-1

PICS Proforma Reference	Name of Item	Normative reference	Status	Profile	AMHS Use
P.A.6.1/1 (1st row in the table of A.6.1 of ISO/IEC 8823-2)	X.410(1984)	2.2.2	o.01	C21	No
P.A.6.1/2 (2nd row in the table of A.6.1 of ISO/IEC 8823-2)	Normal	2.2.2	o.01	C22	Yes
P.A.7.1.1.1/1 (1st row in the table of A.7.1.1.1 of ISO/IEC 8823-2)	Initiator(Presentation connection)		o.03	C23	Yes
P.A.7.1.1.1/2 (2nd row in the table of A.7.1.1.1 of ISO/IEC 8823-2)	Responder(Presentation connection)		o.03	C24	Yes
P.A.7.1.1.3/1 (1st row in the table of A.7.1.1.3 of ISO/IEC 8823-2)	Requestor(orderly release)		o.05	C25	Yes
P.A.7.1.1.3/2 (2nd row in the table of A.7.1.1.3 of ISO/IEC 8823-2)	Acceptor (orderly release)		o.05	C26	Yes

C21 : if A.A.7/2 (2nd row in the table of A.7 of ISO/IEC 8650-2) then m else i
C22 : if A.A.7/1 (1st row in the table of A.7 of ISO/IEC 8650-2) then m else i
C23 : if A.A.6.1/1 (1st row in the table of A.6.1 of ISO/IEC 8650-2) then m else i
C24 : if A.A.6.1/2 (2nd row in the table of A.6.1 of ISO/IEC 8650-2) then m else i
C25 : if A.A.6.2/1 (1st row in the table of A.6.2 of ISO/IEC 8650-2) then m else i
C26 : if A.A.6.2/2 (2nd row in the table of A.6.2 of ISO/IEC 8650-2) then m else i

Table 2 AMHS Requirements

Name of Item	ISO/IEC 8823-1 Reference	ISO Support	AMHS Use
user-data of CP PPDU	8.2	Either Simply-Encoded-Data or Fully-Encoded-Data	Fully-Encoded-Data
user-data of CPA PPDU	8.2	Either Simply-Encoded-Data or Fully-Encoded-Data	Fully-Encoded-Data
user-data of CPR PPDU	8.2	Either Simply-Encoded-Data or Fully-Encoded-Data	Fully-Encoded-Data
presentation-data-values of PDV-list	8.4.2	Either single-ASN1-type, octet-aligned, or arbitrary	single-ASN1-type

2.3.1.3 Session PRL

2.3.1.3.1 Session PRL should comply with ISO 8327 and support the level specified in ISO/IEC ISP 11188-1 (1995).

PICS Proforma Reference	Name of Item	Normative reference	Status	Profile	AMHS Use
S.A.6.2/2 (2nd row in the table of A.6.2 of ISO/IEC 8327-2)	Reuse of transport connection		o	i	Yes
S.A.6.2/4 (4th row in the table of A.6.2 of ISO/IEC 8327-2)	Extended Concatenation (sending)		o	i	Yes
S.A.6.2/5 (5th row in the table of A.6.2 of ISO/IEC 8327-2)	Extended Concatenation (receiving)		o	i	Yes
S.A.7.1.1.1/1 (1st row in the table of A.7.1.1.1 of ISO/IEC 8327-2)	initiator (session connection)		o.3	C41	Yes
S.A.7.1.1.1/2 (2nd row in the table of A.7.1.1.1 of ISO/IEC 8327-2)	Responder (session connection)		o.3	C42	Yes
S.A.7.1.1.2/1 (1st row in the table of A.7.1.1.2 of ISO/IEC 8327-2)	Requestor (orderly release)		o.4	C43	Yes
S.A.7.1.1.2/2 (2nd row in the table of A.7.1.1.2 of ISO/IEC 8327-2)	Acceptor (orderly release)		o.4	C44	Yes
S.A.7.1.1.3/1 (1st row in the table of A.7.1.1.3 of ISO/IEC 8327-2)	Requestor (normal data transfer)		o.5	C45	Yes
S.A.7.1.1.3/2 (2nd row in the table of A.7.1.1.3 of ISO/IEC 8327-2)	Acceptor (normal data transfer)		o.5	C46	Yes
S.A.7.1.2/2 (2nd row in the table of A.7.1.2 of ISO/IEC 8327-2)	Overflow Accept (OA)	9.2.2	c5,c6	i,i	No, No
S.A.7.1.2/3 (3rd row in the table of A.7.1.2 of ISO/IEC 8327-2)	Connection Data Overflow (CDO)	9.2.2	c5,c6	i,i	No, No

PICS Proforma Reference	Name of Item	Normative reference	Status	Profile	AMHS Use
S.A.7.5.1/1 (1st row in the table of A.7.5.1 of ISO/IEC 8327-2)	Requestor (expedited data)		o.6	C47	No
S.A.7.5.1/2 (2nd row in the table of A.7.5.1 of ISO/IEC 8327-2)	Acceptor (expedited data)		o.6	C48	No
S.A.7.6.1/1 (1st row in the table of A.7.6.1 of ISO/IEC 8327-2)	Requestor (typed data)		o.7	C49	No
S.A.7.6.1/2 (2nd row in the table of A.7.6.1 of ISO/IEC 8327-2)	Acceptor(typed data)		o.7	C50	No
S.A.7.7.1/1 (1st row in the table of A.7.7.1 of ISO/IEC 8327-2)	Requestor (capability data)		o.8	C51	No
S.A.7.7.1/2 (2nd row in the table of A.7.7.1 of ISO/IEC 8327-2)	Acceptor (capability data)		o.8	C52	No
S.A.7.8.1/1 (1st row in the table of A.7.8.1 of ISO/IEC 8327-2)	Requestor (minor synchronize)		o.9	C53	Yes
S.A.7.8.1/2 (2nd row in the table of A.7.8.1 of ISO/IEC 8327-2)	Acceptor (minor synchronize)		o.9	C54	Yes
S.A.7.11.1/1 (1st row in the table of A.7.11.1 of ISO/IEC 8327-2)	Requestor (major synchronize)		o.10	C55	No
S.A.7.11.1/2 (2nd row in the table of A.7.11.1 of ISO/IEC 8327-2)	Acceptor (major synchronize)		o.10	C56	No
S.A.7.14.1.1/1 (1st row in the table of A.7.14.1.1 of ISO/IEC 8327-2)	Requestor (activity start)		o.12	C57	Yes
S.A.7.14.1.1/2 (2nd row in the table of A.7.14.1.1 of ISO/IEC 8327-2)	Acceptor (activity start)		o.12	C58	Yes
S.A.7.14.1.2/1	Requestor (activity resume)		o.13	C59	Yes

PICS Proforma Reference	Name of Item	Normative reference	Status	Profile	AMHS Use
(1st row in the table of A.7.14.1.2 of ISO/IEC 8327-2)					
S.A.7.14.1.2/2 (2nd row in the table of A.7.14.1.2 of ISO/IEC 8327-2)	Acceptor (activity resume)		o.13	C60	Yes
S.A.7.14.1.3/1 (1st row in the table of A.7.14.1.3 of ISO/IEC 8327-2)	Requestor (activity interrupt)		o.14	C61	Yes
S.A.7.14.1.3/2 (2nd row in the table of A.7.14.1.3 of ISO/IEC 8327-2)	Acceptor (activity interrupt)		o.14	C62	Yes
S.A.7.14.1.4/1 (1st row in the table of A.7.14.1.4 of ISO/IEC 8327-2)	Requestor (activity discard)		o.15	C63	Yes
S.A.7.14.1.4/2 (2nd row in the table of A.7.14.1.4 of ISO/IEC 8327-2)	Acceptor (activity discard)		o.15	C64	Yes
S.A.7.14.1.5/1 (1st row in the table of A.7.14.1.5 of ISO/IEC 8327-2)	Requestor (activity end)		o.16	C65	Yes
S.A.7.14.1.5/2 (2nd row in the table of A.7.14.1.5 of ISO/IEC 8327-2)	Acceptor (activity end)		o.16	C66	Yes
S.A.7.14.1.6/1 (1st row in the table of A.7.14.1.6 of ISO/IEC 8327-2)	Requestor (give tokens confirm)		o	C67	Yes
S.A.7.14.1.6/2 (2nd row in the table of A.7.14.1.6 of ISO/IEC 8327-2)	Acceptor (give tokens confirm)		o	C68	Yes
S.A.8.1.3/4 (4th row in the table of A.8.1.3 of ISO/IEC 8327-2)	Data Overflow Item (CN)	9.2.2	c6,c5	i, i	No, No

1) Status

c5 : Condition is to support “Responder (session connection)”.
c6 : Condition is to support “Requestor (orderly release)”.

2) Profile

C41 : if A.A.6.1/1 (1st row in the table of A.6.1 of ISO/IEC 8650-2) then m else i
C42 : if A.A.6.1/2 (2nd row in the table of A.6.1 of ISO/IEC 8650-2) then m else i
C43 : if A.A.6.2/1 (1st row in the table of A.6.2 of ISO/IEC 8650-2) then m else i
C44 : if A.A.6.2/2 (2nd row in the table of A.6.2 of ISO/IEC 8650-2) then m else i
C45 : if P.A.7.1.1.2/1 (1st row in the table of A.7.1.1.2 of ISO/IEC 8823-2) then m else i
C46 : if P.A.7.1.1.2/2 (2nd row in the table of A.7.1.1.2 of ISO/IEC 8823-2) then m else i
C47 : if P.A.7.4.4/1 (1st row in the table of A.7.4.4 of ISO/IEC 8823-2) then m else i
C48 : if P.A.7.4.4/2 (2nd row in the table of A.7.4.4 of ISO/IEC 8823-2) then m else i
C49 : if P.A.7.4.5/1 (1st row in the table of A.7.4.5 of ISO/IEC 8823-2) then m else i
C50 : if P.A.7.4.5/2 (2nd row in the table of A.7.4.5 of ISO/IEC 8823-2) then m else i
C51 : if P.A.7.4.6/1 (1st row in the table of A.7.4.6 of ISO/IEC 8823-2) then m else i
C52 : if P.A.7.4.6/2 (2nd row in the table of A.7.4.6 of ISO/IEC 8823-2) then m else i
C53 : if P.A.7.4.7/1 (1st row in the table of A.7.4.7 of ISO/IEC 8823-2) then m else i
C54 : if P.A.7.4.7/2 (2nd row in the table of A.7.4.7 of ISO/IEC 8823-2) then m else i
C55 : if P.A.7.4.10/1 (1st row in the table of A.7.4.10 of ISO/IEC 8823-2) then m else i
C56 : if P.A.7.4.10/2 (2nd row in the table of A.7.4.10 of ISO/IEC 8823-2) then m else i
C57 : if P.A.7.4.13.1/1 (1st row in the table of A.7.4.13.1 of ISO/IEC 8823-2) then m else i
C58 : if P.A.7.4.13.1/2 (2nd row in the table of A.7.4.13.1 of ISO/IEC 8823-2) then m else i
C59 : if P.A.7.4.13.2/1 (1st row in the table of A.7.4.13.2 of ISO/IEC 8823-2) then m else i
C60 : if P.A.7.4.13.2/2 (2nd row in the table of A.7.4.13.2 of ISO/IEC 8823-2) then m else i
C61 : if P.A.7.4.13.3/1 (1st row in the table of A.7.4.13.3 of ISO/IEC 8823-2) then m else i
C62 : if P.A.7.4.13.3.2 (2nd row in the table of A.7.4.13.3 of ISO/IEC 8823-2) then m else i
C63 : if P.A.7.4.13.4/1 (1st row in the table of A.7.4.13.4 of ISO/IEC 8823-2) then m else i
C64 : if P.A.7.4.13.4/2 (2nd row in the table of A.7.4.13.4 of ISO/IEC 8823-2) then m else i
C65 : if P.A.7.4.13.5/1 (1st row in the table of A.7.4.13.5 of ISO/IEC 8823-2) then m else i
C66 : if P.A.7.4.13.5/2 (2nd row in the table of A.7.4.13.5 of ISO/IEC 8823-2) then m else i
C67 : if P.A.7.4.13.6/1 (1st row in the table of A.7.4.13.6 of ISO/IEC 8823-2) then m else i
C68 : if P.A.7.4.13.6/2 (2nd row in the table of A.7.4.13.6 of ISO/IEC 8823-2) then m else i

2.4 Lower Layer Specifications

2.4.1 Protocol Implementation Conformance Statements of COTP

2.4.1.1 In protocol layer 4, ICS SARPs recommend COTP. The functions of COTP are specified below.

(1) "ATN Support" indicates that the item is Mandatory ("M"), Option ("O") or Mandatory implemented and Optionally used ("MO").
(2) "AMHS Support" indicates whether the item is Supported ("yes") or NOT Supported ("no").
(3) "AMHS Use" indicates whether the item is Used ("yes") or NOT Used ("no") in transfer.

Table 1 Support Class

Class	ATN Support	AMHS Support	AMHS Use
Class 0	O	no	no
Class 1	O	no	no
Class 2	O	no	no
Class 3	O	no	no
Class 4 operation over CONS	O	no	no
Class 4 operation over CLNS	M	yes	yes

Table 2 ATN Requirements

Feature	ATN Support	AMHS Support	AMHS Use
Congestion Avoidance	M	yes	yes
Transport to Network Priority	M	yes	yes
ATN Security Label	M	yes	yes
Configurable Transport Timers	M	yes	yes
Enhanced encoding of Acknowledgment Time Parameter	M	yes	yes

NOTE: Implementation of the transport protocol shall support configurable values for all timers and protocol parameters, rather than having fixed values, in order to allow modification as operational experience is gained. The actual values of transport timers are to be determined through bilateral agreement on the AMHS systems connected each other. (See the Clause 2.4.2).

Table 3 Initiator/Responder Capability

Class	ATN Support	AMHS Support	AMHS Use
Initiating CR TPDU	M	yes	yes
Responding to CR TPDU	M	yes	yes

Table 4 Mandatory Functions

Function	ATN Support	AMHS Support	AMHS Use
TPDU transfer	M	yes	yes
Segmenting	M	yes	yes
Reassembling	M	yes	yes
Separation	M	yes	yes
Connection establishment	M	yes	yes
Connection refusal	M	yes	yes
Data TPDU numbering (normal)	M	yes	yes
Retention and acknowledgement of TPDUs (AK)	M	yes	yes
Explicit flow control	M	yes	yes
Checksum	M	yes	yes
Frozen references	M	yes	yes
Retransmission on time-out	M	yes	yes
Resequencing	M	yes	yes
Inactivity control	M	yes	yes

Table 5 Optional Functions

Feature	ATN Support	AMHS Support	AMHS Use
Data TPDU numbering (extended)	O	yes	yes
Non-use of checksum	M	yes	yes
Concatenation	O	no	no
Retention and acknowledgement of TPDUs Use of selective acknowledgement	O	no	no
Retention and acknowledgement of TPDUs Use of request acknowledgement	O	no	no

Table 6 Supported TPDUs

TPDUs		ATN Support	AMHS Support	AMHS Use
CR	supported on transmission	M	yes	yes
CR	supported on receipt	M	yes	yes
CC	supported on transmission	M	yes	yes
CC	supported on receipt	M	yes	yes
DR	supported on transmission	M	yes	yes
DR	supported on receipt	M	yes	yes
DC	supported on transmission	M	yes	yes
DC	supported on receipt	M	yes	yes
DT	supported on transmission	M	yes	yes
DT	supported on receipt	M	yes	yes
ED	supported on transmission	MO	no	no
ED	supported on receipt	MO	no	no
AK	supported on transmission	M	yes	yes
AK	supported on receipt	M	yes	yes
EA	supported on transmission	MO	no	no
EA	supported on receipt	MO	no	no
ER	supported on receipt	M	yes	yes

Table 7 Parameter Values for CR TPDU

Feature	ATN Support	AMHS Support	AMHS Use
Bits 8 and 7 in the additional options selection parameter of a CR TPDU set to zero	M	yes	yes

Table 8 Optional Parameter for a CR TPDU

Supported parameters	ATN Support	AMHS Support	AMHS Use
Called Transport-Selector	M	yes	yes
Calling Transport-Selector	M	yes	yes
TPDU size	O	no	no
Version Number	O	no	no
Protection parameters	O	no	no
Additional option selection	M	yes	yes
Throughput	O	no	no
Residual error rate	O	no	no
Priority	M	yes	yes
Transit delay	O	no	no
Acknowledgement time	M	yes	yes
Preferred maximum TPDU size	O	no	no
Inactivity timer	M	yes	yes

Table 9 Optional Parameter for a CC TPDU

Supported parameters	ATN Support	AMHS Support	AMHS Use
Called Transport-Selector	M	yes	yes
Calling Transport-Selector	M	yes	yes
TPDU size	O	no	no
Protection parameters	O	no	no
Additional option selection	M	yes	yes
Throughput	O	no	no
Residual error rate	O	no	no
Priority	M	yes	yes
Transit delay	O	no	no
Acknowledgement time	M	yes	yes
Preferred maximum TPDU size	O	no	no
Inactivity timer	M	yes	yes

Table 10 Optional Parameter for a DR TPDU

Supported parameter	ATN Support	AMHS Support	AMHS Use
Additional information	O	no	no

Table 11 Optional Parameter for a DT TPDU

Supported parameter	ATN Support	AMHS Support	AMHS Use
Request of acknowledgement	M	yes	no

Table 12 Optional Parameter for an AK TPDU

Supported parameter	ATN Support	AMHS Support	AMHS Use
Flow control confirmation	M	yes	yes

Table 13 Subsequence Number Parameter in the AK TPDU

Supported parameter	ATN Support	AMHS Support	AMHS Use
Subsequence number	M	yes	yes

Table 14 Selective Acknowledgement Parameter in the AK TPDU

Supported parameter	ATN Support	AMHS Support	AMHS Use
Selective acknowledgement parameters	O	no	no

Table 15 Optional Parameter for an ER TPDU

Supported parameter	ATN Support	AMHS Support	AMHS Use
Invalid TPDU	O	no	no

Table 16 User Data in Issued TPDUs

User Data	ATN Support	AMHS Support	AMHS Use
User data of up to 32 octets in a CR with preferred class 4 ?	M	yes	yes
User data of up to 32 octets in a CC ?	M	yes	yes
User data of up to 64 octets in a DR ?	M	yes	yes

Table 17 User Data in Received TPDUs

User Data	ATN Support	AMHS Support	AMHS Use
32 octets of user data in a CC TPDU ?	M	yes	yes
64 octets of user data in a DR TPDU ?	M	yes	yes
32 octets of user data in a CR TPDU ?	M	yes	yes

Table 18 Class Negotiation - Initiator

Feature	ATN Support	AMHS Support	AMHS Use
The preferred class in the CR TPDU may contain any of the classes supported by the implementation	Class 4	Class 4	Class 4

Table 19 The table below specifies valid alternative classes

Preferred class	ATN Support	AMHS Support	AMHS Use
Class 4 over CLNS	None	None	None

Table 20 Class negotiation - responder side

Preferred class	ATN Support	AMHS Support	AMHS Use
What classes can you respond with if CR proposes only class 4?	Class 4	Class 4	Class 4
What classes can you respond with if CR proposes class 4 as preferred class and the alternative class parameter is present?	Class 4	Class 4	Class 4

Table 21 TPDU Size Negotiation

TPDU Size	ATN Support	AMHS Support	AMHS Use
If maximum TPDU size is proposed in a CR TPDU then the initiator shall support all TPDU sizes from 128 octets to the maximum proposed	M	yes	yes
If the preferred maximum TPDU size parameter is used in a CR TPDU then the initiator shall support all TPDU sizes, except 0, that are multiples of 128 octets up to the preferred maximum proposed	M	yes	yes
What is the largest value of the preferred maximum TPDU size parameter in a CR TPDU?	any multiple of 128 octets	any multiple of 128 octets	any multiple of 128 octets
What is the largest value of the preferred maximum TPDU size parameter in a CC TPDU?	any multiple of 128 octets	any multiple of 128 octets	any multiple of 128 octets
What is the largest value of the maximum TPDU size parameter in a CR TPDU with preferred class 4?	One of 128, 256, 512, 1024, 2048	One of 128, 256, 512, 1024, 2048	One of 128, 256, 512, 1024, 2048
What is the largest value of the maximum TPDU size parameter which may be sent in the CC TPDU when class 4 is selected?	128, 256, 512, 1024, 2048	128, 256, 512, 1024, 2048	128, 256, 512, 1024, 2048

Table 22 Use of Extended Format

Extended format	ATN Support	AMHS Support	AMHS Use
What formats can you propose in the CR TPDU in class 4?	normal, extended	extended	extended
What formats can you select in CC when extended has been proposed in CR in class 4?	normal, extended	extended	extended

NOTE: Extended format is needed to be selected for the use of the Data TPDU numbering (extended) (see the Table 5 in this Clause). The Data TPDU numbering (extended) is able to increase the throughput of messages between AMHS systems by increasing the number of the data which can be sent without waiting for the acknowledgement from the other AMHS system.

Table 23 Expedited data Transport service

Expedited data	ATN Support	AMHS Support	AMHS Use
Is the expedited data indication supported in CR and CC TPDU?	MO	yes	yes

Table 24 Non-use of Checksum

Non-use of checksum	ATN Support	AMHS Support	AMHS Use
What proposals can you make in the CR?	non-use, use	use	non-use
What proposals can you make in CC when non-use of checksum has been proposed in CR?	non-use, use	use	non-use

Table 25 Use of selective acknowledgement

Selective Acknowledgement	ATN Support	AMHS Support	AMHS Use
Is use of selective acknowledgement proposed in CR TPDUs ?	O	no	no
Is use of selective acknowledgement selected in a CC when it has been proposed in a CR ?	O	no	no

Table 26 Use of Request Acknowledgement

Request of Acknowledgement	ATN Support	AMHS Support	AMHS Use
Is use of request of acknowledgement proposed in CR TPDUs ?	O	no	no
Is use of request of acknowledgement selected in a CC when it has been proposed in a CR ?	O	no	no

Table 27 Action on Detection of a Protocol Error

Item	ATN Support	AMHS Support	AMHS Use
Class 4 over CLNS	ER, DR, Discard	ER, DR, Discard	ER, DR, Discard

Table 28 Actions on receipt of an invalid or undefined parameter in a CR TPDU

Event	ATN Support	AMHS Support	AMHS Use
A parameter not defined in ISO/IEC 8073 shall be ignored	M	yes	yes
An invalid value in the alternative protocol class parameter shall be treated as a protocol error	M	yes	yes
An invalid value in the class and option parameter shall be treated as a protocol error	M	yes	yes
On receipt of the additional option selection parameter bits 8 to 7, and bits 6 to 1 if not meaningful for the proposed class, shall be ignored	M	yes	yes
On receipt of the class option parameter bits 4 to 1 if not meaningful for the proposed class shall be ignored	M	yes	yes
What action is supported on receipt of a parameter defined in ISO 8073 (other than those covered above) and having an invalid value ?	Ignore, Protocol Error	Ignore, Protocol Error	Ignore, Protocol Error

Table 29 Actions on receipt of an invalid or undefined parameter in a TPDU other than a CR

Event	ATN Support	AMHS Support	AMHS Use
A parameter not defined in ISO/IEC 8073 shall be treated as a protocol error	M	yes	yes
A parameter which has an invalid value as defined in ISO/IEC 8073 shall be treated as a protocol error	M	yes	yes
A TPDU received with a checksum which does not satisfy the defined formula shall be discarded	M	yes	yes

Table 30 Class 4 Timers and Protocol Parameters

Parameters	ATN Support	AMHS Support	AMHS Use
T1 (Local Retransmission)	M	yes	yes
N (Maximum Transmission)	M	yes	yes
I_L (Local Inactivity Time)	M	yes	yes
W (Window Update)	M	yes	yes
L (Frozen Reference Time)	M	yes	yes
R (Persistence)	O	no	no
M_{LR} (NSDU Lifetime)	O	no	no
M_{RL} (NSDU Lifetime)	O	no	no
E_{LR} (Maximum Transit Delay)	O	no	no
E_{RL} (Maximum Transit Delay)	O	no	no
A_L (Acknowledgement Time)	M	yes	yes
A_R (Acknowledgement Time)	M	yes	yes
I_R (Remote Inactivity Time)	M	yes	yes
Does IUT support optional timer TS2 when operating in class 4?	O	no	no

2.4.2 Parameter values

2.4.2.1 The range of values set in the protocol layer 3 and 4 of AMHS are specified below. The actual values are to be determined through bilateral agreement on the AMHS systems connected each other.

2.4.2.2 The following table shows only the parameters, which may influence interoperability. Other parameters are also to be determined through the bilateral agreement.

Parameters set or set to the frame are shown in the following table.

Name	Lower	Upper
Local Retransmission Time(T1){COTP}[SEC]	12	300
Window Time(W){COTP}[SEC]	160	6000
Maximum Number of Transmissions(N){COTP}	1	10
Maximum size of TPDU{COTP}[OCTETS]	1024	1024
Lifetime{CLNS}[IN UNITS OF 500MSEC]	10	30
Reassembly Time{CLNS}[IN UNITS OF 500MSEC]	10	30

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Appendix: PICS of AMHS

This appendix specifies the PICS of AMHS for both AFTN/AMHS Gateway and ATS Message Server. When only ATS Message Server without AFTN/AMHS Gateway is implemented, the column “AMHS Action” in the tables can be ignored.

Followings are the contents included in this appendix.

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Table 6.1 Probe Transfer Envelope
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INTRODUCTION

Description of each column in the table header is as follows;

"support" indicates the specification in the ISP and in the SARPs (ICAO ATN SARPs) respectively. The contents in the table are extracted from the ISP and the SARPs.

"AMHS-Action" indicates the specified action at Origination and at Reception in the SARPs. Please refer to the "Action" column in the SARPs. The contents in the table are extracted from the SARPs.

"AMHS-support" indicates the status of AMHS to be implemented.

"Detailed Action" indicates the detailed action specified in the SARPs, when it is described in the SARPs. The contents in the table are extracted from the SARPs.

"Origination" and "Reception" are also the terms described in the SARPs. They are abbreviated as “O” and “R” respectively in the column of “AMHS-Action” and “AMHS-support” in the table headings.

Definition of each support level and actions is specified in the table below :

support level and actions	Origination	Reception
M	The value is always set.	It is mandatory to set the value.
O	The value is set on conditions.	When the value is set, service is provided.
M-	-	Only the minimal support of this element. 1) allowed to set the value but no service provided 2) value is transparent when relayed
X	The value is not set.	When the value exists, it is considered to be an error.
T	Translated.	Translated.
G	Generated.	-
G1	Optionally generated.	-
G2	Conditionally generated.	-
D	-	Discarded.

1. Message Transfer Envelope for IPM

Table 1.1 Message Transfer Envelope
(Based on : ATSMHS SARPs Table 3.1.2-6 for O, Table 3.1.2-12 for R)

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1	MessageTransferEnvelope	M	M	T	T	M	M	-			
1.1	per message fields										
1.1.1	message-identifier	M	M	G	D	M	M	-			See Table 2/1
1.1.2	originator-name	M	M	T	T	M	M	-			
1.1.3	original-encoded-information-types	O	M	G	D	M	M	-			
1.1.4	content-type	M	M	G	D	M	M	-	BuiltInContentType is set the abstract value "interpersonal-messaging-1984(2) or 1988(22)"	If the value of BuiltInContentType is neither interpersonal-messaging-1984(2) nor interpersonal-messaging-1988(22), then generate NDR[NDRC=1,NDDC=15].	
1.1.5	content-identifier	O	M-	G	D	M	M-	<=16			"G"
1.1.6	Priority	M	M	T	D	M	M	-			
1.1.7	per-message-indicators	M	M	G	D	M	M	-			See Table 1.2/4
1.1.8	deferred-delivery-time	O	M-	G	D	M	M-	-			
1.1.9	per-domain-bilateral-information	O	M-	X	D	X	M-	-			
1.1.10	trace-information	M	M	G	D	M	M	-			
1.1.11	Extensions	M	M	G	D	M	O	-			In X.400, if the value doesn't exist, it is considered to be not selected.

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
	Type	M	M	G	D	M	M	-			Only supports "standard-extension".
	Criticality	M	M	G	D	M	M	-			In X.400, if the value doesn't exist, it is considered to be not selected.
	Value	M	M	M	D	M	M	-	Set the value of "internal-trace-information "		
1.1.11.1	recipient-reassignment-prohibited	O	M-	X	D	X	M-	-			
1.1.11.2	dl-extension-prohibited	O	M-	X	D	X	M-	-			
1.1.11.3	conversion-with-loss-prohibited	O	M-	X	D	X	M-	-			
1.1.11.4	latest-delivery-time	O	M-	X	D	X	O	-		If this exists, and the current time exceeds the value, then generate NDR[NDRC=1,NDDC=5].	
1.1.11.5	originator-return-address	O	M-	X	D	X	M-	-			
1.1.11.6	originator-certificate	O	M-	X	X	X	M-/X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=18].	
1.1.11.7	content-confidentiality-algorithm-identifier	O	M-	X	X	X	M-/X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=18].	

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.1.11.8	message-origin-authentication-check	O	M-	X	X	X	M-/X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=18].	
1.1.11.9	Message-security-label	O	M-	X	X	X	M-/X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=18].	
1.1.11.10	content-correlator	O	M-	X	D	X	M-	<= 512			
1.1.11.11	dl-expansion-history	O	M-	X	D	X	O	-			
1.1.11.12	internal-trace-information	O	M-	G	D	M	M-	-			See Table 3/5
1.2	per-recipient-fields	M	M	T	T	M	M	-		Support maximum of 21 parameters. (This number may be changed when negotiated.)	
1.2.1	recipient-name	M	M	T	T	M	M	-	Set the values of the recipient's MF ~~or XF~~ (XF or CAAS) address.		
1.2.2	originally-specified-recipient-number	M	M	G	D	M	M	-	Set the value which comply with 12.2.1.1.1.5 of ISO/IEC 10021-4. (set continuous number from 1 to the first recipient)		

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1.2.3	per-recipient-indicators	M	M	G	D	M	M	-	Set following value : responsibility=responsible(1) originating-MTA-reportrequest=non-delivery-report(01) originator-report-request= non-delivery-report(01)	For the parameter "per-recipients-fields", only "responsibility=responsible (1)" is relayed or delivered. Reportrequest=delivery-request(10) is ignored.	BITSTRING
1.2.4	explicit-conversion	O	M-	X	D	X	M-	-			
1.2.5	Extensions	M	M-	X	D	X	M	-			In X.400, if the value doesn't exist, it is considered to be not selected.
	Type	M	M	-	D	X	M	-			Only supports "standard-extension".
	Criticality	M	M	-	D	X	M	-		If the value does not exist, all bits are considered to be OFF.	BITSTRING for-submission(0) for-deliver(1) for-transfer(2)
	Value	M	M	-	D	X	M	-			
1.2.5.1	originator-requested-alternate-recipient	O	M-	-	D	X	M-	-			
1.2.5.2	requested-delivery-method	O	M-	-	D	X	M-	-			
1.2.5.3	physical-forwarding-prohibited	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1.2.5.4	physical-forwarding-address-request	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.5	physical-delivery-modes	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.6	registed-mail-type	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.7	recipient-number-for-advice	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.8	physical-redirection-attributes	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.2.5.9	physical-delivery-report-request	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.10	message-token	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.11	content-integrity-check	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.12	proof-of-delivery-request	O	M-	-	X	X	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.13	redirection-history	O	M-	-	D	X	M-	-			
2	Content	M	M	T	T	M	M	-	Set the generated IPM.		

Table 1.2 Common Data Types

(Based on : ATSMHS SARPs Table 3.1.2-6 for O, Table 3.1.2-12 for R)

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1	MTS-Identifier										
1.1	global-domain-identifier	M	M	G	D	M	M	-			
1.2	local-identifier	M	M	G	D	M	M	<=32	Set the characters which identifies message in ia-5 characters.		
2	GlobalDomainIdentifier										
2.1	country-name	M	M	G	D	M	M	2 or 3	Set the country name of AMHS management domain.		
2.2	administration-domain-name	M	M	G	D	M	M	<=16	Set the AMHS management domain name.		
2.3	private-domain-identifier	O	M-	X	D	X	M-	<=16			The value of this parameter may be used in the future.
3	EncodedInformationTypes										
3.1	built-in-encoded-information-types	M	M	G	D	M	M	-	Set the value of "ia5-text(2)=1"		BITSTRING
3.2	non-basic parameters	O	M-	X	D	X	M-	-			
3.3	extended-encoded-information-types	O	M	X	D	X	O	-			
4.	PerMessageIndicators	M	M	G	D	M	M	-			BITSTRING In X.400, if the value doesn't exist, all bits are considered to be OFF.
4.1	disclosure-of-other-recipients(0)	M	M	G	D	M	M	-	Set the abstract value "disclosure-of-other-recipients-prohibited(0)"		

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
4.2	implicit-conversion-prohibited(1)	M	M	G	D	M	M	-	Set the abstract value "implicit-conversion-prohibited(1)"		
4.3	alternate-recipient-allowed(2)	M	M	G	D	M	M	-	Set the abstract value "alternate-recipient-allowed(1)"		
4.4	content-return-request(3)	M	M	G	D	M	M	-	Set the abstract value "content-return-not-requested(0)"	Ignored and considered "content-return-not-requested(0)". However, if error occurs in the ATN component of AMHS and "content-return-request(1)" is set, it is impossible to restrain this service.	
5	PerDomainBilateralInformation	O	M-	X	D	X	M-	-			
6	TraceInformation										
6.1	TraceInformationElement	M	M	G	D	M	M	-			
6.1.1	global-domain-identifier	M	C1	X	D	X	M	-		If the last trace information of this parameter differs from the input MTA, then generate NDR.	
6.1.2	domain-supplied-information	M	M	G	D	M	M	-			
6.1.2.1	arrival-time	M	C2	G	D	M	M	-	Set the value of the time which AFTN/AMHS Gateway received the message.		
6.1.2.2	routing-action	M	M-	G	D	M	M	-	Set the abstract value of "relayed(0)".		
6.1.2.3	attempted-domain	O	M-	X	D	X	M-	-			

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
6.1.2.4	additional actions	O	M-	X	D	X	M-	-			
6.1.2.4.1	deferred-time	O	M-	X	D	X	M-	-			
6.1.2.4.2	converted-encode-information-types	O	M-	X	D	X	O	-			
6.1.2.4.3	other-actions	O	M-	X	D	X	M-	-			

Table 1.3 Extension Data Types
(Based on : ATSMHS SARPs Table 3.1.2-6 for O, Table 3.1.2-12 for R)

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
5	internal-trace-information	O	M-	G	D	M	M-	-			
5.1	global-domain-identifier	M	M	G	D	M	M	<=16	Set the value which identifies AMHS Management Domain.		
5.2	mta-name	M	M	G	D	M	M	<=32	Set the value of mta-name of AMHS.		
5.3	domain-supplied-information	M	M	G	D	M	M	-			
5.3.1	arrival-time	M	M	G	D	M	M	-	Set the value of the time which AFTN/AMHS Gateway received the message		
5.3.2	routing-action	M	M	G	D	M	M	-	Set the abstract value "relayed(0)"		
5.3.3	attempt-domain	O	C1	X	D	X	M-	-			
5.3.4	additional actions	O	C2	X	D	X	M-	-			
5.3.4.1	deferred-time	O	M-	X	D	X	M-	-			
5.3.4.2	converted-encoded-information-types	O	M-	X	D	X	O	-			
5.3.4.3	other-actions	O	M-	X	D	X	M-	-			

2. IPM

Table 2.1 IPM
(Based on : ATSMHS SARPs Table 3.1.2-5 for O, Table 3.1.2-11 for R)

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1	Interpersonal message(IPM)	M	M	T	T	M	M	-			
1.1	heading	M	M	T	T	M	M	-			
1.1.1	this-IPM	M	M	T	D	M	M	-			
1.1.1.1	user	O	M	T	D	M	M-	-	Set the same value as the originator.		
1.1.1.2	user-relative-identifier	M	M	G	D	M	M	<=64			Set the value which identifies this IPM in less than 64 octets.
1.1.2	originator	O	M	T	D	M	M-		Set the originator XF or CAAS address converted from AF address of AFTN message.		
1.1.3	authorizing-users	O	O	X	D	X	M-	-			
1.1.4	primary-recipients	O	M	T	D	M	O	-		At least one of the primary-recipients, copy-recipients, or blind-copy-recipients is mandatory.	
1.1.4.1	RecipientSpecifier	M	M	T	D	M	M	-			If the value of this parameter is as same as P1, then maximum number is 21.
1.1.4.2	recipient	M	M	T	D	M	M	-	Set the recipient XF or CAAS address converted from AF address of AFTN message.		

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.1.4.3	notification-requests	O	M	T	D	M	M	-	Set the bit of rn and nrn ON if and only if the value of ATS-priority-indicator is SS. (In other cases, both bits are not ON.)	If ATS-priority-indicator is SS, and value of notification of the element "primary-recipient", "copy-recipient", "blind-copy-recipient is different from "rn", and the value of per-recipient-fields is "responsible", then it is logged as an error.	According to X.400, if this parameter does not exist, all bits are considered OFF.
1.1.4.3.1	rn(0)	O	O	T	D	M	O	-			
1.1.4.3.2	nrn(1)	O	M	T	D	M	M-	-		Ignored.	
1.1.4.3.3	ipm-return(2)	O	O	X	D	X	M-	-	Always set OFF.	Ignored.	
1.1.5	copy-recipients	O	M	X	D	X	O	-	Not set.	Processed as same as primary-recipients.	
1.1.6	blind-copy-recipients	O	M	X	D	X	O	-	Not set.	Processed as same as primary-recipients.	
1.1.7	replied-to-IPM	O	M	X	D	X	M-	-			
1.1.8	obsoleted-IPMs	O	M	X	D	X	M-	-			
1.1.9	related-IPMs	O	M	X	D	X	M-	-			
1.1.10	subject	O	M	G2	D	O	M-	<=128			
1.1.11	expiry-time	O	M	X	D	X	M-	-			
1.1.12	reply-time	O	M	X	D	X	M-	-			
1.1.13	reply-recipients	O	O	X	D	X	M-	-			
1.1.14	importance	O	O	X	D	X	M-	-			
1.1.15	sensitivity	O	O	X	D	X	M-	-			
1.1.16	auto-forwarded	O	O	X	D	X	M-	-			
1.1.17	extensions	O	O	X	D	X	M-	-			
1.1.17.1	incomplete-copy	O	O	X	D	X	M-	-			
1.1.17.2	langages	O	O	X	D	X	M-	-			

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.1.17.3	auto-submitted	O	O	X	D	X	M-	-			
1.2	IPM BODY	M	M	M	M	M	M	-		One of the ia5-text, ia5-text-body-part, or general-text-body-part has to be set.	
1.2.1	ia5-text	O	M	T	T	M	O	-			
1.2.1.1	parameters	M	M	G	D	M	M	-			
1.2.1.1.1	repertoire	M	M	G	D	M	M	-	Set the value IA5(5).		
1.2..1.2	data	M	M	T	T	M	M	-			
1.2.2	voice	I	X	X	X	X	X	-			
1.2.3	g3-facsimile	O	X	X	X	X	X	-			
1.2.4	g4-class-1	O	X	X	X	X	X	-			
1.2.5	teletex	O	X	X	X	X	X	-			
1.2.6	videotex	O	X	X	X	X	X	-			
1.2.7	encrypted	I	X	X	X	X	X	-			
1.2.8	message	O	X	X	X	X	X	-			
1.2.9	mixed-mode	O	X	X	X	X	X	-			
1.2.10	bilaterally-defined	O	X	X	X	X	X	-			
1.2.11	nationally-defined	O	X	X	X	X	X	-			
1.2.12	externally-defined	O	X	X	X	X	X	-			
1.3	Extended Body Part										
1.3.1	ia5-text-body-part	O	X	X	T	X	O	-			
1.3.2	g3-facsimile-body-part	O	X	X	X	X	X	-			
1.3.3	g4-class1-body-part	O	X	X	X	X	X	-			
1.3.4	teletex-body-part	O	X	X	X	X	X	-			
1.3.5	videotex-body-part	O	X	X	X	X	X	-			
1.3.6	encrypt-body-part	I	X	X	X	X	X	-			
1.3.7	message-body-part	O	X	X	X	X	X	-			
1.3.8	mixed-mode-body-part	O	X	X	X	X	X	-			
1.3.9	bilaterally-defined-body-part	O	X	X	X	X	X	-			
1.3.10	nationally-defined-body-part	O	X	X	X	X	X	-			

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.3.11	general-text-body-part	O	X	X	T	X	O	-			
1.3.12	file-transfer-body-part	O	X	X	X	X	X	-			
1.3.13	voice-body-part	I	X	X	X	X	X	-			
1.3.14	oda-body-part	O	X	X	X	X	X	-			

Table 2.2 IPM Support of the Basic ATS Message Service
(Based on : ATSMHS SARPs Table 3.1.2-5 for O, Table 3.1.2-11 for R)

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1	ATS-Message-Header	-	M	T	T	M	M	-			
1.1	start- of heading	-	M	G	-	M	M	-	Set (SOH)		
1.2	ATS-Message-Priority	-	M	T	T	M	M	-			
1.2.1	priority-prompt	-	M	G	-	M	M	-	Set the value "PRI:(single space)".		
1.2.2	priority-indicator	-	M	T	T	M	M	-			
1.2.3	priority-separater	-	M	G	-	M	M	-	Set (CR)(LF)		
1.3	ATS-Message-Filing-Time	-	M	T	T	M	M	-			
1.3.1	filing-time-prompt	-	M	G	-	M	M	-	Set the value "FT:(single space)".		
1.3.2	filing-time	-	M	T	T	M	M	-			
1.3.3	filing-time-separater	-	M	G	-	M	M	-	Set (CR)(LF)		
1.4	ATS-Message-Optional-Heading-Info	-	O	T1	T1	O	M	-			
1.4.1	OHI-prompt	-	M	G	-	M	M	-	Set the value "OHI:(single space)".		
1.4.2	optional-heading-information	-	M	T	T	M	M	-			
1.4.3	OHI-separater	-	M	G	-	M	M	-	Set (CR)(LF)		
1.5	end-of-heading-blank-line	-	M	G	-	M	M	-	Set (LF)		
1.6	start-of-text	-	M	G	-	M	M	-	Set (STX)		
2	ATS-Message-Text	-	M	T	T	M	M	-			

3. Message Transfer Envelope for IPN

Table 3.1 Message Transfer Envelope (IPN)

(Based on: ATSMHS SARPs Table 3.1.2-6 and Table 3.1.2-9 for O, Table 3.1.2-12 and Table 3.1.2-15 for R)

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1	MessageTransferEnvelope	M	M	T	T	M	M	-			
1.1	per message fields	M	M					-			
1.1.1	message-identifier	M	M	G	D	M	M-	-			
1.1.2	originator-name	M	M	T	T	M	M	-	Set the originator XF or CAAS address converted from AF address of AFTN acknowledgement message.		
1.1.3	original-encoded-information-types	O	M-	G	D	X	M-	-			
1.1.4	content-type	M	M	G	D	M	M	-	BuiltInContentType is set the abstract value "interpersonal-messaging-1984(2) or 1988(22)"	If the value of BuiltInContentType is neither interpersonal-messaging-1984(2) nor interpersonal-messaging-1988(22), then generate NDR[NDRC=1,NDDC=15].	
1.1.5	content-identifier	O	M-	G	D	X	M-	<=16			
1.1.6	priority	M	M	G	D	M	M	-	Set "urgent".		
1.1.7	per-message-indicators	M	M	G	D	M	M	-			See Table 3.2/4
1.1.8	deferred-delivery-time	O	M-	X	D	M	M-	-			
1.1.9	per-domain-bilateral-information	O	M-	X	D	X	M-	-			
1.1.10	trace-information	M	M	G	D	M	M	-			

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1.1.11	extensions	M	M	G	D	M	M-	-			In X.400, if the value doesn't exist, it is considered to be not selected.
	type	M	M	G	D	M	M	-	Set the abstract value "internal-trace-information (38)".		Only supports "standard-extension".
	criticality	M	M	G	D	M	M	-			In X.400, if the value doesn't exist, it is considered to be not selected.
	value	M	M	M	D	M	M	-	Set the value of "internal-trace-information "		
1.1.11.1	recipient-reassignment-prohibited	O	M-	X	D	X	M-	-			
1.1.11.2	dl-extension-prohibited	O	M-	X	D	X	M-	-			
1.1.11.3	conversion-with-loss-prohibited	O	M-	X	D	X	M-	-			
1.1.11.4	latest-delivery-time	O	M-	X	D	X	M-	-		If this exists, and the current time exceeds the value, then generate NDR[NDRC=1,NDDC=5].	
1.1.11.5	originator-return-address	O	M-	X	D	X	M-	-			
1.1.11.6	originator-certificate	O	M-	X	X	X	X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=18].	

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.1.11.7	content-confidentiality-algorithm-identifier	O	M-	X	X	X	X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=19].	
1.1.11.8	message-origin-authentication-check	O	M-	X	X	X	X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=20].	
1.1.11.9	message-security-label	O	M-	X	X	X	X	-		If the value is "CRITICAL FOR DELIVERY" then generate NDR[NDRC=1,NDDC=21].	
1.1.11.10	content-correlator	O	M-	X	D	X	M-	<= 512			
1.1.11.11	dl-expansion-history	O	M-	X	D	X	O	-			
1.1.11.12	internal-trace-information	O	M-	G	D	M	M-	-			
1.2	per-recipient-fields	M	M	T	D	M	M	-			Number of recipient is always one.
1.2.1	recipient-name	M	M	T	D	M	M	-	Set the MF (XF or CAAS) address of the originator of the subject IPM.		
1.2.2	originally-specified-recipient-number	M	M	G	D	M	M	-	Set "1".		

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.2.3	per-recipient-indicators	M	M	G	D	M	M	-	Set the following values : responsibility=responsible(1) originating-MTA-reportrequest=non-delivery-report(01) originator-report-request=non-delivery-report(00)		BITSTRING
1.2.4	explicit-conversion	O	M-	X	D	X	M-	-			
1.2.5	extensions	M	M-	X	D	X	M-	-			In X.400, if the value doesn't exist, it is considered to be not selected.
	type	M	M	-	D	-	M	-			Only supports "standard-extension".
	criticality	M	M	-	D	-	M	-			
	value	M	M	-	D	-	M	-			
1.2.5.1	originator-requested-alternate-recipient	O	M-	-	D	-	M-	-			
1.2.5.2	requested-delivery-method	O	M-	-	D	-	M-	-			
1.2.5.3	physical-forwarding-prohibited	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.4	physical-forwarding-address-request	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.2.5.5	physical-delivery-modes	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.6	registed-mail-type	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.7	recipient-number-for-advice	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.8	physical-redirection-attributes	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	
1.2.5.9	physical-delivery-report-request	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=3,NDDC=18].	

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1.2.5.10	message-token	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=1,NDDC=18].	
1.2.5.11	content-integrity-check	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=1,NDDC=18].	
1.2.5.12	proof-of-delivery-request	O	M-	-	X	-	M-/X	-		If the criticality is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=1,NDDC=18].	
1.2.5.13	redirection-history	O	M-	-	D	-	M-	-			
2	content	M	M	T	T	M	M	-	Set the generated IPN.		

Table 3.2 Common Data Type

(Based on : ATSMHS SARPs Table 3.1.2-6 and Table 3.1.2-9 for O, Table 3.1.2-12 and Table 3.1.2-15 for R)

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1	MTS-Identifier										
1.1	global-domain-identifier	M	M	G	D	M	M	<=16			
1.2	local-identifier	M	M	G	D	M	M	<=32	Set the characters which identifies message in ia-5 characters.		
2	GlobalDomainIdentifier										
2.1	country-name	M	M	G	D	M	M	2 or 3	Set the country name of AMHS management domain.		
2.2	administration-domain-name	M	M	G	D	M	M	<=16	Set the AMHS management domain name.		
2.3	private-domain-identifier	O	M-	X	D	X	M-	-			
3	EncodedInformationTypes										
3.1	built-in-encoded-information-types	M	M	G	D	X	M	-			BITSTRING
3.2	non-basic parameters	O	M-	X	D	X	M-	-			
3.3	extended-encoded-information-types	O	M	X	D	X	O	-			
4.	PerMessageIndicators	M	M	G	D	G	D	-			BITSTRING In X.400, if the value doesn't exist, all bits are considered to be OFF.
4.1	disclosure-of-other-recipients(0)	M	M	G	D	G	D	-	Set the abstract value "disclosure-of-other-recipients-prohibited(0)"		
4.2	implicit-conversion-prohibited(1)	M	M	G	D	G	D	-	Set the abstract value "implicit-conversion-prohibited(1)"		

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
4.3	alternate-recipient-allowed(2)	M	M	G	D	G	D	-	Set the abstract value "alternate-recipient-allowed(1)"		
4.4	content-return-request(3)	M	M	G	D	G	D	-	Set the abstract value "content-return-not-requested(0)"	Ignored and considered "content-return-not-requested(0)". However, if error occurs in the ATN component of AMHS and "content-return-request(1)" is set, it is impossible to restrain this service.	
5	PerDomainBilateralInformation	O	M-	X	D	X	D	-			
6	TraceInformation										
6.1	TraceInformationElement	M	M	G	D	M	M	-			
6.1.1	global-domain-identifier	M	C1	X	D	M	M	-		If the last trace information of this parameter differs from the input MTA, then generate NDR.	
6.1.2	domain-supplied-information	M	M	G	D	M	M	-			
6.1.2.1	arrival-time	M	C2	G	D	M	M	-	Set the value of the time which AFTN/AMHS Gateway received the message		
6.1.2.2	routing-action	M	M-	G	D	M	M	-	Set the abstract value of "relayed(0)".		
6.1.2.3	attempt-domain	O	M-	X	D	X	M-	-			
6.1.2.4	additional actions	O	M-	X	D	X	M-	-			
6.1.2.4.1	deferred-time	O	M-	X	D	X	M-	-			

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
6.1.2.4.2	converted-encode-information-types	O	M-	X	D	X	M-	-			
6.1.2.4.3	other-actions	O	M-	X	D	X	M-	-			

Table 3.3 Extension Data Types

(Based on: ATSMHS SARPs Table 3.1.2-6 for O, Table 3.1.2-12 for R)

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
5	internal-trace-information	O	M-	G	D	M	M-	-			
5.1	global-domain-identifier	M	M	G	D	M	M	16	Set the value which identifies AMHS Management Domain.		
5.2	mta-name	M	M	G	D	M	M	32	Set the value of mta-name of AMHS.		
5.3	domain-supplied-information	M	M	G	D	M	M	-			
5.3.1	arrival-time	M	M	G	D	M	M	-	Set the value of the time which AFTN/AMHS Gateway received the message		
5.3.2	routing-action	M	M	G	D	M	M	-	Set the abstract value "relayed(0)"		
5.3.3	attempt-domain	O	C1	X	D	X	M-	-			
5.3.4	additional actions	O	C2	X	D	X	M-	-			
5.3.4.1	deferred-time	O	M-	X	D	X	M-	-			
5.3.4.2	converted-encoded-information-types	O	M-	X	D	X	O	-			
5.3.4.3	other-actions	O	M-	X	D	X	M-	-			

3. IPN

Table 4.1 IPN
(Based on: ATSMHS SARPs Table 3.1.2-8 for O, Table 3.1.2-14 for R)

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1	Interpersonal Notification(IPN)	M	M	-	-	M	M	-			
1.1	Common-fields	M	M	-	-	M	M	-			
1.1.1	subject-ipm	M	M	G	D	M	M	-	Set the value of this-IPM of the subject IPM.		
1.1.2	ipn-originator	O	M	T	D	M	O	-	Set the originator XF and CAAS address converted from AF address of AFTN message.		
1.1.3	ipm-preferred-recipient	O	M	G2	D	O	O	-	This parameter exists when the recipient indicated by subject IPM and the real recipient differs, and set the recipient which was on the subject IPM.		
1.1.4	conversion-eits	O	M	G2	D	O	O	-	If the originally-encoded-information-types of the subject IPM and encoded-information types at the reception differ, set the encoded-information-types at the reception.		
1.1.5	notification-extensions	O	M	X	D	X	M	-			
1.2	non-receipt-fields	M	M	X	D	X	O	-		Either non-receipt-field or receipt-field is mandatory.	

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.3	receipt-fields	M	M	T	T	M	M	-			
1.3.1	receipt-time	M	M	T	T	M	M	-	Convert the time to UTC-TIME format and set the value.	Convert to AFTN format.	UTC-TIME format is YYMMDDhhmm[ss]Z or YYMMDDhhmm[ss]+(or -) hhmm
1.3.2	acknowledgment-mode	O	O	G	D	M	M-	-	Set the abstract value "manual(0)"		The default value of this element is "manual", so it is not necessary to set the value.
1.3.3	suppl-receipt-info	O	O	X	D	X	M-	-			
1.3.4	rn-extension	O	I	X		X	M-	-			
1.3.5	other-notification-type-fields	O	I	X		X	M-	-			

Table 4.2 OR Descripor
(Based on: ATSMHS SARPs Table 3.1.2-8 for O, Table 3.1.2-14 for R)

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1	ORDescriptor										
1.1	formal-name	M	M	T	-	M	M	-			
1.2	free-form-name	O	O	X	-	X	M-	<=64			
1.3	telephone-number	O	O	X	-	X	M-	-			

5. ReportTransfer Envelope

Table 5.1 Report Transfer Envelope
(Based on: ATSMHS SARPs Table 3.1.2-17 for O, Table 3.1.2-18 for R)

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1	ReportTransferEnvelope	M	M	G	D	M	M	-			
1.1	report-identifier	M	M	G	D	M	M	-			
1.2	report-destination-name	M	M	G	T	M	M	-	If the subject message has the element "dl-expansion-history", and OR name of last element of dl-expansion-history does not exist, set the originator-name of the subject message.		
1.3	trace-information	M	M	G	D	M	M	-			
1.4	extensions	M	M	G	D	M	M	-			In X.400, if the value doesn't exist, it is considered to be not selected.
1.4.1	type	M	M	G	D	M	M	-			Only supports "standard-extension".
1.4.2	criticality	M	M	G	D	M	M	-			In X.400, if the value doesn't exist, it is considered to be not selected.
1.4.3	value	M	M	M	D	M	M	-	Set the value of "internal-trace-informatio n".		
1.4.4	message-security-label	O	M-	X	D	X	D	-			

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
1.4.5	originator-and-DL-expansion-history	O	M-	G2	D	O	D	-	Only when the element "DL-expansion-history" exists in the subject message, set the value.		
1.4.6	reporting-DL-name	O	M-	X	D	X	M-	-			
1.4.7	reporting-MTA-certificate	O	M-	X	D	X	M-	-			
1.4.8	report-origin-authentication-check	O	M-	X	D	X	M-	-			
1.4.9	internal-trace-information	O	M-	G	D	M	M-	-			
1.4.9.1	global-domain-identifier	M	M	G	D	M	M	<=16	Set the value which identifies the AMHS management domain.		
1.4.9.2	domain-supplied-information	M	M	G	D	M	M	-			
1.4.9.3	arrival-time	M	M	G	D	M	M	-	Set the value of the time which AFTN/AMHS Gateway received the message		
1.4.9.4	routing-action	M	M	G	D	M	M	-	Set the abstract value "relayed(0)".		
1.4.9.5	attempt-domain	O	C1	X	D	X	M	-			
1.4.9.6	additional actions	O	C2	X	D	X	M	-			
1.4.9.7	deferred-time	O	M-	X	D	X	M	-			
1.4.9.8	converted-encoded-information-types	O	M-	X	D	X	M	-			
1.4.9.9	other-actions	O	M-	X	D	X	M	-			
2	ReportTransferContent	M	M			M	M	-			
2.1	per report fields							-			
2.1.1	subject-identifier	M	M	G	D	M	M	-	Set the value of the "message-identifier" of the subject message."	It is expected that the value of message-identifier of the subject message is set.	

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
2.1.2	subject-intermediate-trace-information	O	M	G2	D	O	M-	-	If the originating-MTA-report-request of the per-recipient-indicator of the recipient of the subject message per-recipient-indicator takes the value "audited-report", set the value of trace-information of the subject message.		
2.1.3	original-encoded-information-types	O	M	X	D	X	M-	-			
2.1.4	content-type	O	M	X	D	X	M-	-			
2.1.5	content-identifier	O	M	X	D	X	M-	-			
2.1.6	returned-content	O	M-	X	D	X	M-	-			
2.1.7	additional-information	O	M-	X	D	X	M-	-			
2.1.8	extensions	M	M	G2	D	O	M-	-			
2.1.8.1	content-correlator	O	M	G2	D	O	M-	-	If the element "content-correlator" exists in the subject message, the value of the element is set.		
2.2	per-recipient-fields	M	M	T	T	M	M	-			
2.2.1	actual-recipient-name	M	M	T	T	M	M	-	Set the recipient-name of the corresponding per-recipient field of the subject message.		

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
2.2.2	originally-specified-recipient-number	M	M	G	D	M	M	-	Set the value of originally-specified recipient number of the corresponding per-recipient field of the subject message.		
2.2.3	per-recipient-indicators	M	M	G	D	M	M	-	Set the value of the corresponding per-recipient-indicator of the per-recipient-fields of the subject message.		BITSTRING
2.2.4	last-trace-information	M	M	G	D	M	M	-			
2.2.4.1	arrival-time	M	M	G	D	M	M	-	Set the value of the time which AFTN/AMHS Gateway received the message		
2.2.4.2	converted-encoded-information-types	O	M	G2	D	O	M-	-	If the original-EIT and the final EIT are different, set the value of the final EIT. In other cases, nothing is set.		
2.2.4.3	report-type	M	M	G	D	M	M	-			
2.2.4.3.1	delivery	M	M	G2	D	O	X	-	Set this value when the probe is successfully passed to AFTN Component.		
2.2.4.3.2	message-delivery-time	M	M	G	D	M	X	-	If the report is a delivery report, set the time at which the subject message has been successfully passed to AFTN Component.		

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
2.2.4.3.3	type-of-MTS-user	M	M	G	D	M	X	-	Set the abstract value "other(6)".		If this parameter is omitted, then set the value "public(0)".
2.2.4.3.2	non-delivery	M	M	G	D	M	M	-			
2.2.4.3.2.1	non-delivery-reason-code	M	M	G	D	M	M	-	Set the defined NDRC.	If NDRC=1 and NDDC=0, then generate unknown addressee AFTN service message.	
2.2.4.3.2.2	non-delivery-diagnostic-code	O	M	G	D	M	M	-	Set the defined NDDC.		
2.2.5	originally-intended-recipient-name	O	M-	G2	D	O	O	-	If there exists redirection-history element, set the first O/R name of the subject message.		
2.2.6	supplementary-information	O	M-	G2	D	O	O	<=256	a) If delivery report (probe), set the value "This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient" b) If non-delivery report set the value defined in each error (if not defined, set nothing)		
2.2.7	extensions	M	M-	G2	D	O	O	-			In X.400, if the value doesn't exist, it is considered to be not selected.
2.2.7.1	type	M	M	G2	D	M	M	-			Only supports "standard-extension".
	criticality	M	M	G2	D	M	M	-			
	value	M	M	G2	D	M	M	-			

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
2.2.7.1.1	redirection-history	O	M-	G2	D	O	M-	-	If there exists the "redirection-history", set that value.		
2.2.7.1.2	physical-forwarding-address	O	M-	X	X	X	X	-			
2.2.7.1.3	recipient-certificate	O	M-	X	X	X	X	-			
2.2.7.1.4	proof-of-delivery	O	M-	X	X	X	X	-			

Table 5.2 Common Data Types
(Based on: ATSMHS SARPs Table 3.1.2-17 for O, Table 3.1.2-18 for R)

		support		AMHS-Action		AMHS-support			Detailed Action		
NO.	element	ISP	SARPs	O	R	O	R	size	Origination	Reception	Note
1	MTS-Identifier										
1.1	global-domain-identifier	M	M	G	D	M	M	<=16			
1.2	local-identifier	M	M	G	D	M	M	<=32	Set the value which identifies the report in ia-5 characters.		
2	GlobalDomainIdentifier										
2.1	country-name	M	M	G	D	M	M	2 or 3	Set the country name of the AMHS management domain.		
2.2	administration-domain-name	M	M	G	D	M	M	<=16	Set the name of the AMHS management domain.		
2.3	private-domain-identifier	O	M-	X	D	X	M-	<=16			
6	TraceInformation										
6.1	TraceInformationElement	M	M	G	D	M	M	-			
6.1.1	global-domain-identifier	M	C1	X	D	M	M	-		If the last trace information of the global-domain-identifier differs from input MTA, generate NDR.	
6.1.2	domain-supplied-information	M	M	G	D	M	M	-			
6.1.2.1	arrival-time	M	C2	G	D	M	M	-	Set the value of the time which AFTN/AMHS Gateway received the message.		
6.1.2.2	routing-action	M	M-	G	D	M	M	-	Set the abstract value "relayed(0)".		
6.1.2.3	attempt-domain	O	M-	X	D	X	M-	-			

NO.	element	support		AMHS-Action		AMHS-support		size	Detailed Action		Note
		ISP	SARPs	O	R	O	R		Origination	Reception	
6.1.2.4	additional actions	O	M-	X	D	X	M-	-			
6.1.2.4.1	deferred-time	O	M-	X	D	X	M-	-			
6.1.2.4.2	converted-encode-information-types	O	M-	X	D	X	M-	-			
6.1.2.4.3	other-actions	O	M-	X	D	X	M-	-			

6. Probe Transfer Envelope

Table 6.1 Probe Transfer Envelope

NO.	element	support ISP	AMHS support	size	Detailed Action Reception	Note
1	probeTransferEnvelope	M	M	-		
1.1	per message fields	M	M	-		
1.1.1	probe-identifier	M	M	-		
1.1.2	originator-name	M	M	-		
1.1.3	original-encoded-information-types	O	M	-		
1.1.4	content-type	M	M	-	If the value of BuiltInContentType is neither interpersonal-messaging-1984(2) nor interpersonal-messaging-1988(22), then generate NDR[NDRC=1,NDDC=15].	
1.1.5	content-identifier	O	M-	<=16		It was agreed to be "X" in the TMC.
1.1.6	content-length	O	M-	-		
1.1.7	per-message-indicators	M	M	-		BITSTRING In X.400, if the value doesn't exist, all bits are considered to be OFF.
1.1.7.1	disclosure-of-other-recipients(0)	M	M	-		
1.1.7.2	implicit-conversion-prohibited(1)	M	M	-		
1.1.7.3	alternate-recipient-allowed(2)	M	M	-		
1.1.7.4	content-return-request(3)	M	M	-		
1.1.8	per-domain-bilateral-information	O	M-	-		It was agreed to be "X" in the TMC."
1.1.9	trace-information	M	M	-		
1.1.10	extensions	M	M	-		In X.400, if the value doesn't exist, it is considered to be not selected.

NO.	element	support ISP	AMHS support	size	Detailed Action Reception	Note
	type	M	M	-		Only supports "standard-extension".
	criticality	M	M	-		In X.400, if the value doesn't exist, it is considered to be not selected.
	value	M	M	-		
1.1.10.1	recipient-reassignment-prohibited	O	M-	-		
1.1.10.2	dl-extension-prohibited	O	M-	-		
1.1.10.3	conversion-with-loss-prohibited	O	M-	-		
1.1.10.4	originator-certificate	O	M-/X	-	If the value is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=1,NDDC=18].	
1.1.10.5	message-security-label	O	M-/X	-	If the value is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=1,NDDC=21].	
1.1.10.6	content-correlator	O	M-	<=512		
1.1.10.7	probe-origin-authentication-check	O	M-	-		
1.1.10.8	internal-trace-information	O	M-	-		
1.1.10.8.1	global-domain-identifier	M	M	-		
1.1.10.8.2	mta-name	M	M	<=32	Set the value which identifies AMHS.	
1.1.10.8.3	mta-supplied-information	M	M	-		
1.1.10.8.3.1	arrival-time	M	M	-		
1.1.10.8.3.2	routing-action	M	M	-		
1.1.10.8.3.3	attempt-domain	O	M-	-		

NO.	element	support ISP	AMHS support	size	Detailed Action Reception	Note
1.1.10.8.4	additional actions	O	M-	-		
1.1.10.8.4.1	deferred-time	O	M-	-		
1.1.10.8.4.2	converted-encoded-information-types	O	M-	-		
1.1.10.8.4.3	other-actions	O	M-	-		
1.2	per-recipient-fields	M	M	-		
1.2.1	recipient-name	M	M	-		
1.2.2	originally-specified-recipient-number	M	M	-		
1.2.3	per-recipient-indicators	M	M	-		BITSTRING
1.2.4	explicit-conversion	O	M-	-		
1.2.5	extensions	M	M-	-		In X.400, if the value doesn't exist, it is considered to be not selected.
	type	M	M	-		Only supports "standard-extension".
	criticality	M	M	-		
	value	M	M	-		
1.2.5.1	originator-requested-alternate-recipient	O	M-	-		
1.2.5.2	requested-delivery-method	O	M-	-		
1.2.5.3	physical-redirection-attributes	O	M-/X	-	If the value is "CRITICAL FOR DELIVERY", then generate NDR[NDRC=1,NDDC=18].	
1.2.5.4	redirection-history	O	O	-		

Table 6.2 Common Data Type

NO.	element	support ISP	AMHS support	size	Action Reception	Note
1.	MTS-Identifier					
1.1	global-domain-identifier	M	M	<=16		
1.2	local-identifier	M	M	<=32		
2	GlobalDomainIdentifier					
2.1	country-name	M	M	2 or 3		
2.2	administration-domain-name	M	M	<=16		
2.3	private-domain-identifier	O	M-	<=16		The value of this parameter may be used in the future.
3	EncodedInformationTypes					
3.1	built-in-encoded-information-types	M	M	-		BITSTRING
3.2	non-basic parameters	O	M-	-		
3.3	extended-encoded-information-types	O	O	-		
6	TraceInformation					
6.1	TraceInformationElement	M	M	-		
6.1.1	global-domain-identifier	M	M	-	If the last trace information of this parameter differs from the input MTA, then generate NDR.	
6.1.2	domain-supplied-information	M	M	-		
6.1.2.1	arrival-time	M	M	-		
6.1.2.2	routing-action	M	M	-		
6.1.2.3	attempt-domain	O	M-	-		
6.1.2.4	additional actions	O	M-	-		
6.1.2.4.1	deferred-time	O	M-	-		

NO.	element	support ISP	AMHS support	size	Action Reception	Note
6.1.2.4.2	converted-encode-information-types	O	M-	-		
6.1.2.4.3	other-actions	O	M-	-		

STRATEGY FOR AERONAUTICAL MOBILE (R) SERVICE

Provision of Aeronautical Mobile (R) Service in the ASIA/PAC Region will be guided by following strategy:

1. A channel spacing of 25 kHz will continue to be operational specification.

2. The VHF voice service, backed by CPDLC and HF will be the primary communication medium for transcontinental traffic; and a combination of CPDLC and HF voice will be the communication medium for oceanic traffic.

3. The requirement for basic voice communication will continue, supplemented by data-link Flight Information Service (DFIS) applications including D-VOLMET, D-ATIS and PDC to significantly reduce pressure on VHF spectrum congestion.

4. Frequency band 136 – 137 MHz will be used exclusively for the air-ground VHF data-link application.

STRATEGY FOR THE PROVISION OF NAVIGATION SERVICES IN THE ASIA/PACIFIC REGION

Considering:

a) in the Asia/Pacific region, ILS is capable of meeting the majority of requirements for precision approach and landing;

b) 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 SARPs and guidance material for GNSS with augmentation to support Cat I precision approach and approach and landing with vertical guidance (APV);

d) the evolution of Performance Based Navigation for all phases of flight including for approach, landing and departure operations;

e) the knowledge that APV operations may be conducted using GNSS with augmentation as required or barometric vertical guidance and GNSS or DME/DME RNAV lateral guidance;

f) APV operations provide enhanced safety and generally lower operational minima as compared to non-precision approaches;

g) the knowledge that GNSS without augmentation can support non-precision approaches and that augmented GNSS-based systems support Category I operations;

h) GNSS with augmentation to support category II and III operations is projected to be available in 2010-2015 time frame;

i) MLS Cat I is operational and ground and airborne CAT III B certification is in progress;

j) the material contained in the Performance Based Navigation Manual (Doc 9613) for approach, landing and departure operations;

k) the need to maintain aircraft interoperability both within the region and between the Asia/Pacific region and other ICAO regions and to provide flexibility for future aircraft equipage;

l) operators will equip aircraft to support PBN operations

THE STRATEGY FOR ASIA/PACIFIC REGION IN THE PROVISION OF NAVIGATION SERVICES INCLUDING APPROACH, LANDING AND DEPARTURE GUIDANCE IS:

a) retain ILS as an ICAO standard system for as long as it is operationally acceptable and economically beneficial;

b) implement GNSS operations including the early implementation of non-precision RNAV (GNSS) approaches.

c) transition to PBN operations;

d) implement GNSS with augmentation as required for APV and Category I operations where operationally required and economically beneficial;

e) promote the use of APV operations, particularly those using GNSS vertical guidance, to enhance safety and accessibility;

f) to support contingency operations, provide RNAV (GNSS) procedures for approach, landing and departure guidance;

g) conduct necessary on-going PBN studies, education and training;

h) consider the implementation of MLS where operational requirements cannot be satisfied by ILS or GNSS; and

i) 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.

j) Closely monitor the implementation of PBN to ensure continued civil-military interoperability.

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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, their capabilities and the level of user equipage;

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

6) Airworthiness and operational approvals allowing the current GNSS to be used for en-route operations, and non-precision and APV approaches without the need for augmentation services external to the aircraft;

7) Development status of GNSS augmentation systems;

8) Human, environmental and economic factors will affect the implementation of GNSS;

9) The need to protect GNSS frequencies;

10) The effects of the ionosphere on GNSS and availability of mitigation techniques;

11) Integrity, accuracy and distribution of aeronautical information; and

12) The importance for ICAO to implement the Aeronautical Information Management (AIM) Concept and provide States with guidance and training on its implementation;

13) The regional navigation requirements are:

(a) RNP10/RNP4 for en-route;
(b) RNP4 for *transition to* terminal phase of flight;
(c) RNP1 or less for terminal phase of flight;
(d) RNP/RNAV based arrivals and departures;
(e) APV (with interim RNAV (GNSS) for approaches); and
(f) Precision approaches at selected runways.

THE GENERAL STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE ASIA/PACIFIC REGION IS DETAILED BELOW:

1) Introduction of GNSS Navigation Capability should be consistent with the Global Air Navigation Plan;

2) 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. States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised, such as by performance of safety assessment, consultation with users through regional air navigation planning process;

3) Implementation shall be in full compliance with ICAO SARPs and PANS and support the new ICAO Global Plan Initiatives;

4) Introduction of GNSS for en-route, terminal, approach and departure navigation._States should coordinate to ensure that harmonized separation standards and procedures are developed and introduced concurrently in all flight information regions along major traffic flows to allow for a seamless transition to GNSS-based navigation;

5) States are encouraged to implement any new basic GNSS approvals based on TSO 145/6a receiver standards or equivalents and take into account the availability of GNSS augmentation technologies for more demanding requirements;

6) States should work co-operatively on a multinational basis to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated R & D programmes on GNSS implementation and operation;

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

8) ICAO and States should undertake education and training to provide necessary knowledge in Performance Based Navigation (PBN), GNSS theory, AIM concept and operational application;, and

9) States establish multidisciplinary GNSS implementation team in accordance to Section 5.2.2 of Doc 9849 AN/457, the Global Navigation Satellite System (GNSS) Manual, and work out a GNSS implementation plan using Attachment A to Appendix C of Doc 9849 as a guide.

Note 1: Identified SBAS systems are EGNOS, MSAS, GAGAN and WAAS. The MSAS is expected to have initial operational capability by September 2007 for provision of augmentation to the Asia/Pacific region while GAGAN is expected to be operational by 2010.

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PROPOSEDTHE REVISED TERMS OF REFERENCE OF ADS-B STUDY AND IMPLEMENTATION TASK FORCE

- Compare currently available technologies with respect to concept of operations, relative costing, technical and operational performance and maturity of alternative technology/solutions (primary, secondary radar including Mode-S, ADS-B, multilateration, ADS-C);

- Develop an implementation plan for near term ADS-B applications in the Asia Pacific Region including implementation target dates taking into account:

  - available equipment standards;
  - readiness of airspace users and ATS providers;
  - identifying sub-regional areas (FIRs) where there is a positive cost/benefit for near-term implementation of ADS-B OUT;
  - developing a standardised and systematic task-list approach to ADS-B OUT implementation; and
  - holding educational seminars and provide guidance material to educate States and airspace users on what is required to implement ADS-B OUT.

- Study and identify applicable multilateration applications in the Asia and Pacific Region considering:

  - Concept of use/operation;
  - Required site and network architecture;
  - Expected surveillance coverage;
  - Cost of system;
  - Recommended separation minimums; and
  - If multilateration can be successfully integrated into an ADS-B OUT system for air traffic control

- Coordinate ADS-B implementation plan and concept of operations with other ICAO regions where ADS-B implementation is going on and with relevant external bodies such as EUROCONTROL, EUROCAE, RTCA and Industry.

Note: *The Task Force, while undertaking the tasks, should take into account of the work being undertaken by SAS, AS Panels with a view to avoid any duplication.*

The Task Force should report to the APANPIRG, through the CNS/MET Sub-group and provide briefing to the ATM/AIS/SAR Sub-group.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

Guidance Material on Comparison of Surveillance Technologies (GMST)

Version 1.0 – September 2007

GUIDANCE MATERIAL ON COMPARISON OF SURVEILLANCE TECHNOLOGIES (GMST)

1 Introduction

A number of surveillance technologies suitable for the delivery of ATC services to separate aircraft are currently available.

This paper will concentrate on enroute, and terminal applications rather than airport surface surveillance. It will consider the sensor component of the ATC system only – and will ignore the ATC display system. These sensors can support simple display systems or sophisticated automation systems.

2 The need for ATC Surveillance

Surveillance plays an important role in Air Traffic Control (ATC). The ability to accurately and reliably determine the location of aircraft has a direct influence on the separation distances required between aircraft (i.e. separation standards), and therefore on how efficiently a given airspace may be utilised.

In areas without electronic surveillance, where ATC is reliant on pilots to verbally report their position, aircraft have to be separated by relatively large distances to account for the uncertainty in the estimated position of aircraft and the timeliness of the information.

Conversely in terminal areas where accurate and reliable surveillance systems are used and aircraft positions are updated more frequently, the airspace can be used more efficiently to safely accommodate a higher density of aircraft. It also allows aircraft vectoring for efficiency, capacity and safety reasons.

ATC surveillance serves to close the gap between ATC expectations of aircraft movements based on clearances or instructions issued to pilots, and the actual trajectories of these aircraft. In this way it indicates to ATC when expectations are not matched, providing an important safety function. Surveillance provides “blunder” detection.

The demand for increased flexibility to airspace users by reducing restrictions associated with flying along fixed routes requires improved navigation capability on board the aircraft. Equally, accurate surveillance is required to assist in the detection and resolution of any potential conflicts associated with the flexible use of the airspace which is likely to result in a more dynamic environment.

Accurate surveillance can be used as the basis of automated alerting systems. The ability to actively track aircraft enables ATC to be alerted when an aircraft is detected to deviate from its assigned altitude or route, or when the predicted future positions of two or more aircraft conflict. It also supports minimum safe altitude warnings, danger area warnings and other similar alerts.

Surveillance is used to update flight plans, improving estimates at future waypoints and also removing the workload for pilots in providing voice reports on reaching waypoints.

3 General Requirements of an Air - Ground Surveillance System

The most basic function of a surveillance system is to periodically provide an accurate estimate of the position, altitude and identity of aircraft. Depending on the ATC application that a surveillance system is intended to support, there will be other requirements of the system.

A surveillance system may be characterised in terms of the parameters listed below:

1. Coverage volume – the volume of airspace in which the system operates to specification.

2. Accuracy – a measure of the difference between the estimated and true position of an aircraft.

3. Integrity – an indication that the aircraft's estimated position is within a stated containment volume of its true position. Integrity includes the concept of an alarm being generated if this ceases to be the case, within a defined time to alarm. Integrity can be used to indicate whether the system is operating normally.

4. Update rate – the rate at which the aircraft's position is updated to users.

5. Reliability – the probability that the system will continue operating to specification within a defined period. Sometimes this is called continuity.

6. Availability – the percentage of the total operating time during which the system is performing to specification.

Other issues which need to be considered when designing a surveillance system for ATC are:

1. The ability to uniquely identify targets.

2. The impact of the loss of surveillance of individual aircraft both in the short (few seconds) and long term

3. The impact of the loss of surveillance over an extended area.

4. Backup or emergency procedures to be applied in the event of aircraft or ground system failure.

5. The ability to operate to specification with the expected traffic density.

6. The ability to operate in harmony with other systems such as the Airborne Collision Avoidance Systems (ACAS) and Airborne Separation Assistance Systems (ASAS).

7. The ability to obtain Aircraft Derived Data (ADD).

8. The interaction between communication, navigation, and surveillance functions.

4 A Surveillance Sensor is One Part of a Surveillance System

Whilst this paper concentrates on the possible surveillance sensors, they are just one part of an overall system that provides data for use in ATC. A complete system includes:

- Position and altitude sensors. Some of these sensors may be ground based (e.g. radars) or may be airborne (e.g. altitude sensors). Datalinks are used to transmit data from airborne sensors to the ground,
    - The Fundamental Data provided to the air traffic controller is aircraft position, aircraft identity and altitude. Further information such as aircraft direction, speed, the rate of climb may also be provided.

- A system to transmit the data from the reception point on the ground to the ATC centre,
- A display system or ATC automation system
    - Data from a sensor system may be presented on a standalone display or combined with data from other sensor(s) and/or other data in an automation system and then presented on a plan view situation display.
    - The situation display provides Air Traffic Controllers with plan view of the position of aircraft relative to each other and to geographic features. This supports controllers in providing Separation and other services to aircraft.
    - Automation systems may use surveillance data to implement automated safety net functions such as Route Adherence Monitoring, Cleared Level Alarm, Conflict Alert, Lowest Safe Altitude and Danger Area Infringement Warning. These facilities increase overall safety.
- Suitably trained air traffic controllers, aircrew and
- Suitable standards and procedures to use the system including separation minima
    - ICAO PANS-ATM (Doc.4444, Chapter 8) details radar separation minima of five (5) and three (3) nautical miles. These minima allow for a considerable increase in airspace utilisation compared to procedural control. Changes to ICAO documents are about to be published (2007) recognising ADS-B use to support 5 nautical mile separation standards. ICAO's Separation & Airspace Safety Panel (SASP) is working on proposals to allow 3 nautical mile separation standards using ADS-B and also on the use of multilateration to support both 3 and 5 nautical mile separation standards.
    - Due to the low update rate, ACARS based ADS-C is unlikely to ever support 3 and 5 nautical mile separation standards. However it is used to support 30/30 and 50/50 nautical mile procedures used in some regions. ATN and VDL2 based ADS-C may reduce the achievable separation standards in some regions.

5 The Technologies

Knowledge of the position of aircraft is essential to an Air Traffic Controller in the provision of most air traffic services. Certainly knowledge of aircraft position is required to provide separation services. The provision of knowledge regarding aircraft position is referred to as surveillance. Position reports from pilots can provide knowledge of aircraft position to a controller. However the inherent inaccuracy, infrequent updates and scope for error due to misunderstandings requires very large spacing between aircraft to maintain safety. This technique is known as procedural separation.

Today there are primarily four classes of surveillance technology available to support air traffic control services;

1. Radar
2. ADS-B alone
3. Wide Area Multilateration (typically with ADS-B but may be supplied without)
4. ADS-C

5.1 Radar

Radar provides the controller with an accurate, trustworthy on-screen plan view of the aircraft position in real-time. The required separation between aircraft for safe operation can be greatly reduced compared to procedural separation. It also allows vectoring, ATC directed terrain avoidance and the provision of safety nets.

Radar is a technology which detects the range and azimuth of an aircraft based upon the difference in time between transmission of pulses to the aircraft and the receipt of energy from the aircraft. Typically the technology uses a large rotating antenna and associated machinery.

A radar system requires a number of racks of equipment (normally on a plinth) normally in an air-conditioned shelter. A typical site consumes between 10 and 20 kWof electricity and this needs to be backed up by generators and battery backup Uninterruptible Power Supplies (UPS). A specialised tower installation is required.

A radar typically takes a number of months for site preparation and deployment unless special, transportable systems are deployed.

5.1.1 Primary Radar

Primary Surveillance Radar (PSR) transmits a high power signal, some of which is reflected by the aircraft back to the radar. The radar determines the aircraft's position in range from the elapsed time between transmission and reception of the reflection. The direction of the aircraft is the direction in which the narrow beam radar antenna is facing.

PSR does not provide the identity or the altitude of the aircraft. However, PSR does not require any specific equipment on the aircraft.

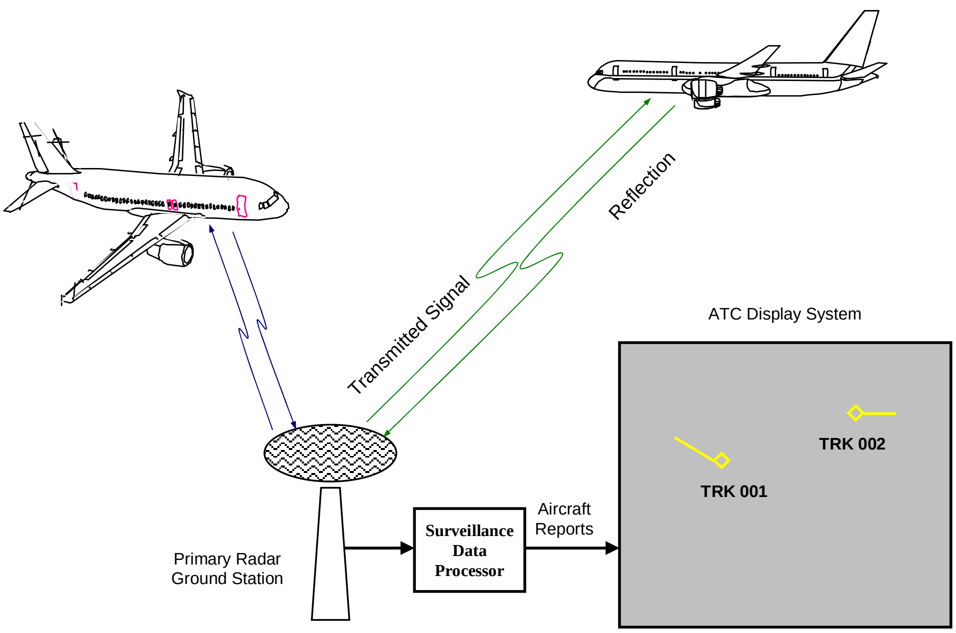

Figure 1 - Primary Radar

Strengths

- PSR does not require a transponder to be installed or operating on aircraft thus allowing the detection and management of non equipped/faulty aircraft or non co-operative aircraft[1]
- Can provide a weather channel output if display of weather is required.
- Well suited for aerodrome surface surveillance

Weaknesses

- PSR does not provide identity
- Does not provide altitude[2]
- Position is based on slant range measurement rather than true range (which presents some difficulties for multi-radar tracking systems)
- Can often report false targets (ground vehicles, weather, birds etc)
- Poor detection performance in the presence of ground and weather clutter especially for flight tangential to the radar
- Expensive compared to Secondary Surveillance Radar (SSR)
- A update rate between 4 and 12 seconds (longer than typical multilateration or ADS-B)
- High transmitter power required for long range performance – brings interference and environmental concerns
- Systems are very expensive to install and maintain
- Systems require optimum site with unobstructed view to aircraft, and with the minimum of ground clutter visible to the radar
- Cannot resolve two aircraft at a similar location at the same range, due to poor azimuth resolution performance.

5.1.2 Secondary Surveillance Radar

Secondary Surveillance Radar (SSR) systems consist of two main elements, a ground based interrogator/receiver and an aircraft transponder. The aircraft's transponder responds to interrogations from the ground station, enabling the aircraft's range and bearing from the ground station to be determined.

Refer to the ICAO Manual of Secondary Surveillance Radar (SSR) Systems (Doc 9684) for a detailed study of the subject.

The development of SSR evolved from military Identification Friend or Foe (IFF) systems and allows the use of the Mode A/C service for civil aviation. Since then it has been significantly developed to include the Mode S service. SSR frequencies of 1030 and 1090 MHz remain shared with the military.

In many cases SSR is co-located with a PSR, usually with the SSR mounted on the top of the PSR antenna.

Mode A/C transponders provide identification (Mode A code) and altitude (Mode C) data with 100 foot resolution information in reply to interrogations. Therefore in addition

[1] ICAO Annex 6 says at para 6.13.1 "From 1 January 2003, unless exempted by the appropriate authorities, all aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Annex 10,Volume IV". A number of authorities provide exemptions.

[2] Some primary radars have height finder capabilities although these are normally too expensive for ATC use and have poor altitude accuracy with respect to civil aviation needs.

to being able to measure the aircraft's range and bearing, the Mode A/C system is also able to request the aircraft to provide its identity and altitude.

Mode S is an improvement of Mode A/C. It contains all the functions of Mode A/C, and also allows selective addressing of targets by the use of unique 24 bit aircraft addresses, and a two-way data link between the ground station and aircraft for the exchange of information. It provides the transponder capability to report altitude data with 25 foot resolution although accuracy and resolution also depend on the altitude sensor systems on board the aircraft.
SSR determines the aircraft's position in range from the elapsed time between the Interrogation and reception of the Reply. The direction of the aircraft is determined from the direction in which the narrow beam radar antenna is facing. The Reply contains the aircraft Identity and/or Altitude. The Identity information is able to be input by the pilot and the altitude information comes from a barometric encoder or air data computer on the aircraft. SSR will only detect an aircraft fitted with a functioning transponder. SSR with Mode S may also data-link many aircraft parameters such as heading, track, bank angle and selected altitude to the Radar.

Whilst SSR independently calculates geographical position, pressure altitude data, flight identity (4 digit octal code) and other data such as emergency flags are provided by airborne sensors or systems and datalinked to the ground.
SSRs transmit pulses on 1030 MHz to trigger transponders installed in aircraft to respond on 1090 MHz. This datalink can theoretically support 4 Mbits/second uplink and 1Mbits/second downlink.

There are two classes of SSR used today:

> **Classical SSR**: typically uses a hog-trough antenna. This SSR system relies on the presence or absence of SSR transponder replies within the beamwidth. Performance can be quite poor, particularly azimuth accuracy and resolution. This type of system is also subject to significant multipath anomalies due to the poor antenna pattern. Range accuracy depends on variability of the fixed delay in the ATC transponder[3].
>
> **Monopulse SSR:** Monopulse SSR systems measure the azimuth position of an aircraft within the horizontal antenna pattern using diffraction techniques. These techniques improve azimuth accuracy and resolution. In addition, these radars typically have large vertical aperture antennas and hence are less subject to multipath effects.

[3] Time allowed for transponder to reply : 3 uS +- 0.5 us as per SARPS

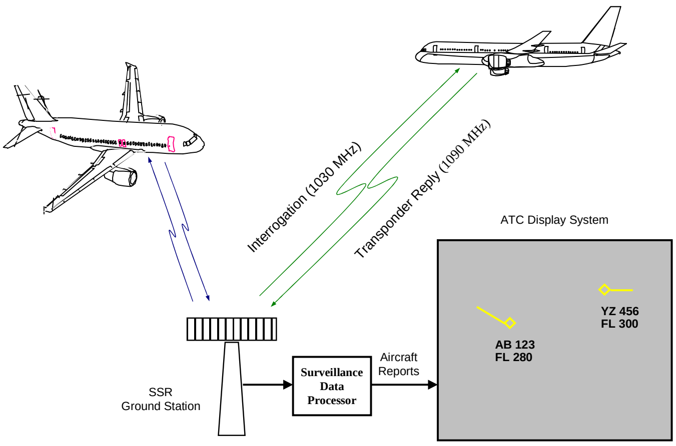

Figure 2 - Secondary Surveillance Radar

Strengths

- SSR allows communication of identity (4 digit octal codes) when matched with flight plan data held by the ground system
- Allows communication of altitude and emergency states to ground system
- Provides good detection capability independent of clutter and weather.
- Provides moderately high update rate.
- Provision of altitude allows correction for slant range error

Weakness

- Poor azimuth accuracy and resolution (particularly for classical SSR)
- Can sometimes report false targets or position (reflections, multipath)
- Can sometimes confuse Mode A replies as Mode C and vice versa
- Can sometimes report false altitude or 4 digit code
- No error detection provided in downlinked 4 digit code and altitude from Mode C transponders
- Systems are expensive to install and maintain
- Systems require optimum site with unobstructed view to aircraft
- Cannot resolve two aircraft at the same location (garbling/ resolution performance)
- Dependent on aircraft avionics
- Not accurate enough for aerodrome surface applications due to transponder delay uncertainty

5.1.3 Mode S Secondary Surveillance Radar

Mode S radars typically use monopulse techniques to measure the azimuth position of an aircraft and have large vertical aperture antennas and hence are less subject to multipath effects. In addition, they are able to discretely interrogate single aircraft transponders and hence can discriminate between two aircraft at the same geographical position.

Mode S has additional capabilities which provide:

- improved ability to distinguish between Mode S equipped aircraft (resolution performance)
- error detection and correction of downlinked data
- improved tracking relying on Mode S 24 bit address (reduced tracking ambiguity)
- improved altitude quantisation

- ability to downlink a wide variety of information from Mode S equipped aircraft

A Mode S radar is backwards compatible with a conventional SSR Mode A/C radar and the detection and processing of Mode A/C transponder replies is essentially identical. To achieve Mode S benefits, the aircraft transponders must be Mode S capable transponders.

All ACAS II (v6.04 or v7.0) equipped aircraft have mode S transponders.

Europe has issued Mode S mandates requiring all aircraft in certain airspace to be Mode S equipped. Some exemptions will exist.

The European mandate also requires support of

Elementary surveillance (ELS) which requires the aircraft to be able to downlink callsign in response to Mode S interrogations and

Enhanced surveillance (EHS) which requires the aircraft to be able to downlink

- Selected Altitude
- Roll Angle
- Track Angle Rate
- Track Angle
- Ground Speed
- Magnetic Heading
- Indicated Airspeed/Mach No
- Vertical Rate

Strengths

- Altitude and identity is protected and the downlink is error free (of course flight identity could have been entered incorrectly)
- Can resolve two aircraft at the same location
- Provides 25 foot altitude quantisation (instead of conventional 100 foot resolution)
- Operates with Mode A/C aircraft albeit with no advantages compared to a Mode A/C radar

Weakness

- Benefits apply only to Mode S equipped aircraft
- More complex to set up than SSR
- Some currently deployed Mode A/C transponders are non compliant with the standards and fail to respond to Mode S interrogations properly – whilst these transponders are tolerated by Mode A/C radars
- Dependent on aircraft avionics – but most **airliners** are equipped with Mode S as a result of ACAS mandates
- Systems require optimum site with unobstructed view to aircraft

5.1.4 Secondary Radar Alone

SSR alone is used for en route radar control in many States where intruder detection is not required. An SSR only installation is less expensive than a combined primary plus secondary radar, but involves a significant outlay for buildings, access roads, mains electrical power, standby generators, towers and turning gear to rotate a large elevated antenna etc.

ICAO Document 4444, Procedures for Air Traffic Services – Air Traffic Management, sets out the requirements for Radar Services in Chapter 8. An extract is copied at Attachment 1. In particular, Section 8.1.9 states:

"SSR systems, especially those with monopulse technique or Mode S capability, may be used alone, including in the provision of separation between aircraft, provided:

a) The carriage of SSR transponders is mandatory within the area; and

b) Aircraft identification is established and maintained by use of assigned discrete SSR codes"

5.1.5 Combined Primary plus Secondary Radar

Combined Primary & Secondary Radar makes use of the advantages of the two types of radar in one installation. Typically, the PSR antenna and the SSR antenna are mounted on the same turning gear and the associated processing performs filtering, combines the SSR and primary data and tracks the radar reports. One track message is output per aircraft each antenna rotation.

The primary radar provides detection of intruder aircraft and the SSR performs detection of co-operative aircraft as well as providing altitude and identity information.

Digital tracking systems gain significantly benefits from having SSR and PSR installed on the same rotating antenna. SSR can resolve tracking ambiguities that would exist in a PSR only solution and vice versa.

Some States choose to mount PSR and SSR systems at separate locations thus providing separate antenna platforms. This has the advantage of a level of redundancy since one antenna stops, a level of service can be provided from the other. However, in this case, the advantages of improved tracking performance are forgone – unless the antennas are nearby and antenna rotation is synchronised[4].

Combined PSR/SSR systems are usually provided to support approach departure ATC in terminal manoeuvring area airspace. It is in the busy terminal area airspace that the probability of general aviation aircraft straying into controlled airspace is higher – and therefore some States prefer to have PSR in these environments.

Often such systems are backed up by offsite SSR only systems.

5.2 ADS-B alone

ADS-B is a system that uses transmissions from aircraft to provide geographical position, pressure altitude data, positional integrity measures, flight identity, 24 bit aircraft address, velocity and other data which have been determined by airborne sensors.

Typically, the airborne position sensor is a GPS receiver, or the GPS output of a Multi-Mode Receiver (MMR). This sensor must provide integrity data that indicates the containment bound on positional errors. The altitude sensor is typically the same barometric source / air data computer source used for SSR. Integrated GPS and inertial systems are also used. Currently inertial only sensors do not provide the required integrity data although these are likely to be provided in the future.

[4] Mechanical slaving brings another degree of complexity and failure modes and is rarely implemented (for good reasons)

An ADS-B ground system uses a non-rotating antenna positioned within a coverage area, to receive messages transmitted by aircraft. Typically a simple pole (DME like) antenna can be used.

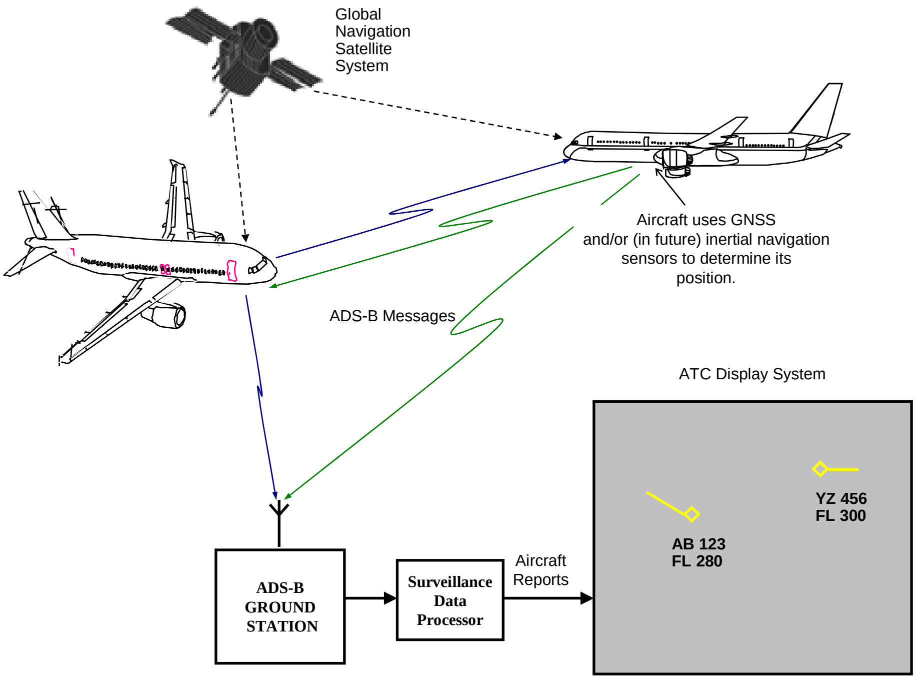

Figure 3 - Automatic Dependent Surveillance - Broadcast

The ADS-B ground system does not necessarily transmit anything. ADS-B receiver ground stations are the simplest and lowest cost installations of all options to provide air-ground surveillance, although costs may increase if ADS-B transmitter (to broadcast or rebroadcast ADS-B data e.g. TIS-B, ADS-R or FIS-B) capabilities are deemed necessary.

An ADS-B receiver is typically less than six inches high by nineteen inches wide and a duplicated site consumes less than 200 watts of electricity. An ADS-B ground station can normally be installed in an existing VHF communications facility.

The installed cost of a duplicated ADS-B ground station is lower than other alternatives. If it can be housed in an existing communications facility, installation can be as short as one week after delivery of equipment from the manufacturer.

While ADS-B has the advantage of quite low ground station cost, it has the disadvantage of requiring aircraft to equip with ADS-B transponders, which will take time. Voluntary equipage among jet airline fleets is still expected to be high, and ADS-B remains very attractive in the longer term.

Many avionics vendors have included ADS-B capability in the software release that supports ELS and EHS.

Some ATC systems can support ADS-B use, including delivery of separation services, when there is partial aircraft ADS-B equipage. Other ATC systems require complete equipage for ADS-B use to be viable.

The use of ADS-B along the Flight Information Region (FIR) boundary may be easily shared by the boundary States. ADS-B technology is generally not sensitive to military authorities because it is co-operative in nature and hence such authorities are less likely to block data sharing.

The low marginal cost of ground stations encourages FIR boundary data sharing where large parts of coverage benefit the adjacent FIR. This data sharing can be considered similar to the sharing of ADS-C data when adjacent Air Navigation Service Providers (ANSPs) use service providers to deliver ADS-C data.

Strengths

- Simple ground station design without transmitter
- Can be installed at sites shared with other users
- Very low ground station cost (but highly variable ADS-B avionics fitment cost)
- Very high update rate
- Almost perfect resolution
- High accuracy and integrity (airborne measurements)
- Higher performance velocity vector measured by avionics and then broadcast, rather than determined from positional data received on the ground
- Accuracy not dependent on range from ground station
- Facilitates exchange of surveillance data across FIR boundaries
- Can be easily deployed for temporary use (emergency, special events etc)
- Can support the display of callsigns on simple display systems without interfaces to flight planning systems since callsign is provided directly from the aircraft
- Facilitates future provision of innovative ATM services based on air-to-air ADS-B.

Weakness

- Dependent on aircraft avionics. This can be a major issue in some environments.
- Equipage rates are relatively low at this stage (2007)
- Systems require optimum site with unobstructed view to aircraft
- Some outages expected due to poor GPS geometry when satellites out of service, although exposure expected to reduce in the future with use of GNSS augmentation & internal support[5]
- ADS-B has the capacity to evolve towards the broadcast and use of other data, such as Trajectory Change Point (TCP) or others, already defined in the standard

ADS-B Critical issue

The critical issue for ADS-B is that it requires ADS-B avionics including GPS or similar in participating aircraft. Whilst many airliner manufacturers produce aircraft with ADS-B out avionics a large legacy fleet remains to be equipped.

The situation is different in different regions of the world. Some States have new airliner fleets which are growing rapidly – and the new aircraft are fitting with ADS-B. In other States very large numbers of legacy aircraft remain unequipped.

The situation is also different in different aviation segments.

[5] Analysis of 37 million ADS-B samples by one State over a 4 month period indicated that 99.8% of samples were acceptable for ATC 5 nautical mile separation. See ADS-B SITF/5-IP/8

Whilst large aircraft are equipping, few regional airliners are equipped.

General Aviation (GA) is another area that can be problematic. In some States the cost to equip the GA fleet is small. In others with a large fleet it can be very expensive. Some States envisage subsidies to assist GA equipage so that all aviation segments benefit. Some States also envisage the mandatory fitment of ADS-B with and without subsidies.

Timing of transition to match aircraft equipage of ADS-B will be critical for many States.

At the same time, the benefits of ADS-B equipage are significant and may allow other surveillance systems to be decommissioned and supports delivery of air-air surveillance applications. ADS-B avionics support the ADS-B application in all locations to which the aircraft travels.

5.3 Multilateration

Multilateration is a system that uses aircraft transponder transmissions (Mode A/C, Mode S or ADS-B) to calculate a 2D or 3D position.

Multilateration relies on signals from an aircraft's transponder being detected at a number of receiving stations to locate the aircraft. It uses a technique known as Time Difference of Arrival (TDOA) to establish surfaces which represent constant differences in distance between the target and pairs of receiving stations, and determines the position of the aircraft by the intersection of these surfaces.

The accuracy of a multilateration system is dependent on the geometry of the target in relation to the receiving stations, and the accuracy to which the relative time of receipt of the signal at each station can be determined.

Multilateration is mainly used for airport surface and terminal area surveillance, although with careful design and deployment it may be used in segments of enroute airspace.

Multilateration independently calculates geographical position in 2D, or in 3D if more sensors are installed.

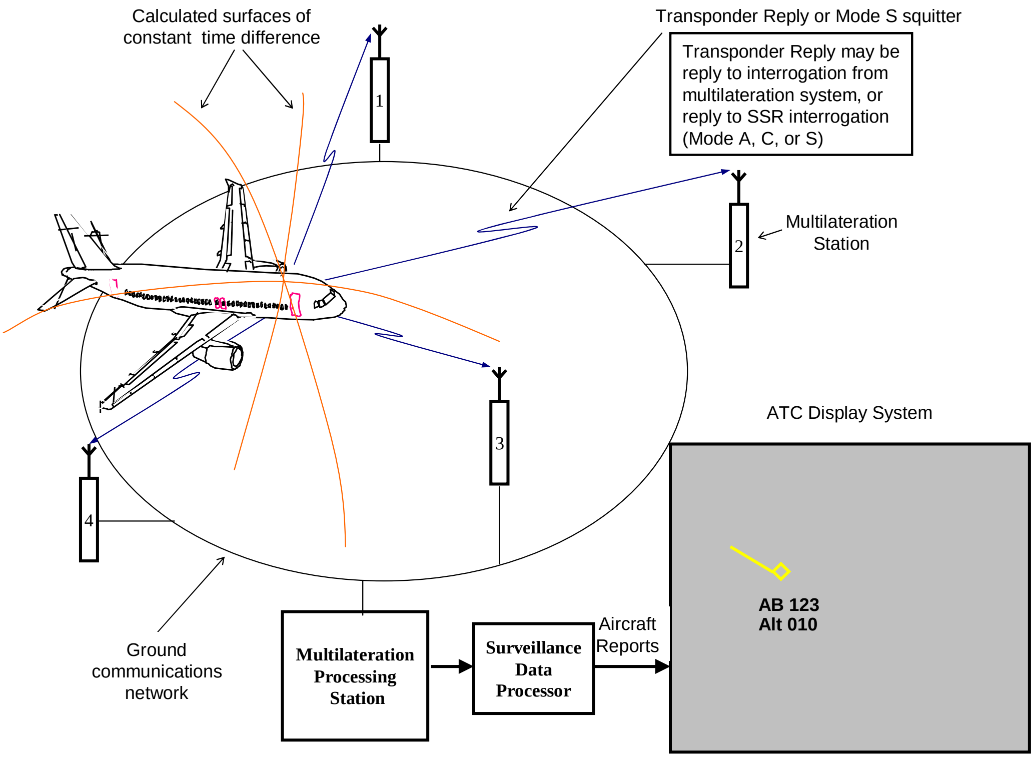

Figure 4 - Transponder Multilateration

Multilateration systems can be defined as being either passive or active. Passive systems require only ground receivers. An active system requires ground receivers and at least one interrogator. Multiple interrogators may be required to meet coverage requirements. The latter enables the system to be independent from other sources to trigger transmissions from aircraft. In most practical ATM applications multilateration systems are active and must interrogate aircraft to obtain altitude and identity data. Passive systems usually rely on nearby radars to perform interrogation[6]. They could operate on ADS-B signals which do not require interrogators.

Multilateration systems will provide a range of fundamental data items relative to a specific target depending on the airborne derivation of the data and if they are transmitted within the aircraft signal used by the multilateration system, i.e. MSSR Mode A or MSSR Mode C or 1090 MHz Extended Squitter (ADS-B). Derived data can include:

- Pressure altitude data derived from decoding ADS-B transmissions or replies to Mode C interrogations.

- Flight identity obtained by decoding ADS-B transmissions or replies to Mode A interrogations.

- 24-bit aircraft address obtained by decoding ADS-B transmissions, DF11 Mode S autonomous transmissions[7] or replies to Mode S interrogations.

[6] Difficulties in distinguishing between Mode A and Mode C replies will be experienced unless the interrogator pulses are available.

[7] DF11 is an autonomous transmission from a Mode S transponder which provides aircraft 24 bit code only. It was primarily designed to support self announcement to TCAS systems. Multilateration systems can

Additionally, multilateration systems can make use of position messages provided by ADS-B systems, i.e. each multilateration receiver can usually be configured to operate as an ADS-B receiver. These can be used as standalone ADS-B sensors.

Initially multilateration systems have been used for surface surveillance. More recently States have begun deploying multilateration for wide area applications of terminal area size. These wide areas tend to be smaller than the area covered by radars.

System performance in the service volume is determined primarily by the geometry of the ground station deployment. Therefore the number of sites and the geographical disposition of those sites (site selection) are the critical factors in achieved performance. The availability of such sites and reliable, high performance communications to the central processing system is required.

One requirement of multilateration systems is that the central processing must be able to determine the time DIFFERENCE of arrival of signals from aircraft. This requires a synchronisation of the ground stations typically using either:

a) A reference transmitter visible to multiple receiver stations, or
b) Use of common clock (GPS or other) to time synchronise the receptions, or
c) The transmission of the received signals by wideband datalink to the central processing system, or
d) Very accurate clocks at each sensor (atomic standard).

Mutilateration systems require a number of ground stations to detect each aircraft transmission.

- For surveillance of airborne aircraft a minimum of four ground stations must receive each message to determine a position.
  - Three ground stations can be used if pressure altitude is also used but the position accuracy will be adversely affected due to 100 foot barometric pressure altitude quantisation and because this altitude varies[8] and does not match the WGS84 geoid.
  - An additional ground station may be necessary to support the ability to continue operations with one ground station failed.
  - One less ground station is required if a ground station uses "radar ranging" to measure the distance of the aircraft from the interrogating station.

- For surface movement applications a minimum of three ground stations must receive each message to determine a position.

- "Ranging" via interrogation of SSR transponders can be used in some cases to improve accuracy.

Strengths

- Provides aircraft identification using 4 digit octal codes, 24 bit Mode S codes or Flight Identity (ADS-B or Mode S based) to ground system
- Allows communication of identity, altitude and emergency states downlinked from aircraft

determine position from DF11 transmissions. These transmissions do not provide altitude or flight ID data. Mode A/C transponders need to be interrogated to determine position.

[8] Due to atmospheric pressure

- Provides good detection capability independent of clutter and weather
- Is able to provide a high update rate
- Can resolve two aircraft at the same location (garbling / resolution performance) if aircraft are Mode S capable using selective address interrogation
- Can operate as a set of multiple ADS-B ground stations
- Can be installed at sites shared with other users
- Is an attractive transition path before widescale ADS-B equipage occurs in some States
- Lower cost than radar[9]
- Data feed can be made to resemble radar data (and hence can be used in some ATC automation systems that are not adapted to support native multilateration data)[10]
- In some locations, when existing infrastructure is available, the systems can be inexpensive to install and maintain compared to alternative systems.

Weakness

- Requires multiple sites
- Requires multiple communication links
- Sometimes reports false targets (reflections, multipath)
- No error detection provided in downlinked 4 digit code and altitude from Mode C transponders
- Systems can be moderately expensive to install and maintain because of the costs associated with the provision and maintenance of multiple sites especially if existing infrastructure is not available.
- Systems require multiple sites with unobstructed view to aircraft. This can be a significant problem in some environments
- Requires a transmitter to trigger aircraft to transmit the data required for ATC applications
- Not yet endorsed by ICAO
- Requires multiple transmitter sites for large coverage, due to the poor uplink antenna gain when omni-antenna used (compared to high gain radar antenna).

5.4 ADS-C

ADS-C (Contract) is also known as Automatic Dependent Surveillance – Addressed (ADS-A) or simply Automatic Dependent Surveillance (ADS). With ADS-C the aircraft uses on-board navigation systems to determine its position, velocity, and other data, and reports this information to the responsible air traffic control centre.

Information that may be sent in ADS-C reports includes:

a. Present position (latitude, longitude, altitude, time stamp, and FOM)
b. Predicted route in terms of next and (next + 1) waypoints
c. Velocity (ground or air referenced)
d. Meteorological data (wind speed, wind direction, and temperature)

ADS-C reports are sent by point to point satellite or VHF data links. The data links are typically provided by service providers. Typically fees are charged for the transmission of each message; as most of these costs are borne by the airlines, there is a reluctance to use ADS-C at

[9] There is a wide variability of the costs for multilateration since site costs typically dominate the total costs. In some environments multilat costs could approach those of radar

[10] Usually brings some additional inaccuracies that are tolerable.

higher rates than 10-15 minutes between messages]. Sometimes HF datalink is used, but with reduced performance.

With ADS-C the airborne and ground systems negotiate the conditions (the Contract) under which the aircraft submits reports (i.e. periodic reports, event reports, demand reports, and emergency reports). Reports received by the ground system are processed to track the aircraft on ATC displays in a similar way to surveillance data obtained from SSR.

ADS-C is typically used in oceanic and remote areas where there is no radar, and hence it is mainly fitted to long range air transport aircraft. The aircraft avionics chooses VHF communication when in coverage of the VHF network to lower costs and improve performance. Satellite data-communications is used at other times such as when the aircraft is over the ocean.

Typically messages are transmitted infrequently (~ each 15 minutes). The positional data is accompanied by a "figure of merit" value which indicates the accuracy. It is not an integrity value.

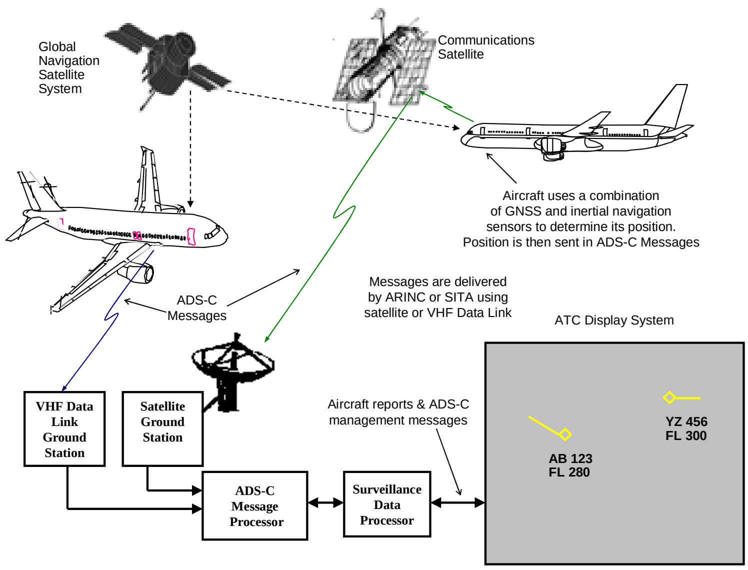

Figure 5 - Automatic Dependent Surveillance - Contract

Strengths

- Provides surveillance coverage over very remote regions and oceans except in the polar regions
- Supports a subset of the safety net applications (Cleared Level Adherence Monitoring : CLAM, Route adherence monitoring : RAM , and ADS Route conformance warning : ARCW[11]) but unable to support more tactical alerts like STCA
- Low capital cost for ANSP
- Minimal maintenance costs

Weakness

- High costs per report (service provider)
- Low reporting rates
- No ability to offer radar like separation services (vectoring etc)
- Expensive avionics fitment
- FANS-1/A is not ICAO-compliant, but has been accepted as a transition step
- ATN variant is not mature but will support higher reporting rates [12]
- Long latency when satellite communication link is used
- Availability not as high as other systems (not all elements are duplicated)
- Susceptibility to failure/overload at satellite earth stations
- Relatively low message delivery reliability

[11] This is the same as "FLIPCY" in the European context

[12] FANS1 standards limit reporting rates so that contracts can be supported over ACARS satellite (amongst other reasons)

6 COMPARISON

This section compares the various technologies

6.1 APPLICATIONS

PSR	**Enroute surveillance**: In the 1960s & 1970s PSR was widely used for ATC surveillance including in enroute airspace. In the late 1970s and following years many ANSPs have decided to discontinue the use of PSR in this application due to the high cost and due to mandatory requirements for SSR transponders in a lot of airspace. In many countries the use of PSR is retained for defence purposes rather than for provision of civil ATC services. The use of PSR for enroute ATS is expected to continue to decrease. **Terminal area surveillance**: PSR remains a useful tool in busy terminal areas to detect non transponder equipped aircraft and provide intruder protection of the terminal area airspace. Typically primary radars have co-mounted SSR to improve tracking performance and provide identity/altitude. In the next decades the use of primary radar is expected to commence to decrease. **Surface movement radar** application: PSR remains a significant tool in surveillance of airport surfaces. Its purpose is to detect vehicles and aircraft which are not detected by other cooperative surveillance means (eg aircraft and vehicles not equipped with transponder or equivalent). **Airborne:** no civil application.
SSR	**Enroute surveillance**: SSR only sensors often provide surveillance in enroute airspace when financially justified. In some States enroute radars rotate slowly (typically 5 rpm) and in others rotate at 16 rpm. In some regions (Europe) two SSR sensors are required to cover the airspace. In other regions, single SSR surveillance is used. **Terminal area surveillance**: SSR radars are currently critical to the effective provision of terminal area surveillance because they provide a moderate update rate of position (typically 15 rpm), identity (4 digit octal codes) and altitude. Typically a terminal area radar includes primary radar and SSR. **Precision Runway Monitor (PRM) - electronic scan**: Special SSR ground stations are used by a number of States to support precision runway approach monitoring to parallel runways. Typically these electronic scan sensors provide an update every 1 second, with an azimuth accuracy exceeding 1 milliradian. The objective of these radars is to detect divergence from the defined final approach path.

	Airborne: ACAS systems including TCAS 1, TCAS 2 and other products such as TCAD rely on SSR transmissions.
Mode S	**Terminal area & enroute surveillance** Mode S SSR sensors are being commissioned around the world to support both enroute and terminal area operations. Whilst the surveillance performance benefits (eg: resolution) of Mode S will be delivered to all Mode S equipped aircraft in the coverage of a Mode S radar, only ANSPs with updated ATC systems will be able to take advantage of many capabilities such as downlink of airborne parameters (DAP). The move away from the use of 4 digit SSR codes will be slow and driven by ATC automation changes as well as fitment of Mode S radar ground stations and transponders in aircraft. Europe’s ELS/EHS mandate will speed this process in Europe and hence worldwide. Legacy ATC automation in other States will slow progress. **Airborne:** ACAS systems including TCAS 1, TCAS 2 and other products such as TCAD rely on SSR transmissions.
Multilateration	**Advanced Surface Movement Guidance and Control Systems (ASMGCS)**: Multilateration has been deployed at numerous locations for surface surveillance. Typically it supports a surface movement radar and provides highly accurate position and identity to these systems. Typically 10-20 ground stations are used to provide multilateration coverage over the whole airport surface. High update and high integrity positional data is provided for Mode S capable aircraft and for ADS-B equipped surface vehicles. Implementation requires new “transponder on” procedures to be followed by flight crew whilst taxing. Careful site selection and tuning of these systems has been found to be necessary to account for multipath, coverage obstructions and for aircraft that are not Mode S capable. Multilateration systems operate more efficiently the higher the Mode S transponder fitment rate. **Terminal area surveillance**: Multilateration shows promise for “wide area” application and a number of States have projects to deploy multilateration for this purpose. However, at this time, no ICAO approval has been obtained to use multilateration for this application. SASP is working on a proposal to use multilateration for 3 nautical mile separation. Austria is using multilateration in a specific terminal area application (Innsbruck) monitoring approaches and has authorised a 5 nautical mile separation standard. **Enroute surveillance**: Multilateration is likely to be able to be used in some “very wide area” applications. At this time, no ICAO approval has been obtained to use multilateration for this application. The Czech Republic has been using a specific type of multilateration for very wide area surveillance for some time in a search & rescue support role. “Very wide area” multilateration requires that multiple ground stations have the ability to “see” the aircraft over large areas. Typically this requires a high number of sites and hence makes multilateration a higher cost that anticipated because of site and

	data communication costs. A comprehensive site survey would be required to ensure that adequate coverage, geometry and site availability exists to meet the requirement. In States with particular requirements, a highly developed communications infrastructure, the cost of site development and data communication may be low enough for this to be preferred. Typically this may occur when terrain would prohibit cost effective radar coverage. **PRM**: Multilateration shows promise for use in PRM applications when sufficient aircraft are equipped because multilateration meets the accuracy and update requirements of PRM. However, at this time, no safety case or ICAO approval has been obtained to use Multilateration for this application. The USA and Australia envisage using multilateration for this purpose. **Airborne:** no application.
ADS-B	**Enroute surveillance**: ADS-B may be used in enroute airspace. Some States will require full ADS-B equipage whilst others will allow separation services without all aircraft being equipped largely dependent on their ATC automation system capabilities and traffic environment. ADS-B will bring safety improvements and automated safety nets where there is no surveillance today. ADS-B will be more readily used in ATC systems which can support low performance surveillance (eg voice reports) and high performance surveillance (eg radar or ADS-B) within a sector. Clearly benefits rise the higher the percentage of equipage. In many States, ADS-B will be used enroute in remote areas which have no radar surveillance. Other States will decommission enroute radars in lieu of ADS-B because of ADS-B's cost effectiveness. ICAO's SASP and OPLINK panels have agreed to the use of ADS-B to provide 5 nautical mile separation standards. The associated changes to PANS ATM doc 4444 are soon to be published. ADS-B may also be used in parallel with radar, improving overall performance by improving detection (coverage holes), improving tracking (using 24 bit code, using velocity vector), reducing latency and increasing update rate. **Terminal area surveillance**: ADS-B may be used in terminal area airspace to provide high quality surveillance data. The application of ADS-B in this domain is currently hindered by lack of equipage of ADS-B avionics. Comprehensive use in busy terminal areas will require a relatively high percentage of equipage because of the difficulties and workload associated with procedural terminal areas. However, in some States mixed equipage may be possible. ADS-B positional data accuracy and ADS-B's high integrity are major advantages as well as the better velocity vector performance of ADS-B compared to radar. No ICAO approval yet exists for the use of a 3 nautical mile separation standard using ADS-B although work is currently being progressed by SASP. **Surface movement**: ADS-B has potential for surveillance on airport surfaces. No States have yet deployed ADS-B alone for this application. However surface surveillance systems have been commissioned to provide identity and emergency flag data to surface movement displays.

	PRM: ADS-B shows promise for use in PRM applications when sufficient aircraft are equipped because ADS-B meets the accuracy, velocity vector performance and update requirements of PRM. However, at this time, no safety case nor ICAO approval has been obtained to use ADS-B for this application. **Air-Air Applications**: ADS-B shows promise for use a large number of air to air applications. A number of States are examining strategies to improve safety, efficiency and increase capacity using these applications. This feature has significant strategic impact on the choice of technology for some States. Applications include In Trail Procedure, Airborne situational awareness, Merging & Spacing etc **Airborne:** A significant number of airborne applications of ADS-B are envisaged by the international community including Air Traffic Situational awareness, In trail procedures, Merging & spacing etc. Airbourne applications are seen by FAA and Europe as key elements of the next generation of Air Traffic Management and are critical to provision of future capacity.
ADS-C	Enroute surveillance in remote or oceanic areas Due to the low update rate, the cost of ADS-C avionics and service provision, it will not be preferred when other technologies can support surveillance. However, over the ocean or remote areas, where other technologies cannot be used, ADS-C will remain as the preferred surveillance tool. ADS-B may compete in cases where ground stations can be installed, for example on islands, oil rigs etc. ADS-C does not support 3 nautical mile or 5 nautical mile separation standards. ADS-C does not support tactical ATC nor vectoring. **Airborne:** airborne equipment may be used for airline-specific communications such as systems monitoring, crew and airframe scheduling and customer care requirements.

6.2 PERFORMANCE CHARACTERISTICS

Since this document is aimed at discussing alternative technologies to be deployed in the future, the performance of new generation radars shall be assumed. This is in contrast to many comparative documents that compare existing (old) radar performance with new surveillance technologies to demonstrate that the new technology is safe.

	Range	Accuracy	Integrity	Resolution	Update period
Primary radar	S-band typically 60-80 NM L-band 160-220 NM	In range : 0.1 NM rms or 0.2 NM 2 σ In azimuth : 0.15 degrees rms or 0.3 degrees 2 σ .	No "message by message" integrity report provided. Range/Azimuth alignment can be assured through statistical comparison of SSR & primary radar reports. Alternatively special primary test units may operate like a SSR site monitor.	1 to 3 degrees in azimuth	Between 4 & 15 seconds
SSR	200 NM-250 NM	For a monopulse radar In range : 0.03 NM rms In azimuth : 0.07 degrees rms or 0.14 degrees 2 σ for random errors. [13]At 50 NM range the 0.14 degree error results in a position error of 0.12 NM. At 100 NM range : 0.24NM, At 200 NM : 0. 48 NM At 250 NM : 0.60 NM	No message by message integrity. Testing of site monitor provides integrity check in general. Downlinked data such as altitude & 4 digit identity is subject to transmission errors which are passed to controllers. Subject to mode A/C code garbling.Subject to confusion between mode A and Mode C data.	0.5 to 1 degree in azimuth	Between 4 & 15 seconds

[13] The range noise errors are 0.03 NM (1σ) and the noise errors in azimuth are 0.07 degrees (1σ). For comparison purposes, and since GPS (ADS-B) errors are expressed with respect to a positional error with 95% confidence, this paper will use 2 σ (95% assuming Gaussian distribution of errors) - namely a 0.14 degree error.
Taking into account the random noise errors only: At 50 NM the 0.14 degree error results in a position error of 0.12Nm. At 100 NM this error becomes 0. 24NM, 0.48 at 200 NM and 0.60Nm at 250 NM. In addition to these errors one must consider systematic errors of alignment. Radars can be maintained aligned accurate to +-0.05 degrees in azimuth. Azimuth errors are clearly the dominant error as range increases, and can be translated into positional errors as follows: Systematic errors of +- 0.2Nm at 250Nm from the radar also need to be considered when using Multi Radar to separate aircraft and when separating aircraft from terrain or geographical boundary.

	Range	Accuracy	Integrity	Resolution	Update period
ModeS	200 NM-250 NM	Same as SSR	No message-by-message positional data integrity. Testing of site monitor provides integrity check in general. Mode S downlinked data is subject to stringent transmission error detection algorithms virtually eliminating the risk of undetected false data.	Perfect for mode S avionics due to ability to uniquely interrogate one aircraft 1 degree in azimuth for mode A/C transponders	Between 4 & 15 seconds
ADS-B	200 NM-250 NM	Determined by the aircraft avionics and independent of range from sensor. For GPS, typically : 95% less than 0.1 NM	Position integrity guaranteed to $1*10^{-7}$ [14]due to RAIM algorithm in avionics. Integrity value is downlinked in the ADS-B message. A site monitor typically augments the integrity monitoring and often also supports GPS constellation monitoring. ADS-B downlinked data is subject to stringent transmission error detection algorithms virtually eliminating the risk of errors in the transmission medium	Perfect due to Mode S avionics unique 24 bit code and random transmission requirements	0.5 seconds from aircraft. Typically 1 second from ground station. In high density environments with significant 1090 Mhz FRUIT, the update rate may be reduced

[14] Sometimes limited to 10^{-5} to account for software assurance level

	Range	Accuracy	Integrity	Resolution	Update period
Multilateration	Determined by the geometry of the ground stations.	Determined by geometry of ground stations with respect to the aircraft. Therefore each multilateration system is designed to achieve a defined accuracy for the particular operational requirements of the service volume. Higher accuracy requires better geometry and typically more ground stations. Very high accuracy in some areas and low accuracy in others. A requirement for multilateration accuracy < 0.1 NM rms is reasonable for such a system. ie 0.2 NM at 2 σ The number and position of ground stations required to achieve this accuracy can then be determined. Processing systems need to filter received information based on geographical area and DOP of receiver system when accuracy of the report is less than that required for the operation.	Position integrity could in theory be guaranteed by reception algorithm if an overdetermined solution is available. This could operate like the RAIM algorithm in GPS. Current implementations do not require an overdetermined solution. Insistence on such a solution would require multilat systems to flag to downstream users whether or not an overdetermined solution is provided. It would also require additional ground stations and costs. Downlinked data from Mode S transponders (but not A/C transponders) is subject to stringent transmission error detection algorithms significantly reducing the risk of false data. Provision of a site monitor can provide a general system integrity check but does not provide integrity data relating to each aircraft.	Perfect for Mode S avionics due to unique 24 bit code and independence of transmission times. For Mode A/C transponders, position resolution is good due to multilateration technique. With Mode A/C avionics, aircraft at same range (and hence possibly garbled) from one ground station are not at the same range from other ground stations. Some multilateration implementations use whisper-shout techniques to resolve Mode A/C transponders.	Typically 1 second for Mode S aircraft. Typically 2.5 to 5 seconds for Mode C transponder aircraft.

	Range	Accuracy	Integrity	Resolution	Update period
ADS-C	200 NM from VHF ground station or via satellite (unrestricted except for polar regions)	Determined by the aircraft avionics. Typically 99% less than 0.2 NM	An Actual Navigation Performance (ANP) value is provided by avionics and generates FOM value to ATC. This is an "accuracy" value and no integrity measure is conveyed to the ATC centre. Downlinked data is subject to stringent transmission error detection algorithms (CRC) virtually eliminating the risk of false data.		Typically a report each 14 minutes. However, also supports event contracts which initiates unscheduled reports on occurrence of defined events.

	Availability	Typical Reliability – MTBF (Continuity) & Major factors	Maturity	Anomalies
		Reliability and availability are very specific to the deployment of concern because they depend on organisational factors, maintenance, telecoms infrastructure as well as hardware and software. Therefore the values shown are very generic.		
Primary radar	> 99% NB: Outages for routine antenna maintenance required	For duplicated system > 20,000 hours Modular and fail soft transmitter & reliance on single antenna. Relies on mechanical machinery for antenna rotation Duplicated receiver/processing	Very mature. Thousands of systems installed. Separation standards and procedures are established in PANS ATM Doc 4444	Affected by weather, "road traffic", multipath, and ground clutter
SSR	> 99 %[15] NB: Outages for routine antenna	For duplicated system > 20,000 hours	Very mature. Thousands of systems installed Separation standards and procedures	Affected by multipath, reflections, second time around replies, plot splits, garbling, resolution loss & data corruption

[15] Eurocontrol standard document for radar surveillance in enroute airspace and major terminal areas para 7.4 : <9 hours/ year = 99.9%
Australia : Planned outages over 10 years (inc major bearing refurbishment) 52 hours/pa average plus unplanned 9 hours = 99.3%

	Availability	**Typical Reliability – MTBF (Continuity) & Major factors**	**Maturity**	**Anomalies**
	maintenance required	Reliance on single antenna. Relies on mechanical machinery for antenna rotation. Duplicated transmitter/ receiver	are established in PANS ATM Doc 4444	
ModeS	> 99% NB: Outages for routine antenna maintenance required	Same as SSR For duplicated system > 20,000 hours	Reasonably mature. Deployments have occurred in Europe, UK & New Zealand although few are operating in purely ModeS modes. Most interrogate A/C as well. Few ATC systems are operationally using Mode S downliked parameters (DAPs). Separation standards and procedures are established in PANS ATM Doc 4444 since Mode S is treated in the same way as SSR. Operational procedures are still being developed for operational use of DAPs.	Similar to SSR for processing of Mode C transponders. Significantly less impact with Mode S transponders. Some new anomalies (loss of detection) associated with some older mode C transponders.

	Availability (of Service inc GPS & avionics)	**Typical Reliability – MTBF (Continuity) & Major factors**	**Maturity**	**Anomalies**
ADS-B	> 99 % NB: Some outages as a result of pre-alerted poor GPS geometry	Duplicated system >20,000 Hours Receiver only Dependence on GPS Duplicated receiver	Maturing. Operational in at least 1 State. SASP and OPLINK panels have agreed with proposed ADS-B separation standards. Procedures have been defined for PANS ATM Doc 4444 and are expected to be published soon.	Some avionics "bugs" identified.
Multilat	>99%	Duplicated system >20,000 Hours Requires multiple sites & multiple communication links Failure of 1 receiver has geography related impact on performance. However, assume that extra ground stations provided to support any one failure	Maturing. Operational in ASMGCS (airport surface) applications worldwide. Operational as WAM in at least 1 State. SASP has development of separation standards on the work program.	Some "teething" problems identified. Careful tuning of each site used to overcome these.
ADS-C	>99% Also constrained by service guarantee by service providers.	2,000 Hours (Low reliability due non duplicated system)	Mature. Used worldwide as FANS1A. Is not an "ICAO system". Yet to mature for ICAO/ATN variants.	FANS1A anomalies documented and managed by FANS1A Central reporting agencies (CRAs) on behalf of States in regions.

6.3 DATA PROVIDED BY EACH TECHNOLOGY

The following provides a brief overview of the information that may be received and processed by the relevant surveillance technologies

	No transponder	**Mode A/C transponder**	**Mode S transponder with DAPs**
Primary radar	Position, calculated velocity vector from these position reports	No data is able to be provided by this sensor	No data is able to be provided by this sensor
SSR	No data is able to be provided by this sensor	Position, flight level (barometric), 4 digit octal identity, calculated velocity vector	Position, flight level (barometric), 4 digit octal identity, calculated velocity vector
Mode S	No data is able to be provided by this sensor	Position, flight level (barometric), 4 digit octal identity, calculated velocity vector	Position, flight level (barometric), 4 digit octal identity, 24 bit unique code, selected altitude, Flight ID, Selected Altitude, Roll Angle, Track Angle Rate, Track Angle, Ground Speed, Magnetic Heading, Indicated Airspeed/Mach No, Vertical Rate, calculated velocity vector[16]
Mulitlat	No data is able to be provided by this sensor	Position, flight level (barometric), calculated altitude, 4 digit octal identity, calculated velocity vector	Position, flight level (barometric), 4 digit octal identity, 24 bit unique code, selected altitude, Flight ID, Selected Altitude, Roll Angle, Track Angle Rate, Track Angle, Ground Speed, Magnetic Heading, Indicated Airspeed/Mach No, Vertical Rate, calculated velocity vector

[16] Based on European Mode S mandate for Elementary & Enhanced surveillance. Additional data block have been defined in Mode S standards and could be used in the future.

ADS-B	ADS-B Requires the aircraft to be equipped with either : - A Mode S transponder capable of ADS-B message transmission (appropriate transponder product and software version), plus appropriate data to be fed to this transponder, typically a GNSS receiver or - A standalone ADS-B transmitter device (perhaps independent of the transponder) able to transmit ADS-B messages according to the standards or - A Mode C transponder able to transmit ADS-B messages according to the standards.
	If ADS-B equipped : Current aircraft : Position, flight level (barometric), position integrity, geometric altitude (GPS altitude), 24 bit unique code, Flight ID, velocity vector, vertical rate, emergency flags, aircraft type category. Fully compliant DO260A[17] will add a number of data fields.

ADS-C	ADS-C Requires the aircraft to be equipped with either a) The FANS1/A package. This includes processing, GPS, ACARS VHF and satellite datalinks b) An ICAO ATN ADS-C avionics package
	If ADS-C FANS1/A equipped : Position, altitude, flight ID, emergency flags, waypoint events, waypoint estimates, limited “intent data”, limited wind speed data If ADS-C FANS1/A equipped : There are currently no aircraft providing ATN ADS-C

[17] RTCA DO260 : Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)

6.4 COST

The cost to deploy and maintain surveillance systems is high. The total cost includes much more than the ground based electronic equipment itself. Consideration of the following points is required when examining the total cost of various systems.

6.4.1 Aircraft owner/operator costs

In comparing the total cost of surveillance systems, some consideration must be given to airborne equipment requirements, which may be considerable for some technologies.

The total lifecycle cost should be considered. The timing of transition to new avionics is governed by numerous factors including the expected life of the aircraft, the cost, the benefit that can be obtained, available products and mandatory avionics requirements.

In considering the various ground based surveillance technologies it can be noted that:

- Primary radar surveillance does not require avionics deployed in aircraft.
- Multilateration surveillance can operate with Mode C, Mode S or ADS-B avionics. It operates better when aircraft are Mode S or ADS-B equipped.
- Mode C based surveillance requires either Mode S or Mode C transponders on board aircraft.
- Mode S based surveillance requires Mode S transponders supporting Elementary and/or Enhanced surveillance parameters if the DAPs benefits are to be realised.
- ADS-B surveillance requires either
  - A suitable Mode S transponder (hardware/software), or
  - A mode C transponder with capability to transmit ADS-B messages, or
  - A standalone avionics package able to transmit ADS-B messages.
  - In addition it requires the transmitter to be connected to appropriate GNSS receiver (or equivalent performance position source)

The costs associated with any aircraft equipage program (for new production aircraft, as well as for retrofit) are highly variable and airframe dependent. Hundredfold cost variations to fit the same avionics to different aircraft types are not uncommon. Operating costs are also highly dependent on aircraft type, fleet size and nature of operation but include

- Engineering support costs
- Scheduled & unscheduled Maintenance
- Flight crew training costs
- Costs associated with aircraft simulator upgrades

For these reasons avionics costs associated with each surveillance technology will be very FIR (or ANSP) specific. However, the nature of the aviation industry (in particular cross FIR and international operations, fleet turnover and the prevalence of aircraft leasing) mean that it is impossible – and unhelpful – to attribute the total cost of avionics equipage to any one FIR, ANSP or surveillance system. It must be noted that some of the avionics required to support surveillance – in particular ADS-B and ADS-C – have other applications and hence benefits to operators.

The current status (2007) of avionics equipage is :

	Mode S	**Mode C**	**ADS-B**
International air transport	Almost all aircraft are equipped with Mode S; ACAS equipped aircraft have Mode S transponders. A large percentage of aircraft that operate in and transit Europe are also equipped with DAP capability	Almost all are equipped with Mode C capability Most new aircraft delivered in the last 5 to10 years are equipped with GPS and most of these have the capability to output HPL integrity data for ADS-B. This is particularly true in Asia Pacific region with its new fleets.	A large percentage of new aircraft manufactured in the last 2 years are equipped. Many legacy aircraft are being equipped at the same time as the European Mode S mandate is implemented.
Domestic major airline air transport	Almost all aircraft are equipped with Mode S; ACAS equipped aircraft have Mode S transponders	Almost all are equipped with Mode C capability. Many aircraft are equipped with GPS and most of these have the capability to output HPL integrity data for ADS-B	New aircraft from Boeing & Airbus are equipped. Many legacy aircraft are not equipped.
Regional aircraft	Many regional aircraft are equipped with Mode S	Almost all are equipped with Mode C capability Many aircraft are equipped with GPS but only some have the capability to output HPL integrity data for ADS-B	Very few are equipped with ADS-B capability because Regional Airliner OEMs have not embraced ADS-B
General aviation	Few general aviation aircraft are equipped with Mode S	Many are equipped with Mode C capability. Many aircraft are equipped with GPS but few with capability to output HPL integrity data for ADS-B	A few are equipped with ADS-B capability using a single GA product. There is insufficient choice in ADS-B products available today for this market.

Taking the above into account, it is very difficult to allocate a cost to equip with any avionics type. Clearly the transition to ADS-B equipage is the most significant and expensive of the alternatives in terms of aircraft equipage).

The APANPIRG meeting report of 2006 states that

"IATA noted that much of the business case is complicated by the problems of quantifying the cost of ADS-B avionics fitment by airlines. In this regard, IATA recommended that APANPIRG should simply assume that all aircraft will be equipped as a consequence of the worldwide move towards ADS-B OUT and Mode S Enhanced Surveillance."

6.4.2 ANSP costs

ANSP costs include:

- Equipment purchase
- Installation costs and system testing
- Project costs including planning, procurement activities etc
- Site costs including
  - land
  - environment impact statement preparation
  - power provision
  - UPS and batteries
  - airconditioning
  - roads
  - shelters
  - racks in which to install main and ancillary equipment
  - towers
  - fencing
  - land clearing
  - security
  - telecommunication lines
- Operating costs
  - Engineering support costs
  - Scheduled and unscheduled Maintenance
  - Power and airconditioning running costs
  - Telecommunication operating costs

Taking the above factors into account and using experience of the technologies to date, the cost of surveillance to support enroute and TMA airspace is shown in the following table.

This table assumes that the selected sites are **NOT** “Greenfield” sites and hence do not include land purchase, environmental clearance, shelter and road building costs.

The table does NOT include avionics costs.

	Major cost factors	**Cost for TMA (60NM radius) $ Australian**	**Cost for Enroute (200NM radius) $ Australian**
Primary radar	Site costs, capital cost, ongoing maintenance & management costs, large UPS & power supply especially for antenna. No avionics required.	$8M	$10-14M

	Major cost factors	**Cost for TMA (60NM radius) $ Australian**	**Cost for Enroute (200NM radius) $ Australian**
SSR	Site costs, capital cost, large UPS & power supply especially for antenna, ongoing maintenance & management costs. SSR Mode C avionics required. In some regions the majority are required to be Mode C equipped.	$6M	$6M
Mode S	Same as SSR. Most vendors offer ModeS radars as “standard” at a similar price to SSR. Mode S avionics required.. Air transport already have Mode S to support ACAS in most parts of the world.	$6M	$6M
ADS-B	Apart from avionics installation, major items are site related costs and ongoing telecommunication costs. ADS-B avionics fitment is not included in estimate here because of difficulty in attribution of cost especially for international aircraft where the fitment supports surveillance in all ADS-B capable FIRs/ANSPs. Major airframe manufacturers fit ADS-B in the factory. IATA has recommended at APANPIRG that APANPIRG members ignore fitment costs be ignored in business case development.	$380K	$380K
Mulitlat	Major items are site related costs and ongoing telecommunication costs. If the operational requirement does not demand coverage extended range coverage (eg say coverage is only required to 40 nautical miles) then multilateration is a stronger competitor. Ie: it may not be warranted paying the extra costs for long range performance provided by radar . Of course each individual case must be considered because the costs are highly dependent on the environment, cost and infrastructure in the country of deployment. Multilateration is a stronger competitor against radar when the required area of coverage is small. Use of Greenfield sites could dramatically increase costs due to development and possibly the number of sites required. Site development costs can easily exceed equipment costs. At least SSR Mode C avionics are required but Mode S avionics are required for best performance.	>$1-$3 M	$2M - $5M

	Major cost factors	**Cost for TMA (60NM radius) $ Australian**	**Cost for Enroute (200NM radius) $ Australian**
ADS-C	No sensor cost. Minimal setup cost for ANSP. Large cost of FANS1/A avionics and associated equipment for new aircraft (and very large for retrofit)..	N/A	N/A

Some further details are provided in **Appendix A**

7 ISSUES IN CHOICE OF SURVEILLANCE TECHNOLOGY

In the deployment of ATC surveillance technologies care is required to match the chosen technology to the operational need and environment. In some cases a clear choice will emerge for a particular State. In other cases a mixed solution may be best.

Some factors to consider are as follows :

7.1 COST

The cost of surveillance systems can be a major determinant of whether surveillance is deployed, and if it is deployed, which technology is chosen. In many States the availability of lower cost surveillance (compared to radar) has allowed surveillance to be provided in areas where surveillance was previously uneconomical.

In States where there is significant traffic, the operational need and the ability to use funds from airways charges will determine the deployment of surveillance.

The lowest cost surveillance to meet the particular operational needs in the particular environment will be chosen.

The issue of who bears the cost and who benefits also needs to be considered.

> For example : Safety benefits may be provided to the whole community. Efficiency benefits may be provided to the airlines and their customers. Costs of surveillance system delivery are usually borne by the ANSP and sometimes passed to airspace users in charges. If new avionics are needed to be fitted to aircraft consideration of who pays for that equipment is required. In some cases the ANSP may be able to subsidise some segments of the industry to equip their fleet. In other cases airlines and aircraft owners bear the entire equipment cost.

Cost is further examined in Paragraph 6.4 as well as in Appendix 1.

7.2 MARKET SEGMENT MIX

The nature of the aircraft to be subject to surveillance is a determinant of the best technology to use

- non cooperative aircraft (targets) can only be detected by primary radar

- cooperative air transport aircraft can be expected to have Mode S or ADS-B equipment and hence ADS-B or SSR/Mode S may be the most appropriate technology

- If general aviation aircraft are to be detected, SSR or ADS-B avionics may need to be installed in those aircraft. This issue can become problematic if a large general aviation fleet operates in the State. If the general aviation fleet is small, it may be cost effective to use ADS-B and pay to fit the small number of aircraft with ADS-B.

In some States the market mix, and which part of the market would pay for avionics fitment is a critical issue.

Equipage of military aircraft can be problematic. However, each State needs to consider the role of the ANSP in the provision of surveillance facilities to support the military.

7.3 Airspace segregation

In some States, airspace can be segregated so that equipped aircraft are able to access defined airspace whilst non equipped aircraft are permitted to operate in different airspace.

7.4 GEOGRAPHY

The decision making needs to consider the obstacles to radio propagation for all relevant technologies. In some cases the geography may favour radar, in other cases it may favour multilateration.

SSR/Mode S radar has a long range capability from a single site due to its high gain antenna. It is well tailored for upper airspace detection up to 250 NM if the geographical location is free from close obstacles.

Multilateration is particularly effective in areas of constrained line of sight situations, due to its ability and adaptability to fill smaller specific area of surveillance. Ie: in places where the benefits of long range radar performance cannot be realised.

The choice of ADS-B is not really affected by geographic considerations because it achieves coverage as good as either multilateration or radar from fewer sites.

In the case of very remote or oceanic regions, there may be no choice apart from ADS-C.

7.5 EXISTING TELECOMMUNICATIONS INFRASTRUCTURE

In cases where there is comprehensive telecommunications infrastructure it will be more easy (and hence less expensive) to install ADS-B and multilateration ground station sites. When telecommunications infrastructure does not exist it can be costly to establish.

7.6 EXISTING SURVEILLANCE & ATC AUTOMATION INFRASTRUCTURE

There are significant benefits of a homogeneous surveillance infrastructure. If one technology (and one vendor) is chosen there are savings in engineering support, training, documentation management and system planning. This can impact on the choice to support additional or new technologies.

The ATC system used by a State may need to be upgraded to support any or all of the technologies listed in this paper. The cost of performing these upgrades needs to be considered. There may also be lower overall costs if the ATC automation system only needs to support the one surveillance technology, although there are operational advantages if the ATC system can support multiple surveillance technologies.

Some ATC systems and associated operational procedures can support ADS-B use, including delivery of separation services, when there is partial aircraft ADS-B equipage. Typically such systems support the graphical display of ADS-B, radar and flight plan tracks.

Other ATC systems and/or operational procedures require complete equipage for ADS-B use to be viable.

7.7 REQUIRED FUNCTIONALITY

Depending on the State’s functional needs, different technologies may be chosen. Each technology has different functional capabilities beyond detection and provision of position and altitude data. Eg: Mode S is able to provide readout of selected altitude; some multilateration systems are able to provide a precise position report independent of GPS; ADS-B is able to provide a high update of high accuracy velocity vector.

Some States require the use of primary radars to support Defence needs rather than Air Traffic Management requirements.

7.8 ABILITY TO MANDATE EQUIPAGE

The choice of SSR, Mode S, multilateration or ADS-B may depend on the State's ability to mandate that aircraft operating in the airspace must be equipped with the required avionics. The State's ability to issue a mandate may depend on many factors.

7.9 AIRSPACE CAPACITY REQUIREMENTS

The capacity of airspace can be increased through the provision of high quality surveillance. This is achieved through the application of reduced separation standards.

At this time ICAO recognises that 3 nautical mile and 5 nautical mile separation standards may be used using primary radar, SSR, and Mode S radar. Changes to ICAO documents are about to be published recognising ADS-B use to support 5 nautical mile separation standards. SASP is working on proposals to allow 3 nautical mile separation standards using ADS-B and also on the use of multilateration to support both 3 and 5 nautical mile separation standards.

ADS-C is unlikely to ever support 3 and 5 nautical mile separation standards. However it is used to support 30/30 and 50/50 nautical mile procedures used in some regions.

7.10 STRATEGIC NATURE OF TRANSITION TO ADS-B

It is widely recognised that ADS-B will eventually become the preferred surveillance technology worldwide, although this will take time.

ICAO, at ANC11 resolved that

"*ICAO and States recognize ADS-B as an enabler of the global ATM operational concept bringing substantial safety and capacity benefits*"

Therefore decision making by States will consider the long term enabling of ADS-B balanced against short term requirements.

For some States it may be too difficult to fit enough aircraft with ADS-B avionics and radar or multilateration may be necessary until ADS-B fitment occurs.

Some States may view the benefits of ADS-B as so large that strategically they move to this technology as soon as possible. Typically this is because in the long term, once aircraft are equipped, ADS-B has strong performance in numerous areas :

- lowest cost of additional surveillance coverage
- **allows air-air surveillance benefits**
- allows low cost surveillance for 3rd party applications (flying schools, Search & Rescue…)

The issue of enabling air-air surveillance is significant since it has the potential to change the way in which ATM is performed. The ability for aircraft pilots to electronically "see" nearby aircraft changes the risks encountered in certain airspace compared to today's practice where pilots use the human eye. ADS-B technology has the potential to significantly influence airspace classification, ATC procedures and system efficiency.

For the airline community, the future air-air applications promise increased capacity, functionality, reduced cost. Some see that they will only be able to cope with future air traffic needs by using aircraft centric – network enabled aircraft. ADS-B is a key component of such a vision. The airline UPS is pioneering considerable work in this area along with the work of the FAA-Eurocontrol Requirements Focus Group.

It is interesting to review the views of a major ANSP customer IATA. The meeting report of APANPIRG 2006 states :

> *"IATA noted that much of the business case is complicated by the problems of quantifying the cost of ADS-B avionics fitment by airlines. In this regard, IATA recommended that APANPIRG should simply assume that all aircraft will be equipped as a consequence of the worldwide move towards ADS-B OUT and Mode S Enhanced Surveillance."*
>
> *It was also informed that as indicated in its CNS/ATM road map published in 2005, IATA supported to mandate the use of ADS-B OUT from 2010 and simultaneously avoid the installation of new or replacement ATC radar facilities where there are demonstrated operational and cost benefits"*

7.11 VERIFICATION OF ADS-B

Some commentators have promoted the use of multilateration as a means of ensuring the validity of received ADS-B data. Technically this is possible. Radar could also be used to verify the integrity of ADS-B data. If radar and/or multilateration in **all** areas of ADS-B coverage is required, then the most advantages of ADS-B are significantly diminished and the ADS-B deployment becomes unlikely. Verification could perhaps be achieved at major airport hubs aimed at detecting non compliant avionics and triggering corrective action – perhaps in the same manner as Mode S and RVSM monitoring stations.

Periodic verification could perhaps be performed by ramp check units in the same manner as SSR transponder verification.

It must be recognised that integrity monitoring of ADS-B positional data is performed by the GPS integrity monitoring function within the aircraft avionics. This is the same monitoring function used to ensure that aircraft may safely conduct non precision landings with GPS – and associated "separation" from terrain.

The only envisaged integrity check for ADS-B air to air applications will be to monitor the ADS-B integrity data transmitted with the ADS-B message.

Regulations can require that aircraft owners provide high quality ADS-B data together with the appropriate integrity qualifiers. In the same way that airworthiness authorities ensure that Mode C data is trustworthy, authorities need to ensure that ADS-B data is trustworthy. Verification of ADS-B data using radar or multilateration is neither required nor justified in most States.

7.12 ADS-B MULTILATERATION MIXED SOLUTION

In some environments a mixed solution may be appropriate whereby multilateration is used to provide coverage in a "central" area, typically at an airport, for both equipped and non ADS-B equipped aircraft. In addition, each multilateration ground station supports ADS-B only coverage to a larger coverage volume surrounding the "central" area.

In this environment. the central area could be a Terminal Manoeuvring Area (TMA) where both airlines and general aviation co-exist at lower flight levels. Outside this area, services are only provided to ADS-B equipped aircraft outside coverage of multilateration.

A number of existing ASMGCS systems using multilateration are able to support this mixed technology solution.

8 SURVEILLANCE INTEGRATION

There are a number of ways that surveillance data from different sensors can be incorporated into an ATC system. Typically these can be :

- A separate display for each technology, although this approach is not desireable it has been used in a number of cases for demonstration or to build operational experience before further integration is performed.

- A priority system whereby one technology (or data from a particular site) is displayed and other data sources discarded whilst the priority source provides useable data

- A fully fused position calculation whereby data from different technologies are used to calculate a best estimate of aircraft position,

All solutions need to consider how best to present the data including consideration of the following :

- What position symbols will be presented?

- Will different symbols be used to indicate data quality or data source

- Will the data be used for situational awareness or for execution of ATC separation services?
- Will a prediction system advise users of potential radar, multilateration or ADS-B outages
- Will coasting of positional data be used? Will “smoothed” data be presented?
- What update rate is displayed to the user ? Is the update synchronised to a particular sensor or is independent of any sensor input?
- How is alignment maintained and monitored between various position sensors?
- Does the controller have the ability to select/deselect a sensor or technology?

9 SURVEILLANCE TECHNOLOGY SELECTION

This section outlines some indicative cases where the environment may suggest particular solutions. It needs to be clear that the total environment including available funding, politics, and numerous other factors also impact on the choice of technology, therefore the solutions presented can only be indicative :

	Solution	Reason
State has a large fleet equipped with Mode C ATC transponders and surveillance is needed in the near term. Intruder protection not required	Multilat (WAM) with ADS-B capability to support future ADS-B equipage	Near term requirement makes it difficult to fit many aircraft with ADS-B
State requires surveillance on a busy airport surface. Detection of vehicles is also required	Multilat and primary radar. ADS-B as part of multilat could used to detect & identify vehicles some of which are itinerant	Effective multilat surveillance with good accuracy and provides identity. Primary radar used for vehicles without transmitters
State has requirement for surveillance of air transport aircraft (small GA fleet) and has an ATC system able to support ADS-B mixed equipage.	ADS-B only with optional fitment.	Percentage of air transport aircraft that are equipped is rising. Could encourage ADS-B equipage by giving improved services & priority to equipped aircraft. Allows non equipped aircraft to operate. ANSP could purchase ADS-B avionics for small fleet.
State has requirement for surveillance of air transport aircraft (minimal GA aircraft) and does not have an ATC system able to support ADS-B mixed equipage.	ADS-B only but equipage mandatory in designated airspace	Percentage of air transport aircraft that are equipped is rising. Can mandate ADS-B in relevant airspace to provide surveillance at minimum cost to ANSP
State provides ATM services to a large number of operators that are unable to fit ADS-B, but already have SSR transponders – surveillance is required enroute	SSR only sensors	Cost of equipping a large number of air transport carriers may be cost prohibitive to Industry

Surveillance needed in relatively small geographical area – without concern of non transponder equipped intruder aircraft, but Air transport also operate into area with ADS-B. GA aircraft that may operate into area not able to be fitted with ADS-B	Multilat (WAM) with ADS-B capability	Multilat can serve the small area with the benefits of ADS-B delivered for air transport operating in a larger area of coverage.
High density airport with need for airspace intruder protection (ie: to detect violations of controller airspace)	Primary & co-mounted Mode S radar	Primary radar for intruder protection. Mode S to maximise resolution and position display performance and to maximise benefits of investment in SSR – even if ATC system cannot yet process Mode S DAPS
Surveillance needed for small GA domestic fleet plus some international carriers. Limited funds available.	ADS-B only but perhaps subsidise fitment of GA if required. Mandate ADS-B equipage	Subsidy cost may be less than cost of multilat or radar
State requires surveillance for a very large airspace and has minimal funds available and there is no surveillance today	ADS-B only	Most effective solution.
State requires surveillance over an ocean without islands for radar or ADS-B stations.	ADS-C	Only alternative
State requires surveillance at an FIR boundary but has no site for radar or ADS-B – and has limited capital funds – typically for FIR boundary safety.	Service provider provision of ADS-B surveillance or If adjacent FIR has surveillance negotiate an agreement for data sharing	Cost effective surveillance without capital cost
State has coverage requirements that are complicated by terrain restrictions that would have previously required multiple radars to solve – and has good physical and telecommunications infrastructure	WAM multilat with ADS-B support	Cost of site preparation and installation and support of radars would be cost prohibitive. Multilat and/or ADS-B offers the only cost effective solution to meet the requirement. Good infrastructure allows multilateration to be deployed cost effectively.

CONCLUSION

The optimum choice of surveillance technology depends on the operational requirements and environment.

As recognised by ICAO at ANC11, ADS-B is a technology of the future. States will work towards its deployment but will consider alternative technology, when cost effective.

ADS-B is the only technology which supports future applications of air to air surveillance. Some states see this as a decisive strategic factor in moving towards ADS-B.

1 APPENDIX A : Cost comparison multilateration and radar

The following examines the costs of radar and multilateration in two scenarios; one where surveillance coverage is needed in an area of radius of 200 NM and another when coverage is needed for a 40 MN radius.

Case 1 : Area of 200 NM radius

In this short analysis it is **assumed** that only 9 multilateration ground stations are required to achieve a coverage of 200 NM in accord with a NLR report[18]

The NLR report presented a 9 ground station multilateration solution designed to provide 200NM coverage (125,663 sq NM) to approximate a 250 NM (196,349 sq NM) coverage of a radar.

It is far from clear whether a realistic multilateration system can be built to support a 200 NM radius area with 9 ground stations. Such a "paper design" does not examine the issues of terrain, site availability and product availability with high power interrogators. Of course the operational coverage needs would also need to be considered, and it is likely that coverage at lower flight levels would bring the need for additional multilateration sites.

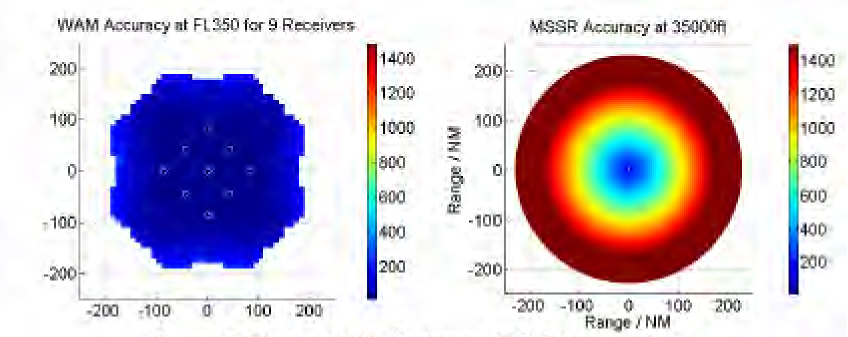

Figure 27 Extended WAM System vs. MSSR (accuracy in ft)

Figure 27 of NLR report

This analysis has been conducted using very approximate estimates of costs.

	Multilat system Assume 9 sites (4 tx/rx, 5 rx)	Radar
Equipment cost	$1.05M	$6M
Tower and antenna mounting[19]	$0.36M	included
Power supply and backup if required	$180K	included
Telecommunications establishment	$90K	$10K

18 National Aerospace Laboratory NLR report prepared for Eurocontrol : NLR-CR-2004-472 "Wide Area Multilateration Report on EATMP TRS 131/04 Version 1.1 August 2005 available at http://www.eurocontrol.int/surveillance/gallery/content/public/documents/WAM_study_report_1_1.pdf Used with permission of Eurocontrol.

19 Tower expected to achieve maximum line of sight and minimise number of sites

Telecommunications ongoing costs ($15K/pa = assume 10 years)	$1.35M	$150K
Installation activity (planning, travel, testing)	$90K	$20K
TOTALS	**$3,120K**	**$6,190K**
For maximum range radius of	200 NM	250NM

If one assumes that an enroute WAM is based on a set of 9 ground stations using existing sites (as described above) then the cost per square nautical mile of coverage is

C(mlat) = $3,120/125,663 = $24.82 per square NM

C(radar) = $6,190,000 / 196,349 = $31.52 per square NM

It must be remembered that these estimates are highly dependent on the environment, cost and infrastructure in the country of deployment. However, these figures indicate that multilat could approach or even exceed the cost of radar in some environments.

If "greenfield sites"[20] are assumed the comparison moves in favour of radar.

	Multilat system(9*)	Radar
Land purchase or lease	$90K	
Environmental impact study/ statement/clearances	$720K	$200K
Shelters or building including fencing & security	$450K	$50K
New road cost if required (very site dependent).	9 * M$x	M$x
TOTAL	**$1260K + road**	**$250K + road**

[20] sites that do not have a building, road, shelter or other infrastructure

Case 2 : Area of 200 NM radius

If the coverage requirement is for a terminal area of say 40 Nautical miles radius then less multilateration ground stations would be required. Lower power interrogation units would be required.

Assuming a more realistic 7 sites (in a location without terrain issues) and the analysis could look like

	Multilat system Assume 7 sites (3 tx/rx, 4 rx)	Radar
Equipment cost	$0.86M	$6M
Tower and antenna mounting[21]	$0.28M	included
Power supply and backup if required	$140K	included
Telecommunications establishment	$70K	$10K
Telecommunications ongoing costs ($15K/pa = assume 10 years)	$1.05M	$150K
Installation activity (planning, travel, testing)	$70K	$20K
TOTALS	**$2,426K**	**$6,190K**
For maximum range radius of	40 NM	250NM

In this case, if the operational requirement does not demand coverage beyond 40 nautical miles it does not warrant paying the extra costs for a radar (even if it provides 250 NM.

Of course each individual case must be considered because the costs are highly dependent on the environment, cost and infrastructure in the country of deployment. Multilateration is a stronger competitor against radar when the required area of coverage is small.

21 Tower expected to achieve maximum line of sight and minimise number of sites

THE SECOND AMENDMENT TO THE AIGD

(Insert new subparagraph 5.8.2 into the AIGD as follows)

5.8.2 It should be noted that independent operations of Mode S transponder and ADS-B may not be possible in all aircraft (e.g. where ADS-B is solely provided by 1090 MHz extended squitter emitted from the transponder). Additionally, some desirable but optional features of ADS-B transmitters may not be fitted in some aircraft. Controller training on this issue, as it relates to the following examples of radio telephony and/or CPDLC phraseology is recommended.

5.8.2.1 STOP ADSB TRANSMISSION or STOP SQUAWK

Issue: In most commercial aircraft a common "transponder control head" is used for SSR transponder, ACAS and ADS-B functionality. In this case, a pilot who complies with the instruction to stop operation of one system will also need to stop operation of the other systems – resulting in a loss of surveillance not intended or expected by the controller.

ATC need to be aware that an instruction to "Stop ADS-B Transmission" may require the pilot to switch off their transponder that will then stop all other functions associated with the transponder operations (such as ACARs etc). Pilots need to be aware of their aircraft's equipment limitations, the consequences of complying with this ATC instruction, and be aware of their company policy in regard to this. As with any ATC instruction issued, the pilot should advise ATC if they are unable to comply.

Recommendation: It is recommended that the concatenated phrases STOP ADSB TRANSMISSION, SQUAWK (code) ONLY or STOP SQUAWK, TRANSMIT ADSB ONLY are used. It is recommended that controller training highlights the possible consequences of **issuing** these instructions and that pilot training highlights the consequences of **complying** with this instruction. It is also recommended that aircraft operators have a clearly stated policy on procedures for this situation. Should a pilot respond with UNABLE then the controller should consider alternative solutions to the problem that do not remove the safety defences of the other surveillance technologies. This might include manual changes to flight data, coordination with other controllers and/or change of assigned codes or callsigns.

5.8.2.2 STOP ADSB ALTITUDE TRANSMISSION [WRONG INDICATION or reason] and TRANSMIT ADSB ALTITUDE

Issue: Some aircraft may not have separate control of ADSB altitude transmission. In such cases compliance with the instruction may require the pilot to stop transmission of all ADSB data – resulting in a loss of surveillance not intended or expected by the controller.

Recommendation: It is recommended that, should the pilot respond with UNABLE, the controller should consider alternative solutions to the problem that do not remove the safety defences of other surveillance data. This might include a procedure that continues the display of incorrect level information but uses pilot reported levels with manual changes to flight data and coordination with other controllers.

5.8.2.3 TRANSMIT ADSB IDENT

Issue: Some aircraft may not be capable or the ADSB SPI IDENT control may be shared with the SSR SPI IDENT function.

Recommendation: It is recommended that controllers are made aware that some pilots are unable to comply with this instruction. An alternative means of identification that does not rely on the ADSB SPI IDENT function should be used.

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BASELINE ADS-B SERVICE PERFORMANCE PARAMETERS

The following table provides guidelines for various performance requirements of ADS-B Category (Tier) 1, 2 or 3 services that States may consider when acquisition of an ADS-B managed service agreement with a service provider:

Service Parameter	**Category 1 (Tier 1)** **5nm separation capable commensurate with Radars (separation/vectoring/high performance with reliability, integrity & latency)**	**Category 2 (Tier 2)** **Situational awareness similar to ADS-C (safety net alerts, SAR, supports procedural separation without voice, not 5nm separation)**	**Category 3 (Tier 3)** **Position Reporting with Enhanced Flight Operation**
Aircraft Updates	1 second < Rate < 5 seconds as Operationally required	1 second < Rate < 20 seconds as Operationally required	1 second < Rate < 60 seconds as Operationally required
Network Latency	95%: < 2 seconds of ground-station output	95%: < 15 seconds of ground-station output	95%: < 60 seconds of ground-station output
Reliability 1	2 autonomous ground-stations including antenna, each providing data, no common point of failure	1 unduplicated ground-station including antenna	1 unduplicated ground-station including antenna
Reliability 2 - MTBF	Each ground-station including antenna to have MTBF >10,000 hrs	Each ground-station including antenna to have MTBF >10,000 hrs	Each ground-station including antenna to have MTBF >10,000 hrs
Reliability – Communications Infrastructure	Completely duplicated, no common point of failure	Unduplicated, MTBF > 400 hrs	Unduplicated, MTBF > 200 hrs
Reliability – Total ADS-B Service	Total Service MTBF > 50,000 hrs	Total Service MTBF > 400 hrs	Total Service MTBF > 200 hrs
Availability – Total ADS-B Service	Total Service Availability > .999	Total Service Availability > .95	Total Service Availability > .90
Integrity – Ground Station	Site monitor, including GPS RAIM, monitored by RCMS	Site monitor, including GPS RAIM, monitored by RCMS	Site monitor, including GPS RAIM, monitored by RCMS
Integrity – Data Communications & Processing	All systems up to ATM system, errors < 1 x 10E-6	All systems up to ATM system, errors < 1 x 10E-6	All systems up to ATM system, errors < 1 x 10E-6

The choice of category (tier) could be based upon a number of factors including the following,

a) The desired service
b) The available budget
c) The available ATC automation system & its capabilities and/or interim display systems
d) ATC training and ratings
e) Availability of appropriately tailored ATC procedures

States could initially choose one level and transition to another at a later time. For example, Category (Tier) 2 could be used to add additional safety nets/situational awareness and gain operational experience during the initial stage, moving later to a full separation service using Category (Tier) 1.

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INTERNATONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

Multilateration (MLAT) Concept of Use

Version 1.0 – September 2007

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List of Acronyms

ADS-B	automatic dependent surveillance — broadcast
ADS-C	automatic dependent surveillance — contract (also known as
	ADS or ADS-A)
ADSP	ADS Panel (of ICAO)
AIGD	ADS-B Implementation and Operations Guidance Document
	Trade name for Rannoch Multilateration
AIRSCENE	aeronautical information services
AIS	Asia-Pacific Air Navigation Planning and Implementation
APANPIRG	Regional Group
	area proximity warning
APW	airborne separation assistance system
ASAS	airport surface detection equipment
ASDE	airspace management
ASM	air traffic control
ATC	air traffic flow management
ATFM	air traffic management
ATM	Air Traffic Management Operational Concept Panel
ATMCP	controller access parameters
CAP	cockpit display of traffic information
CDTI	communications, navigation and surveillance
CNS	controller-pilot data link communications
CPDLC	data link initiation capability
DLIC	emergency locator transmitter
ELT	estimated time of arrival
ETA	future air navigation systems
FANS	flow and capacity management
F&CM	flight information service — broadcast
FIS-B	flight management system
FMS	global navigation satellite system
GNSS	ground proximity warning
GPW	high frequency
HF	human-machine interface
HMI	initial approach fix
IAF	International Civil Aviation Organization
ICAO	instrument flight rules
IFR	Multistatic Dependent Surveillance: Sensis trade name for
MDS	multilateration
	Multilateration
MLAT	minimum safe altitude warning
MSAW	medium term conflict detection
MTCD	ICAO's Operational Data Link Panel
OPLINKP	primary surveillance radar
PSR	regular passenger transport
RPT	search and rescue
SAR	Standards and Recommended Practices
SARPs	ICAO's separation and airspace safety panel
SASP	surface movement control
SMC	secondary surveillance radar
SSR	short term conflict alert
STCA	Traffic alert and collision avoidance system
TCAS	traffic information service — broadcast

TIS-B VFR VMC WAM	visual flight rules visual meteorological conditions Wide Area Multilateration

Foreword

1.1. This document presents the Multilateration Surveillance (MLAT) concept of use and therefore provides a description of MLAT systems and their detailed role as an application enabling important changes to the future communications, navigation, and surveillance/air traffic management (CNS/ATM) system.

1.2. The description of the role of MLAT takes into account the heterogeneous and evolving situation with respect to the available ground infrastructure, aircraft capabilities, airspace regimes, the coincidence with Automatic Dependent Surveillance – Broadcast (ADS-B) systems, and interface with legacy surveillance systems.

1.3. Wide Area Multilateration (WAM) implementations are an opportunity to provide useful ATC surveillance where it is required and concurrently introduce ADS-B for partial use. This forms a graduated transition from the current global environments to a future ADS-B based system.

1.4. The MLAT concept of use is described to show potential use in the wide area and airport surface operations, and that it is able to be considered both as an independent system and as complementary to other enablers such as secondary surveillance radar (SSR), SSR Mode S, ADS-B or ADS-C.

1.5 The impacts on operational and organizational levels arising from the introduction of MLAT systems is noted for consideration.

Glossary of Terms

In this document:

ADS-B IN means the reception of ADS-B position reports by an aircraft.

ADS-B OUT means the transmission of ADS-B position reports.

Surveillance System means an airborne or ground system used for monitoring the positions of aircraft and other objects for the purpose of air traffic management.

Chapter 1. Introduction

1.1. Purpose and scope

1.1.1. The purpose of this document is to develop a concept of use for MLAT. This technology is being developed, tested and is also used operationally in several areas of the world. However, international standards to incorporate MLAT into the future global CNS/ATM system have not yet been completely developed. This document is a step in this ICAO process.

1.1.2 The work to develop SARPs and guidance material for ADS-B was based upon a concept of use for the technology, as agreed by the 11th Air Navigation Conference in 2003. Since that time a major conceptual change has occurred with the term "radar" now being replaced in many ICAO documents with the term "ATS Surveillance System" and an associated performance-based definition; a recognition that ADS-B and other technologies can provide 'radar-like' services.

1.1.3 APANPIRG has chosen to follow a similar procedure to that successfully used for ADS-B; to develop a Concept of Use so observers and participants have a common understanding, and then to update the ADS-B Implementation and Operational Guidelines Document (AIGD) to include MLAT. The scope of this document is restricted to the concept of use portion of the task. It does not contain specific operational requirements, although its contents will lead naturally to the development of operational practices for MLAT.

1.2. Background

1.2.1. In the early 1990's, ICAO approved the concept of the Future Air Navigation System (FANS) based on satellite and datalink technology, which later became known as CNS/ATM. It was recognised that the traditional ATC surveillance system has limitations that constrained its capabilities in the existing and future ATM environment.

The limitations identified include the following:

- *limited or no conventional surveillance* - including non-equipped continental areas, low altitudes, non-continental areas, surface movements, silence cones, blind areas, antenna screening, etc. In some cases (e.g. oceanic areas), this will result in the need for procedural control, using voice position reports;

- *electro-mechanical rotation of the classical radar antennas*, not only with high power demand and RF output, but also inefficient scanning periods and limited ability to adapt the reporting rate to suit ATC needs.
  (Note: E-SCAN antennas may offer an alternative in this case);

- *radar garbling, fruit and splitting*;

- *unavailability of aircraft derived data*, beyond the Mode A/C identification and altitude data;

- *non-homogeneous operation*, caused by the current existence of a diversity of systems with different performance and capabilities;

- increasingly some regions have a *shortage of Mode A codes* (a maximum of 4096 available) requiring frequent changes of code during the flight or duplicate use which can create identification ambiguities;

- *lack of capability to fully support future airborne situation awareness* applications, because the corresponding surveillance data are not available to the aircrew; and

- *lack of capability to fully support airport surface surveillance* applications.

1.2.2. Due to constraints like these and to a large extent driven by cost, the necessary levels of capacity, flexibility and efficiency required to meet the future predicted air traffic growth, will not be met by the traditional surveillance systems alone. Various surveillance technologies have been developed to address these limitations. These include Mode S secondary surveillance radar (SSR) with enhanced services, ADS-contract (ADS-C), ADS-broadcast (ADS-B), and Multilateration (MLAT).

1.3. Concept overview

1.3.1. ICAO Global ATM Operational Concept (Doc 9854) describes the services that will be required to operate the global air traffic system up to and beyond 2025. The operational concept addresses what is needed to increase user flexibility and maximize operating efficiencies in order to increase system capacity and improve safety levels in the future air traffic management system. The extensive work which has taken place or is currently underway has convinced ICAO that ADS-B functionality has the potential to be one of the key elements necessary in achieving these operational concept goals.

1.3.2. Early implementations of ADS-B have been supported by the developed ICAO standards for airborne equipment and for ATC separation. Where ADS-B OUT performance is readily achievable for the majority of aircraft, the benefits of this surveillance are quickly achieved. MLAT is a related alternative technology that will suit many States' surveillance needs for the medium term. The receipt and processing of ADS-B as part of an MLAT system encourages progressive installation of ADS-B avionics and thereby increases the benefits achievable with ADS-B.

1.3.3. The ADS-B Concept of Use document describes the role of ADS-B as one of the enablers of this future global CNS/ATM system. This MLAT Concept of Use is supplementary to that document, indicating the place of Multilateration usage.

1.3.4. The description of MLAT in this context is addressed in Chapter 2. It includes functionality, the role of MLAT and ADS-B in ATM, operational improvements, and typical applications. The applications can support all phases of flight gate-to-gate.
Chapter 4 addresses important issues for consideration, and Chapter 5 addresses implementation considerations for States.

1.3.5. During the development of the MLAT concept of use, considerations were made for other co-existing enablers (*inter-alia* ADS-B, ADS-C, TIS-B and CPDLC) in order to identify their complementary roles in the various operational scenarios.

1.3.6. The overall objective is to develop a common understanding of terms, definitions and possible uses of MLAT in the future environment. A secondary objective is to do this early enough in the various stages of development to assist efforts to influence and facilitate that development.

Chapter 2. Concept for Surveillance Using Multilateration

2.1. General

2.1.1 Surveillance is used in civil aviation for many purposes, including ATM, weather reporting, terrain avoidance, and search and rescue. A variety of technologies are used to provide surveillance data for ATM, but for full independence (of the targets under surveillance - which may include aircraft, vehicles and a variety of other “traffic”) the techniques available are visual acquisition, primary surveillance radar (PSR), and millimetric PSR (for debris, animals, birds).

2.1.2 All other techniques, including MLAT, SSR, ADS-C, ADS-B, CPDLC and voice position reporting, require varying degrees of cooperation from the target and the carriage of serviceable equipment to facilitate the exchange of data. For example, both voice and CPDLC position reporting mandate the use of specific communication equipment and are “dependent” on the 4-D navigation data determined by the avionics.

2.1.3 Multilateration is a co-operative system also, but one which can utilise data received from an aircraft that may be transmitted in response to different technologies. The minimum level of avionics to enable Multilateration with interrogation is a Mode A/C transponder. SSR Mode S or ADS-B avionics will enhance the performance of the system and may remove the need for interrogation.

2.1.4 While ADS-B transmissions contain the position data and may be received directly by other aircraft, MLAT surveillance data is processed by the ground system and typically provided only to an ATS facility, although rebroadcast to ADS-B equipped aircraft within a TIS-B service volume is potentially possible.

2.2. MLAT functionality

2.2.1 MLAT is a surveillance application that accurately establishes the position of transmissions, matches any identity data (octal code, aircraft address or flight identification) that is part of the transmission and sends it to the ATM system

2.2.2 Like SSR, MLAT is considered to be a co-operative surveillance technique, combining a dependence on target-derived data for identification and altitude with ground based calculation of position. MLAT can achieve a higher update rate than a typical rotating radar, determined by the intervals between aircraft transmissions (responses).

2.2.3 An MLAT system consists of the following components:

- A transmitting subsystem that includes interrogation message generation and transmission function;
- An optional Intelligent Interrogation process that determines whether an MLAT interrogation is required (in an area being interrogated by TCAS and SSR systems)
- A receiving antenna array subsystem that receives the transmissions from the target and timestamps receipt at each antenna; and
- A central processor that calculates and outputs the MLAT (and ADS-B) tracks.

Note - Having an interrogation transmitter ensures regularity of responses from the target aircraft/vehicle. The target aircraft/vehicle/obstacle must have a subsystem that will respond to an interrogation OR is automatically generating a transmission on the 1090MHz frequency.

2.2.4. The fitment of transponders in target aircraft or vehicles is essential for SSR Mode A/C/S radar, Multilateration, and ADS-B systems. The types can be summarised as follows:

2.2.4.1. Mode A/C Transponder - needs interrogation from radar, a multilat System, or TCAS. Special processing is used to manage matching of individual replies when received at multiple ground stations.

2.2.4.2. Mode S transponder - transmits DF11 download format automatically without radar interrogation and allows unique matching of messages received at all ground stations. Mode S provides error free mode C data.

2.2.4.3. ADS-B transmitter - transmits DF17/18 download formats automatically without radar interrogation and allows unique matching of messages received at all ground stations. Mode S provides error free mode C data

2.2.5. The airborne sources of the position, navigation or intent data in ADS-B and Mode S transmissions are not considered to be part of the MLAT system. Mode A/C transponder standards are the minimum applicable for MLAT surveillance.

2.3 The role of MLAT in Air Traffic Management (ATM)

2.3.1 ATM is described in the ICAO Global ATM operational Concept (Doc 9854) as the dynamic, integrated management of air traffic and airspace in a safe, economical and efficient manner through the provision of facilities and seamless services in collaboration with all parties. The operational concept also describes a system that provides ATM through the collaborative integration of humans, information, technology, facilities and services, supported by air, ground and/or space-based communications, navigation and surveillance.

2.3.2 This operational concept identifies seven interdependent components of the future ATM system. They comprise:

a) airspace organization and management;
b) aerodrome operations;
c) demand and capacity balancing;
d) traffic synchronization;
e) conflict management;
f) airspace user operations; and
g) ATM service delivery management.

2.3.3 Inherent to this concept are the characteristics of scalability and adaptability, according to the specific needs and operational environment of each State and region. MLAT shares these characteristics in that specific applications of the technology may be implemented according to need.

2.3.4 MLAT is an enabling technology that will enhance the provision of ATM in a variety of applications, from “radar-like” air traffic control purposes to enhanced situational awareness of surface movements. MLAT offers most advantages in situations where other surveillance systems (eg radar) are not available. It can also be combined with other surveillance systems, such as radar and ADS-B, to improve the total surveillance picture.

2.3.5 MLAT applications will have a direct effect upon aerodrome operations, traffic synchronization, airspace user operations, and conflict management. These effects will then influence the nature of airspace organization and management, demand and capacity balancing, and ATM service delivery management.

2.4. ATM improvements and benefits

2.4.1. MLAT applications, particularly when combined with ADS-B, are expected to provide important operational improvements by addressing some of the limitations of the traditional radar surveillance system, optimize the controller workload and provide benefits in the areas of safety, capacity, efficiency and environmental impact, thus contributing to the overall CNS/ATM objectives. These benefits include the following:

a) low cost extension of the surveillance coverage for low altitudes (below existing radar coverage) and areas where no radar coverage currently exists, leading to more efficient use of airspace;

b) enabling airports to obtain surface and local surveillance including general aviation and military operations;

c) use of aircraft-derived data in a variety of systems e.g. ground-based conflict alert, minimum safe altitude warning, danger area proximity warning, automated support tools, surveillance data processing and distribution.

d) increasing airport safety and capacity, especially under low visibility conditions, by providing airport surface surveillance and, at the same time, protecting against runway incursions by aircraft and vehicles.

e) changes to airspace sectorization and route structure resulting from improvedsurveillance should provide more efficient routing;

f) reduced infrastructure costs in airspace in which MLAT coverage is provided. It may be possible to decommission some radar equipment. Where multiple surveillance coverage is presently required, optimization of the surveillance infrastructure should be achieved by the implementation of the most efficient mix of radar sensors, MLAT and ADS-B; and

g) cost savings achieved from the implementation of an MLAT and ADS-B based surveillance system rather than the life cycle expenses associated with installing, maintaining, and extending existing radar-based surveillance systems.

2.4.2. Valid reasons exist for a State having some SSR and PSR or other technologies for civil air traffic surveillance coverage. For example, Mode S enhanced surveillance, ADS-C and other systems can also be used to deliver some of the above benefits.

2.5. MLAT applications

2.5.1 Overview

In an effort to provide the operational improvements identified above, a number of applications are already developed and being operated.

2.5.2. MLAT ATM Applications

Broadly speaking, the air traffic control application of MLAT fall under the following headings:

- Airport surface surveillance applications for ground and aerodrome control
- Area and Approach surveillance in airspace with radar coverage;
- Area and Approach surveillance in airspace without radar coverage;
- ATM system technical improvements including sampling of RVSM performance and sampling ADS-B performance.

2.5.3. MLAT Specific Use Applications

- Airport surface surveillance; and aircraft derived data for ground-based ATM tools.
- Situational awareness
- Airport Low Visibility Operations (e.g. CATIIIB)
- Parallel Runway Approach Monitoring
- Other applications Ramp control/gate management
- Noise monitoring data provision
- Airport usage data (for Billing)
- Airways usage data (for Billing)
- Flight following (for AOC, flying schools)
- Enhanced ATS situational awareness (tagging obstacles, restricted areas)
- Enhanced overall flight data for improved SAR activity

2.5.4. Ground-based surveillance applications

4.5.4.1 This application provides a source of airport surveillance information for safer and more efficient ground movement management at airports. Relevant airport ground vehicles need to also be equipped and displayed, together with aircraft, on a situation display.

4.5.4.2 MLAT supports ground conflict detection by providing frequent updates of aircraft and vehicle positions, enabling the monitoring of aircraft and vehicles to protect against runway incursions, and to monitor taxiing operations in low visibility operations such as CATIIIB minima conditions. It is an essential part of some A-SMGCS systems.

2.5.5. Other uses

2.5.5.1 ATC surveillance for airspace where there is no radar coverage, or where radar coverage exists, as a backup and possible replacement for SSR.

2.5.5.2 The higher update rate available with MLAT reports, in combination with other capabilities, may enhance surveillance services and allow the application of reduced separation standards. ICAO’s Separation and Airspace Safety Panel (SASP) is currently examining the introduction of MLAT separation standards, and at least one State already provides ATC separation services with MLAT.

2.5.5.3. This application can support ATC surveillance currently provided by radar, in Terminal or wider airspace. An example is the case of surveillance in areas where single radar coverage is provided. Where SSR is used, MLAT can provide a backup system and supplement radar position updates through additional position reports. Where PSR is used MLAT can provide additional data, such as aircraft identification.

2.5.5.4. ATC surveillance in airspace without radar coverage. This application will provide ATC surveillance in non-radar areas, (e.g. remote approach control areas). While ADS-B alone could provide surveillance coverage from "gate-to-gate", MLAT will be able to ensure the surveillance of aircraft equipped only with SSR transponders in those areas closer to the airport where traffic levels justify ATC surveillance, but radar is not feasible or affordable.

2.5.5.5. Other MLAT applications being considered or used to varying degrees include:

- monitoring of aircraft to ensure that flight trajectories comply with noise sensitive environments (e.g. curfew);
- facilitating the collection of data for the issuing of aviation charges in remote areas where this may be applicable;
- enabling the display of temporary obstacles — e.g. a construction crane equipped with a transponder or ADS-B emitter;
- validation of ADS-B transponder performances; and
- Search and rescue (SAR) and emergency response.

Chapter 3. Operational Deployments

3.1 Description of MLAT potential benefits

3.1.1 The operational environments in which MLAT will be used may include any of the following characteristics:

- varying infrastructure capabilities, ranging from the lack of any surveillance means up to the co-existence of ADS-B and MLAT with different types of conventional data sources such as primary and secondary surveillance radars. Some MLAT vendors can deliver a pseudo rotational 'radar like' ASTERIX Cat 1 / 48 output to minimise the initial setup adaptation required. It is expected that a variety of other technologies such as ADS-C and CPDLC will play a complementary role in the provision of ATC service;
- mixed aircraft equipage levels, at least in the transition period;
- varying airspace types (e.g. different traffic density levels);
- varying flight phases, e.g. airport surface, TMA, en-route, non-continental, continental; and
- varying types of application/services in different environments.

3.1.2. MLAT can detect ADS-B reports generated and also manipulate report rates by the transmission rate of interrogations, and in processing to output at a rate that suits the communications network and ATM system.

3.1.3. Compared to radar sensors, an MLAT system for an aerodrome surface application or for a local area around an aerodrome is less than half the cost. A Dual ADS-B location with power and communications is about half to two-thirds the cost of a full MLAT system, excluding the cost of transponder upgrades.

Other than cost, another important advantage of both ADS-B and MLAT are the degrees of redundancy which a single radar does not have.
An MLAT system configuration can allow staged degradation before the system would become unusable.

3.2 Users of MLAT
The users of MLAT will primarily be in ATC roles, from gate to gate. Here are some examples:

3.2.2 ATC Ground
Ground Tower and Surface Movement controllers will use MLAT for surface surveillance of aircraft and vehicles on the apron and or manoeuvring area. This is most desirable when the airport layout is complex (assessed by the configuration of buildings, the number of runways and taxiways) and where airports are capable of conducting operations out of visual range of the air traffic controller responsible (CAT II and III ILS operations and vertically-guided GNS approaches to similar minima are likely to fall in this category).

3.2.3 ATC Aerodrome
Aerodrome controllers will utilise the surveillance to assist with runway utilisation, and confirm that traffic is following instructions to and from the runway. Final approach monitoring using the high update available from an MLAT system providing more precision to discern whether an aircraft is lining up to land on the wrong runway, and to automate the alerting of such a situation. For departing flights in an environment where Tower initiated departures applies, the high update rate will provide a smoother and instantaneous turn of a lead aircraft as observed on the display so minimising waiting time for a following departure.

3.2.4 ATC Approach
MLAT for approach control will be useful in ATM system software to smooth the turns of displayed tracks, and can be used for Terminal area ATC surveillance in place of SSR or as a backup to SSR.

3.2.5 ATC Area control
Wide Area Multilateration (WAM) can extend beyond the Terminal area, depending on the configuration of the sensors. In this respect MLAT can provide a backup for SSR for a specific area, as a fill in to a specific airspace where surveillance is required and aircraft equipped only with Mode A/C transponders are common, in both cases the benefit of ADS-B data being received from each single site greatly improve the coverage for suitably equipped aircraft.

Chapter 4. Issues

4.1 Issues to consider
There are many issues associated with the introduction of MLAT to the air traffic management operational concept. The following are technical and operational issues to consider during development and implementation of MLAT. This list is not exhaustive, but serves as a guide for States considering MLAT systems for their surveillance needs.

4.2 Technical issues

4.2.1 Technical standards

4.2.1.1 As 1090MHz Extended Squitter (also known as 1090ES or Mode S data link) ADS-B and MLAT technology matures, the technical standards for the airborne as well as the ground systems are being refined. This leads to the need to potentially upgrade these systems to meet new national and international requirements. Efforts are underway within ICAO to ensure global interoperability.

4.2.1.2. Multiple Sites each require power and data communication paths. Site access, land rental or ownership, and technical maintenance capability to add multiple sites are issues to consider.

4.2.1.3 VHF coverage of the airspace may be coincident with a MLAT interrogation site to ensure best coverage. As with ADS-B the preferred situation is for the responsible controller to have reliable radio access to any flights within the controlled airspace.

4.2.2 Aircraft installation

Various types of aircraft have different installation certification and integration requirements. Consequently there are differences in costs. Antenna placement in relation to ground system sensors is a similar consideration as for SSR. Where ADS-B data received by the MLAT system is to be used alone, the issues regarding transponders and the GNSS systems must be considered. Specifically issues such as the navigation system integration to ADS-B or Mode S, compatibility with various link technologies, and cockpit controls and displays issues all have to be considered. Certification will also vary with intended function (e.g. ATC surveillance services, TIS-B situational awareness) as well as aircraft type (e.g. single engine aircraft versus heavy jet aircraft).

4.2.3 Remote ground stations

Installation, certification, and maintenance monitoring of remote MLAT ground stations to meet intended level of service raise their own issues. These include leasing agreements, power requirements, communication to a central facility (e.g. air traffic control centre), installation remote control features, accessibility and security. Remote switching and monitoring is an important consideration.

4.2.4 Automation system adaptation

Ground-based air traffic control system adaptation to facilitate the acquisition, processing and distribution of MLAT data is a significant issue. The automation’s capacity for handling the data (e.g. processing power available, local area network, data storage capacity), maintenance monitoring, correlation between various surveillance sources and integration into existing safety functions (e.g. conflict alert, minimum safe altitude warning) are a few areas to consider. Employing a Service Provider to deliver the system outputs is another option.

4.2.5 Technical Maintenance

For a new surveillance area, increased provision of Technical Maintenance support is likely to be required given the multiple remote sites inherent with MLAT configurations, and similarly maintenance for power supply and network communications personnel.

4.2.6 Security

4.2.6.1 The flexibility and versatility of the proposed MLAT systems will allow for many safety and capacity enhancing applications in the short and long term. As applications approach maturity and their requirements become more complex, they also become more sensitive to some outside interference, a risk not dissimilar to current systems using SSR Mode A/C.

4.2.6.2 1090MHz interference sources can be malicious or accidental and can occur intermittently or for an extended period. The interference can be a localized source causing for example a “co-channel interference” problem up to a military denial of airspace operation involving active jamming. The sources, causes, and effects of an interference event can be broadly categorized into several groups. There are practical limits that must be recognized due to technological, political, and fiscal reasons. Not all solutions will be technical - that is, come from a box. Some of the solutions may be procedural, legal, technical or a combination of all. In short, States will need to consider the likelihood and severity of interference by conducting appropriate hazard and safety assessments as a means of developing mitigation strategies.

4.2.7 Performance of the data link

4.2.7.1 Bandwidth and performance of the 1090 MHz data link is dependant upon the complexity of the scenarios that are envisaged and could be a significant issue in high density areas.

4.2.7.2 For example, the level of equipage (i.e. which airport vehicles and/or obstacles are fitted with transponders or ADS-B emitters), the number of aircraft involved and possible use of TIS-B to rebroadcast data from another surveillance source will need to be considered.

4.3 Operational issues

4.3.1 Human factors issues

4.3.1.1 The human factors considerations associated with surveillance systems are dependent not on the technology, but on the specific applications. That is, the issues are dependent upon the answers to questions, such as:

- what is the information to be displayed (e.g. aircraft position data or derived aircraft intent)?
- how are the input systems different and what is the appropriate way to show differences that may be important to operators?
- who (e.g. tower, ACC, airline operations) is the user of this information? Displays will need to be developed and evaluated for different applications;
- how will the information be used? The information and the way in which it is displayed must be capable of supporting the decisions that the users will make based on the MLAT information.

4.3.1.2 While the specific issues will depend on the specific applications, there are general issues that should be anticipated. These include:

- *effective integration of MLAT information into the situation display*. The position determined by MLAT can be different to the position reported by radar or other systems. When more than one input type is received, these positions will need to be reconciled so that only one position (preferably the most accurate position possible) is displayed for a single aircraft. This can be achieved by the use of a multi sensor (e.g. MLAT, ADS-B, SMR, ASR) data processor. Controllers need to know which aircraft are being tracked by which system when the type of surveillance affects how they control that aircraft, or the quality of the reported position, so that appropriate separation standards can be applied. Depending on the application and the limit of MLAT coverage, controllers may also need to know other capabilities of the displayed aircraft, such as RNP, ADS-B and CDTI. All of this adds information to be integrated into the present displays;

- *limitations of the technology*. Users will need to fully understand the limitations of the information presented and be informed of any known degradations or failures.

- *degree to which the displayed information supports the application*. The degree to which the MLAT information supports spacing and separation tasks and the degree to which flight crews and controllers are expected to successfully accomplish and integrate these tasks is being assessed in different ICAO forums. How the information is displayed is as important as the integrity of the information in supporting the user's confidence in the system. A concept under active development is to provide improvements to HFOM, for example elevating an GPS derived ADS-B position FOM that is marginal for use - by supporting MLAT FOM; and

- *effects on workload*. The effects of the additional information, and the procedures associated with specific applications, on the workload of the user need to be assessed. The information needs to be integrated so that it is unambiguous, immediately useful, and does not interfere with other critical information.

4.3.2 Procedures development, separation standards, airspace design, and training issues
In support of new operations, appropriate procedures, separation standards, airspace design, and training are being developed to effectively utilize MLAT and its applications. Controllers, pilots, and maintenance technicians, as well as others who may use MLAT or be impacted by the procedures need proper training on coverage issues, normal and failure mode operations. In addition, airspace design (e.g. size of ATC sectors) will need to be considered for the types of services provided.

4.3.3 Fleet equipage
With the availability of various ADS-B and SSR technologies and the cost of equipping or re-equipping aircraft with new avionics, it is unlikely that aircraft will have homogeneous equipment. The introduction of MLAT allows the system to have full surveillance of all transponder equipped aircraft without the hurdle of making the carriage of ADS-B transponders mandatory for a State or large airspace area.

It should be remembered that in some MLAT systems, ADS-B is an integral part, so aircraft operators should be encouraged to install ADS-B OUT capability which will benefit the whole airspace system in time, and which can benefit the operator and ATS system directly through improved coverage in areas beyond the MLAT high performance area.

The design configuration of the MLAT system may have only some or no MLAT receivers detecting ADS-B. In the cockpit, the traffic information service — broadcast (TIS-B), may evolve to be of particular importance, ensuring consistency on both air and ground traffic situation displays.

4.3.4 Transition issues
One of the main issues with regard to the impact from the transition towards an ADS-B-based surveillance system is that MLAT extends out the time when full capability of ADS-B is needed. In the foreseeable future, the systems have to be capable of coping with a heterogeneous set of aircraft capabilities, types of surveillance sensors, local system sophistication etc. and should be capable of providing the required quality of service both on the ground and on board the aircraft. This quality of service should be at least equal to that of the current system in place. MLAT is often seen as a ‘transitional technology’ that caters for legacy aircraft while also being capable of processing ADS-B transmissions.

4.3.5 Institutional
There are common types of institutional issues regardless of the State implementing MLAT. These include such things as legal issues (e.g. separation standards), radio spectrum allocation/management, and certification issues. Each State will have to resolve these, but global harmonization needs to be considered for consistency.

4.3.6 Environmental issues

4.3.6.1 With any new system, environmental issues need to be considered to include noise abatement, airspace constraints, and remote ground system installations.

4.3.6.2 The ADS-B processing capability of MLAT systems enables new or improved applications which are expected to contribute significantly to these savings by providing more direct or efficient routings, and easier access to the optimum altitudes and airspeeds.

Chapter 5. Implementation

5.1 Planning

There is a range of activity that needs to take place to bring an application from initial concept to operational use. This section documents these activity areas under the topics of collaborative planning and decision making, system compatibility and integration, while the second section of this chapter provides a checklist to assist States with the management of MLAT implementation activities.

5.1.2 Implementation team to ensure international coordination

5.1.2.1 From the ICAO perspective, when a State decides to implement a new technology it benefits the wider ATM community if they consult and advise the wider ATM community of plans and implementation issues encountered. Moreover, the implementation should also be coordinated between States and Regions as appropriate, in order to achieve maximum benefits for airspace users and service providers.

5.1.2.2 An effective means of coordinating the various demands of the affected organizations is to establish an implementation team. Team composition may vary by State or Region, but the core group responsible for MLAT implementation planning should include members with operational expertise in aviation disciplines, with access to other specialists as may be required. Where both MLAT and ADS-B services are being introduced at the same time, or being considered, a single team should seek a harmonised approach for both systems.

5.1.2.3 Ideally, such a team should comprise representatives from the ATS providers, regulators and airspace users, as well as other stakeholders likely to be influenced by the introduction of MLAT and ADS-B, including manufacturers and military authorities. All identified stakeholders should participate as early as possible in this process so that demands are identified prior to the making of schedules or contracts.

5.1.2.4 The role of the implementation team is to consult widely with stakeholders, identify operational needs, resolve conflicting demands and make recommendations to the various stakeholders managing the implementation. To this end, the implementation team should have high-level access to the decision-makers.

5.1.3 System compatibility

5.1.3.1 ADS-B has potential use in almost all environments and operations and is likely to become a mainstay of the future ATM system. MLAT is able to fill in the gaps for areas where surveillance is needed, but where targets / aircraft have only Mode A/C or Mode S short squitter transponders. Engineering and operational trials of both systems have been conducted and operational implementations have occurred, and ADS-B now has a comprehensive set of internationally accepted standards. Generally first applications are in niche areas where radar surveillance is not available or possible. ICAO Regional cooperation and alignment are important.

5.1.3.2 Given the international nature of aviation, special efforts should be taken to ensure harmonization though compliance with ICAO Standards and Recommended Practices (SARPs). The choice of actual technologies to implement MLAT (and ADS-B) should consider not only the required performance of individual components, but also their compatibility with other CNS systems.

5.1.3.3 The future concept of ATM encompasses the advantages of interoperable and seamless transition across flight information region (FIR) boundaries and MLAT/ADS-B implementation teams should include simulations, trials and cost/benefit analysis to support these objectives.

5.1.4 Integration

5.1.4.1 MLAT implementation plans will include the development of both business and safety cases. The adoption of any new CNS system has major implications for service providers, regulators and airspace users and special planning should be considered for the integration into the existing and foreseen CNS/ATM systems. The following briefly discusses each element.

5.1.4.2 The communication system is an essential element within CNS. An air traffic controller can now monitor an aircraft using MLAT and ADS-B in non-radar areas where previously only voice position reports were available. However, a communication system that will support the new services resulting from the improved surveillance will be necessary.

5.1.4.3 Where MLAT is being introduced to perform A-SMGCS or PRM functions, consideration must be given to the supporting navigational systems such as ILS, GLS, airport lighting, taxiway markings, etc

5.1.4.4 MLAT and ADS-B may be used to supplement existing surveillance systems or as the principal source of surveillance data. Ideally, surveillance systems will incorporate all available data to provide a coherent picture that improves both the amount and utility of surveillance data to the user. The choice of the optimal mix of data sources will be defined on the basis of operational demands, available technology, safety and cost-benefit considerations.

5.1.4.4.2 MLAT is dependent on the aircraft having at least a Mode A/C transponder. It can receive identity through correlation of a code with the flight plan, or the flight identification transmitted by ADS-B or Mode S transponder

5.2. Implementation checklist

5.2.1 The purpose of this implementation checklist is to document the range of activities that need to take place to bring an MLAT application from an initial concept to operational use. This checklist may form the basis of the terms of reference for an MLAT implementation team, although some activities may be specific to individual stakeholders. *Note - When completed, the MLAT/ADS-B Implementation and Operations Guidance Document will be more prescriptive of these headings.*

5.2.2 The activities are listed in an approximate sequential order. However, each activity does not have to be completed prior to starting the next activity. In many cases, a parallel and iterative process should be used to feed data and experience from one activity to another. It should be noted that not all activities will be required for all applications.

5.2.3 Concept phase

construct operational concept for the airport or airspace:

- define the purpose of MLAT and ADS-B;
- operational environment;
- ATM functionality that will be affected
- ATM system modifications necessary (and cost estimates)
- infrastructure;
- identify benefits:
- safety enhancements;
- efficiency;
- capacity;
- environmental;
- physical and electronic (remote control) access; and

- other metrics (e.g. predictability, flexibility, usefulness);
- identify constraints:
- pair-wise equipage; need for exclusive airspace;
- required coverage
- required configuration /ground infrastructure;
- RF spectrum;
- define airspace area within which MLAT accuracy is acceptable
- integration with existing technology; and
- technology reliability / availability (system, communications, power);
- contingency systems / procedures
- prepare business case:
- cost benefit analysis; and
- demand and justification.

5.2.4 Design phase

identify operational requirements:

- security;
- systems interoperability;
- identify human factors issues:
- human-machine interfaces;
- training development, delivery and license validation;
- workload demands;
- role of automation vs. role of human;
- crew coordination/pilot decision-making interactions; and
- ATM collaborative decision-making;
- identify technical requirements:
- site selection
- standards development;
- data required;
- functional processing;
- functional performance; and
- required certification levels;
- equipment development, test, and evaluation:
- prototype systems built to existing or draft standards/specifications;
- methodology required by the ANSP safety management system
- developmental bench and flight tests if sufficient data not already provided;
- select technology;
- develop procedures:
- pilot and controller actions and responsibilities;
- phraseologies;
- separation/spacing criteria and requirements;
- controller’s responsibility to maintain a monitoring function, if appropriate;
- identify any controller issues for operations at the transition between types of surveillance.
- contingency procedures; and
- emergency procedures;
- prepare design phase safety case:
- safety rationale;
- safety budget and allocation; and
- functional hazard assessment.

5.2.5 Implementation phase

prepare implementation phase safety case;

- Obtain acceptance as necessary of safety case
- Include any safety mitigation that is required into system design or procedures.

Prepare the sites:

- communication, power and physical preparation for remote and central equipment sites;

conduct operational test and evaluation:

- flight deck and ATC validation simulations; and
- flight tests and operational trials;
- obtain systems certification:
- aircraft equipment performance checks; and
- ground system deployment and checking;
- obtain regulatory approvals: flight operations; and air traffic;
- implementation transition:
- continue data collection and analysis;
- continue feedback into standards development processes; and
- performance monitoring to ensure agreed performance is maintained.

5.2.5.1 Once the implementation phase is complete, the ongoing maintenance and upgrading of both MLAT and ADS-B operations and infrastructure should continue to be monitored, measured and reported on – both internally and externally, through the appropriate forums.

STRATEGY FOR THE IMPLEMENTATION OF SURVEILLANCE SYSTEMS IN THE ASIA/PACIFIC REGION

Considering that:

1. States are implementing CNS/ATM systems to gain safety and efficiency benefits, and have endorsed the move toward satellite and data link technologies;

2. Regional planning is key to timely and successful implementation of a seamless global air traffic management system;

3. Safety and efficiency will be increased through harmonisation of technology and applications;

4. The 11th Air Navigation Conference endorsed the use of ADS-B as an enabler of the global air traffic management concept and encouraged states to support cost-effective early implementation of ADS-B applications;

5. APANPIRG has decided to use the 1090MHz Extended Squitter data link for ADS-B air-ground and air-air applications in the Asia/Pacific Region, noting that in the longer term an additional link type may be required;

6. SSR and ADS-C will continue to meet many critical surveillance needs for the foreseeable future ;

7. ACAS acts as situational awareness tool and last resort for safety conflict resolution;

8. Initial SARPs, PANS and guidance material for the use of ADS-B have been developed;

9. ADS-B avionics and ground systems are available;

10. ADS-B aircraft-based surveillance applications are under study in the region;

11. Multilateration is a technology that can supplement SSR and ADS-B;

12. Availability of guidance on technical requirements for Mode S and Extended Squitter provided in ICAO Doc 9871 'Technical Provisions for Mode S Services and Extended Squitter. Draft Edition 2006'

13. The future air traffic environment will require increased use of aircraft derived surveillance information for the implementation of a seamless automated air traffic flow management system; and

14. The process of achieving civil-military interoperability in the surveillance domain is to consider the requirements, identify existing capabilities and harmonize surveillance strategies.

THE GENERAL STRATEGY FOR THE IMPLEMENTATION OF SURVEILLANCE SYSTEMS IN THE ASIA/PACIFIC REGION IS TO:

1. Minimise the reliance upon pilot position reporting, particularly voice position reporting, for surveillance of aircraft;

2. Reduce the dependence on Primary Radar for area surveillance;

3 Provide maximum contiguous ATS surveillance coverage of international air routes using 1090MHz Extended Squitter ADS-B and Mode S SSR;

4. Maximise the use of ADS-B on major air routes and in terminal areas, giving consideration to the mandatory carriage of ADS-B Out as specified in Note 1 and use of ADS-B for ATC separation service;

5. Make full use of SSR Mode S capabilities where radar surveillance is used and reduce reliance on 4 digit octal codes;

6. Make use of ADS-C where technical constraint or cost benefit analysis does not support the use of ADS-B, SSR or Multilateration;

7. Make use of Multilateration for surface, terminal and area surveillance where appropriate as an alternative or supplement to other surveillance systems;

8. Increase the effectiveness of surveillance and collision avoidance systems through mandatory use of pressure altitude reporting transponders;

9. Improve safety through sharing of ATS surveillance data across FIR boundaries;

10. Ensure provision of communication, navigation, and data management capabilities necessary to make optimal use of surveillance systems;

11. Enhance ATM automation tools and safety nets through the use of aircraft derived data such as flight identification, trajectories and intentions; and

12. Closely monitor the implementation of ADS-B and multilateration in order to verify their impact on civil-military interoperability.

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Associated GPI 19 and GPI 17

Note 1:

a) *Version 0 ES as specified in Annex 10, Volume IV, Chapter 3, Paragraph 3.1.2.8.6 (up to and including Amendment 82 to Annex 10) and Chapter 2 of draft* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260) to be used till at least 2020.*

b) *Version 1 ES as specified in Chapter 3 of draft* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260A); Or*

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Implementation Issues Identified by the ASIA/PAC SIGMET Seminar

The ASIA/PAC SIGMET Seminar held from 11 to 13 July 2007 at the ICAO Regional Office, Bangkok, provided feed-back on common issues in regard to implementation of SIGMET provision. The 11th meeting of the CNS/MET Sub-group of APANPIRG agreed that these issues should be brought to the attention of an appropriate ICAO body for consideration and provision of additional guidance to States and/or amendment to SIGMET SARPs as necessary. These issues are summarized as follows:

- In the volcano name in VA SIGMET, “MT” should be optional – not all volcanoes are mountains; the name should be taken from VA advisory;

- For VA SIGMET, additional guidance is necessary for reporting multiple layers, as well as, procedures for reporting more than one eruption within FIR (e.g., one ceasing and one new eruption);

- In VA SIGMET, when the VA cloud crosses the FIR boundary the description of the VA cloud should not be limited to the FIR boundaries because this may be misleading information for pilots;

- In TC SIGMET: align the TC SIGMET format with the changes to the format of TC advisory in Amendment 74 in regard to: the use of 16 compass points for the direction of movement of TC centre; use of “NIL” in the TC name field;

- It was considered necessary to have a provision for including the time of forecast: FCST [nnnnZ];

- Enable the use of “SFC” in reporting layer, i.e., SFC/FLnnn;

- Reporting of more than one area in the FIR affected by the same meteorological phenomenon – current provision require separate SIGMET. This was considered not efficient and creating additional work load, as well as information load on systems, such as VOLMET. It was proposed to use “AND” which would enable the description of two geographical areas for the same phenomenon, e.g., TS;

- It was requested that the use of sequence numbers be clarified. The SIGMET Guide currently recommends that separate SIGMETs should be issued for different phenomena affecting the same FIR, and for keeping more than one SIGMETs at a time valid for the FIR concerned, different series of sequence number could be used, e.g. series A1, A2, … for “phenomenon A” and B1, B2, … for “phenomenon B”. However, Annex 3 currently specifies that “The sequence number referred to in the template in Table A6-1 shall correspond with the number of SIGMET messages issued for the flight information region since 0001 UTC on the day concerned. Separate series of sequence numbers shall be used for “SIGMET” and “SIGMET SST” messages”. It therefore appears that the current Annex 3 provisions do not expect separate series of sequence numbers for different phenomenon affecting the same FIR. It is also unclear whether separate series of sequence numbers should be used for WS, WC and WA SIGMETs;

- It was requested that the examples provided in Annex 3, Appendix 6, Table A6-1 should encompass more “difficult” cases;

- The participants emphasized that training events like the ASIA/PAC SIGMET Seminar were extremely useful and necessary for the Region. It was suggested that they should be organized every 2 to 3 years in order to assist States in the implementation of the ICAO provisions.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA/PACIFIC REGIONAL SIGMET GUIDE

FOURTH EDITION — SEPTEMBER 2007

RECORD OF AMENDMENTS AND CORRIGENDA

Amendments			
No.	Date of issue	Date entered	Entered by

Corrigenda			
No.	Date of issue	Date entered	Entered by

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PART 1. INTRODUCTION

1.1 General

1.1.1 The main purpose of this document is to provide guidance for standardization and harmonization of the procedures and formats related to the aeronautical meteorological warnings for hazardous en-route meteorological phenomena, known as SIGMET information. The guidance is complementary to the Annex 3 standards and recommended practices regarding SIGMET and to the SIGMET related provisions of the ASIA/PAC Basic ANP and FASID, ICAO Doc 9673.

1.1.2 ICAO provisions concerning the issuance and dissemination of SIGMET information are contained in:

- Annex 3 - *Meteorological Service for International Air Navigation*, Part I, Chapter 3, 3.4 – 3.7, Chapter 7, 7.1, and Part II, Appendix 6;
- ASIA/PAC Basic ANP, Part VI, and ASIA/PAC FASID Table MET 1B, MET 3A and MET 3B;
- Annex 11 - *Air Traffic Services*, Chapter 4, 4.2.1 and Chapter 7, 7.1;
- PANS – *Air Traffic Management*, Doc 4444, Chapter 9, 9.1.3.2;
- Regional Supplementary Procedures, Doc 7030, Part 1, 11.2.

Additional guidance on the SIGMET procedures is contained in the *Manual of Aeronautical Meteorological Practice* (Doc 8896), and the *Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services* (Doc 9377).

1.1.3 The SIGMET Guide is intended mainly to assist the MWOs in the Asia/Pacific Region in preparing and disseminating SIGMET information. It provides detailed information on the format of SIGMET messages as specified by Annex 3. The explanations of the format are accompanied by examples based on region-specific meteorological phenomena. The guide also provides information regarding the necessary coordination between the MWOs, the ATS units and the pilots, and their respective responsibilities.

1.1.4 This document is prepared by the ICAO ASIA/PAC Regional Office. It is reviewed and updated regularly in order to be kept in line with the relevant ICAO SARPs and regional procedures. This current version incorporates the changes to SIGMET-related provisions included in Amendment 74 to Annex 3 which was approved by ICAO Council on 21 February 2007.

PART 2. RESPONSIBILITIES AND COORDINATION

2.1 General

2.1.1 SIGMET is warning information, hence it is of highest priority among other types of meteorological information provided to the aviation users. The primary purpose of SIGMET is for in-flight service, which requires timely transmission of the SIGMET messages to pilots by the ATS units and/or through VOLMET and D-VOLMET.

2.1.2 Airlines are the main users of the SIGMET information. They contribute to the effectiveness of the SIGMET service through issuance of special air-reports reported by pilots to the ATS units. Special air-reports are among the most valuable sources of information for the Meteorological Watch Offices (MWO) in the preparation of SIGMET. The ATS units receiving special air-reports should forward them to the associated MWOs without delay.

2.1.3 In view of the foregoing, it should be well understood that the effectiveness of the SIGMET service depends strongly on the level of collaboration between the MWOs, ATS units and pilots. That is why, close coordination between these parties, as well as mutual understanding of their needs and responsibilities, are essential for the successful implementation of the SIGMET service.

2.1.4 For the special cases of SIGMET for volcanic ash and tropical cyclones, the MWOs are provided with advisories from the volcanic ash advisory centres (VAAC), and tropical cyclone advisory centres (TCAC) designated in the Regional ANP.

2.1.5 Another use of SIGMET is for the flight planning. This requires global dissemination of SIGMET through the international OPMET data banks and the satellite broadcasts: ISCS and SADIS. SIGMET should also be distributed to the World Area Forecast Centres (WAFC) London and Washington for use in the preparation of the significant weather (SIGWX) forecasts.

2.1.6 In the next paragraphs, the main responsibilities and coordination links, related to the provision of SIGMET information, are described.

2.2 Meteorological Watch Office - responsibilities and procedures related to SIGMET

2.2.1 SIGMET information should be issued by the meteorological watch offices (MWO) in order to provide timely warning for occurrence or expected occurrence of specified en-route weather phenomena, affecting the safety of the flight operations in the MWO's area of responsibility (AOR). SIGMET provides information concerning the location, extent, intensity and expected evolution of the specified phenomena.

2.2.2 Information about the provision of SIGMET service, including details on the designated MWO(s), should be included in the State's Aeronautical Information Publication (AIP) as specified in Annex 15, Aeronautical Information Service, Appendix 1, GEN 3.5.8.

2.2.3 All designated MWOs in ASIA/PAC Region are listed in the FASID Table MET 1B of the ASIA/PAC FASID, which is reproduced as Appendix A to this Guide.

2.2.4 If, for some reason, a State is not able to meet its obligations for establishing MWO(s) and for provision of SIGMET for the FIR(s) or control area(s) the State is providing air traffic services, arrangements should be made between the meteorological authorities of the States concerned, that another

MWO takes over these responsibilities for certain period of time. Such delegation of responsibilities should be notified by a NOTAM and a letter to the ICAO Regional Office.

2.2.5 Since the MWO is normally not a separate administrative unit, but part of the functions of an aerodrome meteorological office or other meteorological office, the meteorological authority concerned should ensure that the MWO obligations and responsibilities are clearly defined and assigned to the unit designated to serve as MWO. Corresponding operational procedures should be established and the meteorological staff should be trained accordingly.

2.2.6 In preparing SIGMET information MWOs should follow strictly the format determined in Annex 3 (detailed format description is provided in Appendix 6, Table A6-1 of Annex 3). SIGMET should be issued only for those weather phenomena listed in Annex 3 and only when specified criteria for their intensity and spatial extent are met.

Note: MWOs should not issue SIGMET for weather phenomena of lower intensity or such of transient nature or smaller scale, which do not affect significantly the flight safety and their transmission to users may lead to unnecessary precautionary measures.

2.2.7 The MWOs should be adequately equipped in order to be able to identify, analyze and forecast (to the extent required) those phenomena for which SIGMET is required. The MWO should make use of all available sources of information, such as special air-reports, information from meteorological satellites and weather radars.

2.2.8 On receipt of a special air-report from the associated ACC or FIC, the MWO should:

a) issue SIGMET information based on the special-air report; or

b) send the special air-report for on-ward transmission in case that the issuance of SIGMET information is not warranted (e.g., the phenomenon concerned is of transient nature).

2.2.9 Appropriate telecommunication means should be available at the MWO in order to ensure timely dissemination of SIGMET according to a dissemination scheme, which should include transmission to:

- Local ATS users;

- Aeronautical MET offices within its AOR, where SIGMET is required for briefing and/or flight documentation;

- Other MWOs concerned (it should be ensured that SIGMET is sent to all MWOs whose AORs are, at least partly, within the 1800 km (1000 NM) range from the observed phenomenon);

- Centres designated for transmission of VOLMET or D-VOLMET where SIGMET is required for those transmissions;

- Responsible ROBEX centre and Regional OPMET Data Bank (it should be arranged that through the ROBEX scheme SIGMETs are sent to the designated OPMET data banks in the other ICAO regions, to the WAFCs and to the SADIS and ISCS providers);

- Responsible TCAC or VAAC according to FASID Tables MET 3A and MET 3B.

2.2.10 In issuing SIGMET for tropical cyclones or volcanic ash, the MWOs should include as appropriate the advisory information received from the responsible TCAC or VAAC. In addition to the information received from the TCAC and VAAC the MWOs may use the available complementary information from other reliable sources. In such a case the responsibility for this additional information would lie completely on the MWO concerned.

2.3 Responsibilities of ATS units

2.3.1 Close coordination should be established between the MWO and the corresponding ATS unit (ACC or FIC) and arrangements should be in place to ensure:

- receipt without delay and display at the relevant ATS units of SIGMET issued by the associated MWO;

- receipt and display at the ATS unit of SIGMETs issued by MWOs responsible for the adjacent FIRs/ACCs if these SIGMETs are required according to p. 2.3.4 below, (within 1800 km (1000 NM) range from the observed phenomenon); and

- transmission without delay by the ATS unit of special air-reports received through voice communication to the associated MWO.

2.3.2 SIGMET information should be transmitted to aircraft with the least possible delay on the initiative of the responsible ATS unit, by the preferred method of direct transmission followed by acknowledgement or by a general call when the number of aircraft would render the preferred method impracticable.

2.3.3 SIGMET information transmitted to aircraft-in-flight should cover a portion of the route up to two hours flying time ahead of the aircraft. SIGMET should be transmitted only during the time corresponding to their period of validity (p. 3.4.2.3 refers).

2.3.4 Air traffic controllers should ascertain whether any of the currently valid SIGMETs may affect any of the aircraft they are controlling, either within or outside the FIR/CTA boundary, up to a distance of 1000 NM (1800 KM), which corresponds to two hours flying time ahead of the current position of the aircraft. If this is the case, the controllers should at their own initiative transmit the SIGMET promptly to the aircraft-in-flight likely to be affected. If necessary, the controller should pass to the aircraft available SIGMETs issued for the adjacent FIR/CTA, which the aircraft will be entering, if relevant to the expected flight route.

2.3.5 The ATS units concerned should also transmit to aircraft-in-flight the special air reports received, for which SIGMET has not been issued. Once a SIGMET for the weather phenomenon reported in the special air report is made available this obligation of the ATS unit expires.

2.4 Responsibilities of pilots

2.4.1 Timely issuance of SIGMET information is largely dependant on the prompt receipt by MWOs of special air-reports. That is why, it is essential that pilots prepare and transmit such reports to the ATS units whenever any of the specified en-route conditions are encountered or observed.

2.4.2 It should be emphasized that, even when automatic dependent surveillance (ADS) is being used for routine air-reports, pilots should continue to make special air-reports.

2.5 Coordination between MWOs and the TCACs and VAACs

2.5.1 Amongst the phenomena for which SIGMET information is required, the volcanic ash clouds and tropical cyclones are of particular importance for the planning of long-haul flights.

2.5.2 Since the identification, analysis and forecasting of volcanic ash and tropical cyclones requires considerable technical and human resource, normally not available at each MWO, the Volcanic Ash Advisory Centres (VAAC) and Tropical Cyclone Advisory Centres (TCAC) have been designated to provided VA and TC advisories to the users and assist the MWOs in the preparation of the forecast part of the SIGMETs for those phenomena. Close coordination should be established between the MWO and its responsible TCAC and/or VAAC.

2.5.3 Information regarding the VAACs and TCACs serving ASIA/PAC Region with their corresponding areas of responsibility and lists of MWOs and ACCs to which advisories are to be sent is provided in FASID Tables MET 3A and MET 3B of the ASIA/PAC FASID. These tables are reproduced in Appendix B and Appendix C to this Guide.

2.5.4 TC and VA advisories are required for global exchange through the satellite distribution systems, SADIS and ISCS. They are used by the operators during the preflight planning. Nevertheless, it should be emphasized that SIGMET information is still of higher operational status and is required especially for in-flight re-planning. SIGMETs should be transmitted to aircraft-in-flight through voice communication or VOLMET or D-VOLMET thus providing vital information for making in-flight decisions regarding large-scale route deviations due to volcanic ash clouds or tropical cyclones.

PART 3. PROCEDURES FOR PREPARATION OF SIGMET INFORMATION

3.1 General

3.1.1 SIGMET information is prepared in abbreviated plain language using approved ICAO abbreviations, a limited number of non-abbreviated words, geographical names and numerical values of self-explanatory nature. All abbreviations and words to be used in SIGMET are given in Appendix D.

3.1.2 The increasing use of automated systems for handling the MET information by the aviation users makes it essential that all types of OPMET information, including SIGMET, are prepared and transmitted in the prescribed standardized formats. Therefore, the structure and format of the SIGMET message, as specified in Annex 3, Part II, Appendix 6, which provides detailed information regarding the content and order of elements in the SIGMET message, should be followed strictly by the MWOs.

3.1.3 SIGMET is intended for transmission to aircraft in flight either by ATC or by VOLMET or D-VOLMET. Therefore, SIGMET messages should be kept consise and clear without additional descriptive text other than the prescribed in Annex 3.

3.1.4 After the issuance of a SIGMET the MWO should maintain watch over the evolution of the phenomenon for which the SIGMET has been issued and issue updated SIGMET when necessary. The TC and VA SIGMET should be updated at least every 6 hours.

3.1.5 SIGMET should be promptly cancelled when the phenomenon is no longer occurring or no longer expected to occur in the MWO's area of responsibility. The SIGMET is understood to cancel itself automatically at the end of its validity period. If the phenomenon persists a new SIGMET message for a further period of validity should be issued.

3.2 Types of SIGMET

3.2.1 Although Annex 3 provides one general SIGMET format, which encompasses all weather phenomena, it is convenient when describing the structure and format of the messages to distinguish between three types of SIGMET, as follows:

- SIGMET for en-route weather phenomena other than VA and TC (this includes: TS, CB, TURB, ICE, MTW, DS and SS); this SIGMET will be referred as WS SIGMET;
- SIGMET for volcanic ash, which will hereafter be denoted as VA SIGMET or WV SIGMET; and
- SIGMET for tropical cyclones, which will hereafter be denoted as TC SIGMET or WC SIGMET.

3.2.2 The three types of SIGMET can be identified by the data type designator included in the WMO abbreviated heading of the SIGMET message, as explained below.

3.3 Structure of the SIGMET message

3.3.1 A SIGMET message consists of:

- ***WMO heading*** – all SIGMETs are preceded by an appropriate WMO heading;

- ***First line***, containing location indicators of the respective ATS unit and MWO, sequential number and period of validity;
- ***SIGMET main body***, containing information concerning the observed or forecast weather phenomenon for which the SIGMET is issued together with its expected evolution within the period of validity;

3.3.2 The first two parts of the SIGMET message are common for all types of SIGMET. The format and content of the third part is different; that is why, in the following paragraphs the meteorological part of the SIGMET message is described separately for the three types of SIGMET.

3.4 Format of SIGMET

Note: In the following text, square brackets - [ ] - are used to indicate an optional or conditional element, and angled brackets - < > - for symbolic representation of a variable element, which in a real SIGMET accepts concrete numerical value.

3.4.1 WMO Header

$T_1T_2A_1A_2$ii CCCC YYGGgg [CCx]

3.4.1.1 The group **$T_1T_2A_1A_2$ii** is the bulletin identification for the SIGMET message. It is constructed in the following way:

T_1T_2	Data type designator	**WS** – for SIGMET for meteorological phenomena other than volcanic ash cloud or tropical cyclone **WC** – for SIGMET for tropical cyclone **WV** – for SIGMET for volcanic ash
A_1A_2	Country or territory designators	Assigned according to Table C1, Part II of Manual on the Global Telecommunication System, Vol I – Global Aspects (WMO - No. 386)
Ii	Bulletin number	Assigned on national level according to p 2.3.2.2, Part II of Manual on the Global Telecommunication System, Vol I – Global Aspects (WMO - No. 386)

3.4.1.2 **CCCC** is the ICAO location indicator of the communication centre disseminating the message (could be the same as the MWO location indicator).

3.4.1.3 **YYGGgg** is the date/time group, where YY is the date and GGgg is the time of transmission of the SIGMET in hours and minutes UTC (normally this time is assigned by the disseminating (AFTN) centre).

3.4.1.4 The group **CCx** should be used only when issuing a correction to a SIGMET which had already been transmitted. The third letter "x" takes the value A for the first correction, B for the second correction, etc.

Examples:

WSTH31 VTBS 121200
WVJP01 RJTD 010230
WCNG21 AYPY 100600 CCA

3.4.2 <u>First line of SIGMET</u>

CCCC SIGMET [nn]n VALID YYGGgg/YYGGgg CCCC-

3.4.2.1 The meaning of the groups in the first line of the SIGMET is as follows:

CCCC	ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET refers
SIGMET	Message identifier
[nn]n	Daily sequence number (see p.3.4.2.2)
VALID	Period of validity indicator
YYGGgg/YYGGgg	Validity period of the SIGMET given by date/time group of the beginning and date/time group of the end of the period (see p.3.4.2.3)
CCCC	ICAO location indicator of the issuing MWO
-	**hyphen** to separate the preamble from the text

3.4.2.2 The numbering of SIGMETs starts every day at 0001 UTC. The sequence number should consist of up to three symbols and may be a combination of letters and numbers, such as:

- 1, 2, …
- 01, 02, …
- A01, A02, …

Examples:

RPMM SIGMET 3 VALID 121100/121700 RPLL-
WSJC SIGMET A04 VALID 202230/210430 WSSS-

Note 1: No other combinations should be used, like "CHARLIE 05" or "NR7".

Note 2: Some States in the Region, like Australia, use more than 3 symbols, e.g., two letters and two figures. In the case of Australia this difference is due to the fact that more than one MWO serves one FIR and 4 characters are used to identify the part of the FIR for which the SIGMET is issued.

Note 3: Correct numbering of SIGMET is very important since the number is used for reference in communication between ATC and pilots and in VOLMET and D-VOLMET.

3.4.2.3 The following considerations should be taken into account when determining the validity period:

- The period of validity of a WS SIGMET should be not more than 4 hours;
- The period of validity of a WC or WV SIGMET should be up to 6 hours;
- In case of a SIGMET for an observed phenomenon, the filing time (date/time group in the WMO header) should be the same or very close to the time in the date/time group indicating the start of the SIGMET validity period;
- When the SIGMET is issued for a forecast phenomenon:
  - o the beginning of validity period should be the time of the expected commencement (occurrence) of the phenomenon in the MWO area of responsibility;
  - o the time of issuance of the SIGMET should be not more than 4 hours before the start of validity period (i.e., expected time of occurrence of the

phenomenon); for TC and VA SIGMET the lead time should be up to 12 hours.

3.4.2.4 The period of validity is that period during which the SIGMET information is valid for transmission to aircraft in flight.

Examples:

1. SIGMET for an observed phenomenon:

WSTH31 VTBS 241120
VTBB SIGMET 3 VALID 241120/241500 VTBS–

2. SIGMET for a forecast phenomenon (expected time of occurrence 1530)

WSSG31 WSSS 311130
WSJC SIGMET 1 VALID 1530/1930 WSSS-

3.4.3 ***Format of the meteorological part of SIGMET messages for weather phenomena other than TC and VA***

3.4.3.1 The meteorological part of a SIGMET for weather phenomena consists of seven elements as shown in the table below.

Start of the second line of the message

1	**2**	**3**	**4**	**5**
Name of the FIR/UIR or CTA	Description of the phenomenon	Observed or forecast	Location	Level
<CCCC> <name> FIR [CTA]	<Phenomenon>	OBS [AT <GGgg>Z] FCST	Geographical location of the phenomenon given by coordinates, or geographical objects, or location indicators	FL<nnn> or FL<nnn/nnn> or [TOP [ABV or BLW]] FL<nnn>

6	7
Movement or expected movement	Changes in intensity
MOV <direction, speed>KMH[KT] or STNR	INTSF or WKN or NC

3.4.3.1.1 Name of the FIR/UIR or CTA

CCCC <name> FIR[/UIR]
or
CCCC <name> CTA

The ICAO location indicator and the name of the FIR/CTA is given followed by the appropriate abbreviation: FIR, FIR/UIR or CTA.

Examples:

VTBB BANGKOK FIR

3.4.3.1.2 Phenomenon

The phenomenon description consists of a qualifier and a phenomenon abbreviation. SIGMET should be issued only for the following phenomena observes or forecast at cruising levels (irrespective of altitude):

- thunderstorms – if they are OBSC, EMBD, FRQ or SQL with or without hail;
- turbulence – only SEV
- icing – only SEV with or without FZRA
- mountain waves – only SEV
- dust storm – only HVY
- sand storm – only HVY
- radioactive cloud – RDACT CLD

The appropriate abbreviations and combinations, and their meaning are given in Appendix E.

3.4.3.1.3 Indication whether the phenomenon is observed or forecast

OBS [AT <GGgg>Z]
or FCST

The indication whether the phenomenon is observed or forecast is given by using the abbreviations OBS or FCST. OBS is followed by an optional time group in the form AT GGggZ, where GGgg is the time of the observation in hours and minutes UTC. If the exact time of the observation is not known the time is not included. When FCST is used, it is assumed that the time of occurrence or commencement of the phenomenon coincides with the beginning of the period of validity included in the first line of the SIGMET.

Examples:

OBS AT 0140Z
FCST

3.4.3.1.4 Location of the phenomenon

The location of the phenomenon is given with reference to geographical coordinates (latitude and longitude) or with reference to geographical features well known internationally. The MWOs should try to be as specific as possible in reporting the location of the phenomenon and, at the same time, to avoid overwhelming geographical information, which may be difficult to process or perceive.

The following are the most common ways to describe the location of the phenomenon:

- Indication of a part of the FIR with reference to latitude:
  N OF or S OF <Nnn[nn]> or <Snn[nn]>
- Indication of a part of the FIR with reference to longitude:
  E OF or W OF <Ennn[nn]> or <Wnnn[nn]>
- Indication of a part of the FIR with reference to latitude and longitude:
  any combination of the above two cases;
- Location with reference to a **LINE** described with lat/lon of two points;
- With reference to a location with ICAO location abbreviation CCCC (normally, this should be the case of SIGMET based on special air-report in which the reported phenomenon is given with reference to an airport or another object with ICAO location indicator CCCC);
- With reference to geographical features well known internationally.

More details on reporting the location of the phenomenon are given in Appendix 6 to Annex 3 and in Appendix F to this Guide.

3.4.3.1.5 Flight level and extent

FL<nnn>
or FL<nnn/nnn>
or TOP FL<nnn>
or [TOP] ABV FL<nnn>
or [TOP] BLW FL<nnn>

The location or extent of the phenomenon in the vertical is given by one or more of the above abbreviations, as follows:

- reporting single level – **FL<nnn>**
- reporting a layer – **FL<nnn/nnn>**, where the lower level is reported first; this is used particularly in reporting turbulence and icing;
- reporting a level or layer with reference to one FL using ABV or BLW
- reporting the level of the tops of the TS clouds using the abbreviation TOP.

Examples:

EMBD TS … TOP ABV FL340
SEV TURB … FL180/210
SEV ICE … BLW FL150
SEV MTW … FL090

3.4.3.1.6 Movement

MOV <direction> <speed>KMH[KT]
or
STNR

Direction of movement is given with reference to one of the eight points of compass. Speed is given in KMH or KT. The abbreviation STNR is used if no significant movement is expected.

Examples:

MOV NW 30KMH
MOV E 25KT

3.4.3.1.7 Expected changes in intensity

The expected evolution of the phenomenon’s intensity is indicated by one of the following abbreviations:

INTSF – intensifying
WKN – weakening
NC – no change

3.4.4 Structure of the meteorological part of VA SIGMET

3.4.4.1 The general structure of the meteorological part of the SIGMET message is given in the table below:

Start of the second line of the message

1	**2**			**3**
FIR/UIR or CTA	Phenomenon	Volcano		Volcanic ash cloud observed or forecast
		Name	Location	
<CCCC> <name> FIR [/UIR][CTA]	VA	[ERUPTION] [MT <name>]	[LOC <lat,lon>]	VA CLD OBS AT <GGgg>Z VA CLD FCST

4			5
Extent of the cloud			Expected movement
Vertical	Horizontal	Position	
FL <nnn/nnn>	[APRX <nnn> KM[NM] BY <nnn> KM[NM]]	[<lat,lon> - <lat,lon> - …]	MOV <direction> <speed>

6	
Volcanic ash cloud forecast at the end of the period of validity	
FCST time	Position
FCST <GGgg>Z	VA CLD APRX <lat,lon> - <lat,lon> - …

3.4.4.2 Name and location of the volcano and/or indicator for VA cloud

VA [ERUPTION] [MT <name>] [LOC <lat,lon>] VA CLD
or
VA CLD

3.4.4.2.1 The description of the volcano injecting volcanic ash consists of the following elements:

- starts with the abbreviation **VA** – volcanic ash;

- the word **ERUPTION** is used when the SIGMET is issued for a known volcanic eruption;
- geographical/location information:
  - i. if the name of the volcano is known, it is given by the abbreviation **MT** – mountain, followed by the name;
    e.g., **MT RABAUL**
  - ii. location of the volcano is given by the abbreviation **LOC** – location, followed by the latitude and longitude in degrees and minutes;
    e.g., **LOC N3520 E09040**
- this section of the message ends with the abbreviation **VA CLD** – volcanic ash cloud.

3.4.4.2.2 If the FIR is affected by a VA cloud with no information about the volcanic eruption which generated the cloud, only the abbreviation **VA CLD** should be included in the SIGMET.

3.4.4.3 Time of observation or indication of forecast

VA CLD OBS AT <GGgg>Z
or
VA CLD FCST

The time of observation is taken from the source of the observation – satellite image, special air-report, report from a volcanological station, etc. If the VA cloud is not yet observed over the FIR but the volcanic ash advisory received from the responsible VAAC indicates that the cloud is going to affect the FIR within the next 12 hrs, SIGMET should be issued according to paragraph 2.4 above and the abbreviation VA CLD FCST should be used.

Examples:

VA CLD OBS AT 0100Z
VA CLD FCST

3.4.4.4 <u>Level and extent of the volcanic ash cloud</u>

FL<nnn/nnn> [APRX <nnn>KM BY <nnn>KM] [<P1(lat,lon) - P2(lat,lon) - … >]
or
FL<nnn/nnn> [APRX <nnn>NM BY <nnn>NM] [<P1(lat,lon) - P2(lat,lon) - … >]

FL<nnn/nnn>	The layer of the atmosphere where the VA cloud is situated, given by two flight levels from the lower to the upper boundary of the cloud
[APRX <nnn>KM BY <nnn>KM] or [APRX <nnn>NM BY <nnn>NM] or [nnKM WID LINE BTN (nnNM WID LINE BTN]	Approximate horizontal extent of the VA cloud in KM or NM; or along line with defined width (WID)
[<P1(lat,lon) – P2(lat,lon) - … >]	Approximate description of the VA cloud by a number of points given with their geographical coordinates[1]; the points should be separated by hyphen

[1] The format of geographical coordinates reporting in SIGMET is given in Appendix F.

If the VA cloud spreads over more than one FIR, separate SIGMETs should be issued by all MWOs whose FIRs are affected. In such a case, the description of the volcanic ash cloud by each MWO should encompass the part of the cloud, which lies over the MWO's area of responsibility. The MWOs should try and keep the description of the volcanic ash clouds consistent by checking the SIGMET messages received from the neighboring MWOs.

Examples:

FL100/180 APRX 10KM BY 50KM N0100 E09530 – N1215 E11045
FL 150/210 S0530 E09300 – N0100 E09530 – N1215 E11045

3.4.4.5 Movement or expected movement of the VA cloud

MOV <direction> <speed>KMH[KT]
or
STNR

The direction of movement is given by the abbreviation **MOV** – moving, followed by one of the eight points of compass: N, NE, E, SE, S, SW, W, NW. The speed of movement is given in KMH or KT.

Examples:

MOV E 35KMH
MOV SW 20KT
STNR

3.4.4.6 Forecast position of the VA cloud at the end of the validity period of the SIGMET message

FCST <GGgg>Z VA CLD APRX <P1(lat,lon) - P2(lat,lon) - … >

The **GGggZ** group should indicate the end of validity period given in the first line of the SIGMET message. The description of the expected position of the volcanic ash cloud is given by a number of points forming a simplified geometrical approximation of the cloud.

3.4.4.7.2 When the wind direction distribution with height determines that the cloud is spread horizontally into different directions at different height layers the VA cloud may need to be described by more than one layer; the different layers should be indicated by flight levels in the form FL<nnn/nnn>.

3.4.5 Structure of the meteorological part of TC SIGMET

3.4.5.1 The general structure of the meteorological part of the TC SIGMET is given in the table below:

Start of the second line of the message

1	2	3		4
FIR/UIR or CTA	TC name	Observed or forecast		Extent
		Time	Location of TC centre	
<CCCC> <name> FIR [/UIR][CTA]	TC <name>	OBS AT <GGgg>Z [FCST]	<lat,lon>	CB TOP [ABV or BLW] FL<nnn> WI <nnn>KM[NM] OF CENTRE

5	6	7
Expected movement	Intensity change	Forecast of the centre position at the end of the validity period
MOV <direction> <speed>KMH[KT] or STNR	INTSF or WKN or NC	FCST <GGgg>Z TC CENTRE <lat,lon>

3.4.5.2 Name of the tropical cyclone

TC <name>

The description of the tropical cyclone consists of the abbreviation TC followed by the international name of the tropical cyclone given by the corresponding WMO RSMC.

Examples:

TC GLORIA
TC 04B

3.4.5.3 Time of observation or indication of forecast

OBS AT <GGgg>Z
or
FCST

The time in UTC is given in hours and minutes, followed by the indicator Z. Normally, time is taken from own observations or from a TC advisory received from the responsible TCAC. If the TC is not yet observed in the FIR but the tropical cyclone advisory received from the responsible TCAC, or any other TC forecast used by the MWO, indicates that the TC is going to affect the FIR within the next 12 hrs, SIGMET should be issued, according to paragraph 2.4 above, and the abbreviation FCST should be used.

Examples:

OBS AT 2330

3.4.5.4 Location of the TC centre

<location>

The location of the TC centre is given by its lat,lon coordinates in degrees and minutes.

Examples:

N1535 E14230

3.4.5.5 Vertical and horizontal extent of the CB cloud formation around TC centre

CB TOP [ABV or BLW] <FLnnn> WI <nnnKM or nnnNM> OF CENTRE

Examples:

CB TOP ABV FL450 WI 200NM OF CENTRE
CB TOP FL500 WI 250KM OF CENTRE

3.4.5.6 Movement or expected movement

MOV <direction> <speed>KMH[KT]
or
STNR

Direction of movement is given with reference to one of the eight points of compass. Speed is given in KMH or KT. The abbreviation STNR is used if no significant movement is expected.

Examples:

MOV NW 30KMH
MOV E 25KT

3.4.5.7 Intensity change

The expected change of the intensity of the tropical cyclone is indicated by one of the following abbreviations:

INTSF – intensifying
WKN – weakening
NC – no change

3.4.5.8 Forecast location of the TC centre at the end of the validity period of the SIGMET message

FCST <GGgg>Z TC CENTRE <location>

Normally, the time given by GGggZ should be the same as the end of validity period indicated in the first line of the SIGMET message. Since the period of validity is up to 6 hours (normally, 6 hours), this is a 6-hour forecast of the position of the TC centre.

The location of the TC centre is given by its lat, lon coordinates following the general rules of reporting lat, lon information provided in Appendix F to this Guide.

Examples:

FCST 1200Z TC CENTRE N1430 E12800

3.4.6 Cancellation of SIGMET

3.4.6.1 If during the validity period of a SIGMET the phenomenon for which the SIGMET had been issued is no longer occurring or no longer expected, the SIGMET should be cancelled by the issuing MWO. The cancellation is done by issuing same type of SIGMET with the following structure:

- WMO heading with the same data type designator;
- First line that contains as period of validity the remaining time of the original period of validity;
- Second line, which contains the name of the FIR or CTA, the combination CNL SIGMET, followed by the sequential number of the original SIGMET and its validity period.

Examples:

1. Cancellation of a WS or WC SIGMET:

WSXY31 YUSO 101200
YUDD SIGMET 5 VALID 101200/101600 YUSO-
YUDD SHANLON FIR …

Cancellation SIGMET:

WSXY31 YUSO 101430
YUDD SIGMET 6 VALID 101430/101600 YUSO-
YUDD SHANLON FIR CNL SIGMET 5 101200/101600=

2. Cancellation of a VA SIGMET

WVXY31 YUSO 131518
YUDD SIGMET 03 VALID 131515/132115 YUSO-
YUDD SHANLON FIR …

Cancellation SIGMET:

WVXY31 YUSO 132000
YUDD SIGMET 04 VALID 132000/132115 YUSO-
YUDD SHANLON FIR CNL SIGMET 03 13151500/132115=

or, in case that the volcanic ash cloud moves to an adjacent FIR:

WVXY31 YUSO 132000
YUDD SIGMET 04 VALID 132000/132115 YUSO-
YUDD SHANLON FIR CNL SIGMET 03 13151500/132115 VA MOV TO YUDO FIR=

3.5 Dissemination

3.5.1 SIGMET information is part of the operational meteorological (OPMET) information. According to Annex 3 the telecommunication facilities used for the exchange of the operational meteorological information should be the aeronautical fixed service (AFS).

3.5.2 The AFS consists of a terrestrial segment, AFTN or ATN (AMHS), and a satellite segment which comprises the SADIS and ISCS satellite broadcasts provided by the UK and the USA respectively.

3.5.3 Currently, AFTN links should be used by the MWOs to send the SIGMET, as follows:

- to the adjacent MWOs and ACCs* using direct AFTN addressing;
- When required for VOLMET or D-VOLMET, SIGMET should be sent to the relevant centre providing the VOLMET service;
- SIGMET should be sent to all regional OPMET Data Banks (RODB);
- It should be arranged that SIGMET is relayed to the SADIS and ISCS providers for satellite dissemination, as well as to the WAFCs London and Washington, either through the ROBEX scheme, or directly by the issuing MWO;
- SIGMET for volcanic ash should be disseminated to the responsible VAAC.

3.5.4 Through SADIS and ISCS, SIGMET is disseminated to all authorised users . In this way, SIGMET is available on a global basis, meeting the aeronautical requirements.

* *Note: For this dissemination it is required that SIGMET is available at the ACCs for transmission to aircraft in flight for the route ahead up to a distance corresponding to two hours flying time.*

APPENDIX A

FASID TABLE MET 1B

METEOROLOGICAL WATCH OFFICES

EXPLANATION OF THE TABLE

Column

1 Location of the meteorological watch office (MWO). Locations, other than aerodromes, where an MWO is to be established are shown in parentheses.

2 ICAO location indicator, assigned to the MWO.

3 Name of the FIR, UIR and/or search and rescue region (SRR) served by the MWO.

4 ICAO location indicator assigned to the ATS unit serving the FIR, UIR and/or SRR.

5 Indication of requirement for the MWO to issue SIGMET for volcanic ash.

6 Indication of requirement for the MWO to issue SIGMET for tropical cyclones.

7 Remarks.

Note. — Unless otherwise stated in column 5, the MWO listed in column 1 is the designated collecting centre for the air-reports received within the corresponding FIR/UIR listed in column 3.

MWO Location	ICAO loc. ind.	Area served		SIGMET		Remarks
		Name	ICAO loc. ind.	VA	TC	
1	2	3	4	5	6	7
AUSTRALIA						
ADELAIDE/Adelaide	YPRM	Melbourne FIR [1)]	YMMM			MWOs have areas of responsibility (AOR) defined by specific forecast area boundaries. These boundaries are not aligned with FIR boundaries MWO Darwin is designated to issue VA SIGMET for the whole Brisbane and Melbourne FIRs.
BRISBANE/Brisbane	YBRF	Brisbane FIR [2)] Melbourne FIR [3)]	YBBB YMMM		X	
DARWIN/Darwin	YDRM	Brisbane FIR [4)] Melbourne FIR [5)]	YBBB YMMM	X	X	
HOBART/Hobart	YMHF	Melbourne FIR [6)]	YMMM			
MELBOURNE/Melbourne	YMRF	Brisbane FIR [7)] Melbourne FIR [8)]	YBBB YMMM			
PERTH/Perth	YPRF	Brisbane FIR [9)] Melbourne FIR [10)]	YBBB YMMM		X	
SYDNEY/Sydney	YSRF	Brisbane FIR [11)] Melbourne FIR [12)]	YBBB YMMM			
TOWNSVILLE	YBTL	Brisbane FIR [13)]	YBBB			
BANGLADESH						
DHAKA/Zia Intl	VGZR	Dhaka FIR and SRR	VGFR	X	X	
CAMBODIA						
PHNOM-PENH/Pochentong	VDPP	Phnom-Penh FIR and SRR	VDPP	X	X	Not Implemented
CHINA						
BEIJING/Capital	ZBAA	Beijing FIR and SRR	ZBPE	X		
GUANGZHOU/Baiyun	ZGGG	Guangzhou FIR and SRR	ZGZU	X	X	
KUNMING/Wujiaba	ZPPP	Kunming FIR and SRR	ZPKM	X		
LANZHOU/Zhongchuan	ZLLL	Lanzhou FIR and SRR	ZLHW	X		
HAIKOU/Meilan	ZJSY	Sanya FIR and SRR	ZJSA	X	X	
SHANGHAI/Hongqiao	ZSSS	Shanghai FIR and SRR	ZSHA	X	X	
SHENYANG/Taoxian	ZYTX	Shenyang FIR and SRR	ZYSH	X		
TAIBEI/Taibei Intl	RCTP	Taibei FIR and SRR	RCAA	X	X	
URUMQI/Diwopu	ZWWW	Urumqi FIR and SRR	ZWUQ	X		
WUHAN/Tianhe	ZHHH	Wuhan FIR and SRR	ZHWH	X		
HONG KONG/Hong Kong Intl	VHHH	Hong Kong FIR and SRR	VHHK	X	X	
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA						
PYONGYANG/Sunan	ZKPY	Pyongyang FIR and SRR	ZKKK	X	X	Not Implemented
FIJI						
NADI/Nadi Intl	NFFN	Nadi FIR and SRR	NFFF	X	X	
FRENCH POLYNESIA						
TAHITI/Faaa	NTAA	Tahiti FIR and SRR	NTTT	X	X	
INDIA						
CHENNAI/Chennai	VOMM	Chennai FIR and SRR	VOMF	X	X	

MWO Location	ICAO loc. ind.	Area served		SIGMET		Remarks
		Name	ICAO loc. ind.	VA	TC	
1	2	3	4	5	6	7
DELHI/Indira Ghandi Intl	VIDP	Delhi FIR and SRR	VIDF	X	X	
KOLKATA/Kolkata	VECC	Kolkata FIR and SRR	VECF	X	X	
MUMBAI/Jawaharlal Nehru Intl	VABB	Mumbai FIR and SRR	VABF	X	X	
INDONESIA						
JAKARTA/Soekarno-Hatta Intl	WIII	Jakarta FIR/UIR and SRR	WIIF	X	X	
UJUNG PANDANG/Hasanuddin	WAAA	Ujung Pandang FIR/UIR and SRR	WAAF	X	X	
JAPAN						
(TOKYO/Tokyo)	RJTD	Fukuoka FIR and Tokyo SRR	RJJJ	X	X	
LAO PEOPLE'S DEMOCRATIC REPUBLIC						
VIENTIANE/Wattay	VLVT	Vientiane FIR and SRR	VLVT	X		Not Implemented
MALAYSIA						
KOTA KINABALU/Kota Kinabalu Intl	WBKK	Kota Kinabalu FIR and SRR	WBFC	X	X	
KUALA LUMPUR/Kuala Lumpur Intl	WMKK	Kuala Lumpur FIR and SRR	WMFC	X	X	
MALDIVES						
MALE/Hulule	VRMM	Male FIR and SRR	VRMM	X	X	
MONGOLIA						
ULAN BATOR/Ulan Bator	ZMUB	Ulan Bator FIR and SRR	ZMUB	X		
MYANMAR						
YANGON/Yangon Intl	VYYY	Yangon FIR and SRR	VYYY	X	X	
NAURU						
NAURU I./Nauru	ANAU	Nauru FIR and SRR	ANAU	X	X	Not Implemented
NEPAL						
KATHMANDU/Tribhuvan Intl	VNKT	Kathmandu FIR and SRR	VNSM	X		
NEW ZEALAND						
(Wellington/Kelburn)	NZKL	Auckland Oceanic FIR and SRR New Zealand FIR AND SRR	NZZO NZZC	X		Operational monitoring coverage south of 60˚S is limited due to the lack of information
PAKISTAN						
KARACHI/Quaid-E-Azam Intl	OPKC	Karachi FIR and SRR	OPKR	X	X	
LAHORE/Lahore	OPLA	Lahore FIR and SRR	OPLR	X		
PAPUA NEW GUINEA						
PORT MORESBY/Jacksons	AYPY	Port Moresby FIR and SRR	AYPY	X	X	
PHILIPPINES						
MANILA/Ninoy Aquino Intl	RPLL	Manila FIR and SRR	RPHI	X	X	
REPUBLIC OF KOREA						
INCHEON/Incheon Intl	RKSI	Incheon FIR and SRR	RKRR	X	X	
SINGAPORE						
SINGAPORE/Singapore Changi	WSSS	Singapore FIR and SRR	WSJC	X	X	
SOLOMON ISLANDS						

MWO Location	ICAO loc. ind.	Area served		SIGMET		Remarks
		Name	ICAO loc. ind.	VA	TC	
1	2	3	4	5	6	7
HONIARA/Henderson	AGGH	Honiara FIR and SRR	AGGG	X	X	Not Implemented
SRI LANKA						
COLOMBO/Katunayake	VCBI	Colombo FIR and SRR	VCBI	X	X	
THAILAND						
BANGKOK/Bangkok Suvarnabhumi Intl	VTBS	Bangkok FIR and SRR	VTBB	X	X	
UNITED STATES						
(ANCHORAGE)	PAWU	Anchorage FIR	PAZA	X		
HONOLULU/Honolulu Intl	PHFO	Oakland Oceanic FIR South of 30N, East of 130E and West of 140W; Honolulu SRR.	KZOA	X	X	
(KANSAS CITY/Missouri)	KMKC	Oakland Oceanic FIR North of 30N.	KZOA	X		
VIET NAM						
(Gia Lam)	VVGL	Hanoi FIR and SRR Ho-Chi-Minh FIR and SRR	VVNB VVTS	X X	X X	

1) limited by the coordinates: 27S/128E;27S/135E;26S/138E; 2806S/14012E;29S/142E; 3414S/14205E;3345S/14045E; 40S/14045E;45S/14045E; 45S/129E;33S/129E;30S/129E; 2715S/12830E.

2) outside the AOR of YBTL MWO and limited by the coordinates: 0937S/14102E;0916S/14203E; 0913S/14206E;0911S/14214E; 0914S/14217E;0922S/14230E; 0922S/14230E;0923S/14236E; 0919S/14248E;0908S/14352E; 0924S/14414E;0957S/14405E; 1130S/14402E;1144S/14404E; 12S/144E;12S/155E;14S/155E; 14S/16115E;1740S/163E; 2830S/163E;2830S/155E; 2850S/15316E;29S/150E; 29S/14330E;26S/138E; 14S/138E;0937S/14102E.

3) limited by the coordinates: 26S/138E;29S/143E;29S/142E; 2806S/14012E;26S/138E.

4) limited by the coordinates: 1055S/12447E;0920S/12650E; 07S/135E;0950S/13940E; 0950S/141E;14S/138E; 18S/138E;2215S/138E; 26S/138E;2218S/13638E; 2128S/13609E;2111S/13134E; 2151S/13058E;2313S/12828E; 2322S/12629E;2327S/12415E; 2250S/12330E;2030S/12330E; 20S/129E;16S/12915E; 1528S/12806E;1450S/12825E; 14S/12730E;1345S/12609E; 14S/124E;1055S/12447E.

5) limited by the coordinates: 2250S/12330E;2327S/12415E; 2322S/12629E;2313S/12828E; 2151S/13058E;2111S/13134E; 2128S/13609E;2218S/13638E; 26S/138E;27S/135E; 2715S/12830E;25S/12815E; 25S/12330E;2250S/12330E.

6) limited by the coordinates: 40S/14045E;40S/143E; 3953S/14353E;4006S/14759E; 40S/150E;45S/150E; 45S/14045E;40S/14045E.

7) limited by the coordinates: 3730S/15033E;3730S/163E; 45S/163E;45S/150E; 4434S/150E;4351S/15040E; 43S/151E;3811S/15019E; 3730S/15033E.

8) limited by the coordinates: 3345S/14045E;3414S/14205E; 3510S/14728E;3730S/150E; 3730S/15033E;3811S/15019E; 43S/151E;4351S/15040E; 4434S/150E;40S/150E; 4006S/14759E;3953S/14353E; 40S/143E;40S/14045E; 3811S/14045E;3345S/14045E.

9) limited by the coordinates: 12S/110E;12S/12320E; 1055S/12447E;14S/124E; 1345S/12609E;14S/12730E; 1450S/12825E;1528S/12806E; 16S/12915E;20S/129E; 2030S/12330E;2250S/12330E; 2153S/12226E; then along the major arc of a circle of 15 NM radius centred on 2143S 12213E; 2133S/12201E;2026S/12045E; then along the minor arc of a circle of 120NM radius centred on 2023S 11837E; 1823S/11825E;1753S/11822E; then along the minor arc of a circle of 150NM radius centred on 2023S 11837E; 1934S/11606E;1931S/11331E; 12S/110E.

10) limited by the coordinates: 06S/75E;02S/78E;02S/92E;12S/107E;12S/110E;1931S/11331E;1934S/11606E; then along the minor arc of a circle of 120NM radius centred on 2023S 11837E; 1753S/11822E;1823S/11825E; then along the minor arc of a circle of 120NM radius centred on 2023S 11837E; 2026S/12045E;2133S/12201E; then along major arc of a circle of 15.0NM radius centred on 2143S 12213E; 2153S/12225E;2250S/12330E; 25S/12330E;25S/12815E; 2715S/12830E;30S/129E; 30S/129E;33S/129E;45S/129E; 45S/75E;06S/75E.

11) limited by the coordinates: 29S/14632E;29S/150E; 2850S/15328E;2830S/155E; 2830S/163E;3730S/163E; 3730S/15033E 3657S/15045E; then east of the minor arc of a circle of 120NM radius centred on 3457S/15032E; 3519S/15256E;3421S/15140E; 3359S/15201E;3351S/15154E; 3328S/15148E;3315S/15126E; 3312S/15114E;3320S/15042E; 3327S/15033E;3206S/14850E; 29S/14632E.

12) limited by the coordinates: 29S/142E;29S/14330E; 29S/14632E;3206S/14850E; 3327S/15033E;3320S/15042E; 3312S/15114E;3315S/15126E; 3328S/15148E;3351S/15154E; 3359S/15201E;3421S/15140E; 3519S/15256E; then east of the minor arc of a circle of 120NM radius centred on 3457S 15032E; 3657S/15045E;3730S/15033E; 3730S/150;3510S/14728E; 3414S/14205E;29S/142E.

13) limited by the coordinates: 14S/138E;10S/141E;09S/142E; 09S/144E;13S/145E;15S/147E; 1817S/148E;2309S/15252E; 2334S/14811E;1818S/14332E; 18S/138E;14S/138E.

APPENDIX B

FASID TABLE MET 3A

TROPICAL CYCLONE ADVISORY CENTRES

EXPLANATION OF THE TABLE

Column

1. Location of the tropical cyclon advisory centre (TCAC).
2. ICAO location indicator of TCAC (for use in the WMO heading of advisory bulletin).
3. Area of responsibility for the preparation of advisory information on tropical cyclones by the TCAC in Column 1.
4. Period of operation of the TCAC.
5. MWOs to which the advisory information on tropical cyclones should be sent.
6. ICAO location indicator of the MWOs in Column 4.

Note: MWOs in italics are situated outside the Asia/Pacific Region.

TROPICAL CYCLONE ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	PERIOD OF OPERATION[2]	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT	
				Name	ICAO LOC. IND.
1	2	3	4	5	6
Darwin (Australia)	YDRM (ADRM)	South-East Indian Ocean[1] N: 0°S S: 36°S W: 90°E E: 141°E South-West Pacific Ocean[2]: N: 0°S S: 40°S W: 141°E E: 160°E	November – April	Adelaide[3] Brisbane Colombo Darwin Hobart[3] Honiara[4] Jakarta Melbourne[3] Perth Port Moresby Sydney[3] Townsville[3] Ujung Pandang	YPRM YBRF VOMM YDRM YMHF AGGH WIII YMRF YPRF AYPY YSRF YBTL WAAA
Honolulu (United States)	PHFO	Central Pacific: N: 60°N S: 0°N W: 180°W E: 140°W	May – November	Anchorage Honolulu Kansas City Tahiti	PAWU PHFO KKCI NTAA
Miami (United States)	KNHC	Eastern Pacific: N: 60°N S: 0°N W: 140°E E: Coastline	May – November	Honolulu Kansas City ~~*Miami*~~ Tahiti	PHFO KKCI ~~*KNHC*~~ NTAA
Nadi (Fiji)	NFFN	Southern Pacific: N: 0°S S: 40°S W: 160°E E: 120°W	November – April	Brisbane Hobart[3] Honiara[4] Honolulu Melbourne[3] Nadi Sydney[3] Tahiti Townsville[3] Wellington	YBRF YMHF AGGH PHFO YMRF NFFN YSRF NTAA YBTL NZKL
New Delhi (India)	VIDP	1) Bay of Bengal 2) Arabian Sea N: Coastline S: 5°N W: 60°E E: 100°E	April – June October – December	Chennai Colombo Dhaka ~~Delhi~~ Jakarta	VOMM VCBI VGZR ~~VIDP~~ WIII

TROPICAL CYCLONE ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	PERIOD OF OPERATION[2)]	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT	
				Name	ICAO LOC. IND.
1	2	3	4	5	6
				Karachi	OPKC
				Kuala Lumpur	WMKK
				Male	VRMM
				Mumbai	VABB
				Tehran	*OIII*
				Yangon	VYYY
Tokyo (Japan)	RJTD	Western Pacific (incl. South China Sea)		Bangkok	VTBS
				Guangzhou	ZGGG
				Gia Lam	VVGL
				Hong Kong	VHHH
				Honolulu	PHFO
				Jakarta	WIII
				Kansas City	KMKC
				Kota Kinabalu	WBKK
				Kuala Lumpur	WMKK
				Manila	RPLL
				Nadi	NFFN
				Phnom-Penh[4)]	VDPP
				Pyongyang[4)]	ZKPY
				Shanghai	ZSSS
				Singapore	WSSS
				Incheon	RKSI
				Taibei	RCTP
				Tokyo	RJTD
				Ujung Pandang	WAAA

NOTES:

1) Co-ordinates of the areas of responsibility of the Darwin and Nadi Tropical Cyclone Advisory Centres to be confirmed.
2) Indicates approximately the main seasons for tropical cyclones.
3) Tropical cyclone SIGMET for the Australian FIRs is issued by MWOs: Brisbane, Darwin and Perth.
4) MWO not implemented

APPENDIX C

FASID TABLE MET 3B

VOLCANIC ASH ADVISORY CENTRES

EXPLANATION OF THE TABLE

Column

3. Location of the volcanic ash advisory centre (VAAC).
4. ICAO location indicator of VAAC (for use in the WMO heading of advisory bulletin).
5. Area of responsibility for the preparation of advisory information on volcanic ash by the VAAC in column 1.
6. ICAO Region of the State in column 5.
7. State of the MWO in column 6.
8. MWOs to which the advisory information on volcanic ash should be sent.
9. ICAO location indicator of the MWOs in column 6.
10. ACCs to which the advisory information on volcanic ash should be sent.
11. ICAO location indicator of the ACCs in column 8.

VOLCANIC ASH ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILIT Y	ICAO REGIO N	STATE	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT		ACC TO WHICH ADVISORY INFORMATION IS TO BE SENT	
					Name	ICAO LOC. IND.	Name	ICAO LOC. IND.
1	2	3	4	5	6	7	8	9
Anchorage (United States)	PAWU	Anchorage Oceanic Anchorage Continental Anchorage Arctic and west to E150, north of N60	NAM	USA	Anchorage	PAWU	Anchorage	PAZA
			APAC	Japan	Tokyo	RJTD	Saporo Tokyo Fukuoka Naha	RJCG RJTG RJDG RORG
Darwin (Australia)	YDRM (ADRM)	Southward from N10 and from E100 to E160 and the Perth FIR between E100 and E75, Colombo FIR and those parts of the Kuala Lumpur, Bangkok, Chennai, Yangon and Kolkata FIRs lying within N10 E100 to N20 E100 to N20 E82 to N10 E82 to N6 E78 to S2 E78 to E6 E75	APAC	Australia	Adelaide[3)]	YPRM	Adelaide	YPAD
			APAC	Thailand	Bangkok	VTBS	Bangkok	VTBB
			APAC	Australia	Brisbane[3)]	YBRF	Brisbane Cairns	YBBN YBCS
			APAC	India	Chennai	VOMM	Chennai	VOMF
			APAC	Australia	Darwin	YDRM	Darwin	YPDN
			APAC	Viet Nam	Gia Lam	VVGL	Hanoi Ho-Chi-Minh	VVNB VVTS
			APAC	Australia	Hobart[3)]	YMHF	Hobart	YMHB
			APAC	Solomon I.	Honiara[2)]	AGGH	Honiara	AGGH
			APAC	Indonesia	Jakarta	WIII	Jakarta	WIIF
			APAC	Malaysia	Kota Kinabalu	WBKK	Kota Kinabalu	WBFC
			APAC	Malaysia	Kuala Lumpur	WMKK	Kuala Lumpur	WMFC
			APAC	Philippines	Manila	RPLL	Manila	RPHI
			APAC	Australia	Melbourne[3)]	YMRF	Melbourne	YMMM
			APAC	Australia	Perth[3)]	YPRF	Perth	YPPH
			APAC	Papua New Guinea	Port Moresby	AYPY	Port Moresby	AYPM
			APAC	Singapore	Singapore	WSSS	Singapore	WSJC
			APAC	Australia	Sydney[3)]	YSRF	Sydney	YSSY
			APAC	Australia	Townsville[3)]	YBTL	Townsville	YBTL
			APAC	Indonesia	Ujung Pandang	WAAA	Ujung Pandang	WAAF
			APAC	Myanmar	Yangon	VYYY	Yangon	VYYY
Tokyo (Japan)	RJTD	N60 to N10 – and from E90 to Oakland Oceanic and Anchorage Oceanic and Continental FIR	APAC	Thailand	Bangkok	VTBS	Bangkok	VTBB
			EUR	Russian Federation	Blagove-schensk	UHBB	Blagoveschensk	UHBB
			APAC	China	Beijing	ZBAA	Beijing Huhhot Taiyuan	ZBPE ZBHH ZBYN

VOLCANIC ASH ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	ICAO REGION	STATE	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT		ACC TO WHICH ADVISORY INFORMATION IS TO BE SENT	
					Name	ICAO LOC. IND.	Name	ICAO LOC. IND.
1	2	3	4	5	6	7	8	9
		boundaries	EUR	Russian Federation	Bratsk	UIBB	Bratsk	UIBB
			EUR	Russian Federation	Chita	UIAA	Chita	UIAA
			APAC	Viet Nam	Gia Lam	VVGL	Hanoi Ho-Chi-Minh	VVNB VVTS
			APAC	China	Guangzhou	ZGGG	Guangzhou Changsha Guilin Nanning	ZGZU ZGCS ZGKL ZGNN
			APAC	China	HAIKOU/ Meilan	ZJSY	Sanya	ZJSA
			APAC	China	Hong Kong	VHHH	Hong Kong	VHHH
					Incheon	RKSI	Incheon	RKRR
			EUR	Russian Federation	Irkutsk	UIII	Irkutsk	UIII
			EUR	Russian Federation	Khabarovsk	UHHH	Khabarovsk	UHHH
			EUR	Russian Federation	Kirensk	UIKK	Kirensk	UIKK
			APAC	China	Kunming	ZPPP	Kunming Chengdu Chongqing	ZPKM ZUDS ZUCK
			APAC	China	Lanzhou	ZLLL	Lanzhou Xi'an	ZLAN ZLSN
			EUR	Russian Federation	Magadan	UHMM	Magadan	UHMM
			EUR	Russian Federation	Magdagachi	UHBI	Magdagachi	UHBI
			APAC	Philippines	Manila	RPLL	Manila	RPHI
			EUR	Russian Federation	Nik.-na-Amure	UHNN	Nik.-na-Amure	UHNN
			EUR	Russian Federation	Okha	UHSH	Okha	UHSH
			EUR	Russian Federation	Okhotsk	UHOO	Okhotsk	UHOO
			EUR	Russian Federation	Pet.-Kamchatsky	UHPP	Pet.-Kamchatsky	UHPP
			APAC	Cambodia	Phnom-Penh[2)]	VDPP	Phnom-Penh	VDPP
			APAC	DPR Korea	Pyongyang[2)]	ZKPY	Pyongyang	ZKKK
			APAC	China	Shanghai	ZSSS	Shanghai Hefei Jinan Nanchang Nanjing Xiamen Qingdao	ZSHA ZSOF ZSTN ZSCN ZSNJ ZSAM ZSQD

VOLCANIC ASH ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	ICAO REGION	STATE	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT		ACC TO WHICH ADVISORY INFORMATION IS TO BE SENT	
					Name	ICAO LOC. IND.	Name	ICAO LOC. IND.
1	2	3	4	5	6	7	8	9
			APAC	China	Shenyang	ZYTX	Shenyang Dalian Hailar Harbin	ZYSH ZYTL ZBLA ZYHB
			APAC	China	Taibei	RCTP	Taibei	RCAA
			APAC	Japan	Tokyo	RJTD	Saporo Tokyo Fukuoka Naha	RJCG RJTG RJDG RORG
			APAC	Mongolia	Ulan-Bator	ZMUB	Ulan-Bator	ZMUB
			APAC	China	Urumqi	ZWWW	Urumqi	ZWWW ZWUQ
			APAC	Lao PDR	Vientiane	VLVT	Vientiane	VLVT
			EUR	Russian Federation	Vladivostok	UHWW	Vladivostok	UHWW
			APAC	China	Wuhan	ZHHH	Wuhan	ZHWH
			EUR	Russian Federation	Yuzhnosakhalinsk	UHSS	Yuzhnosakhalinsk	UHSS
Washington (United States)	KNES	Oakland Oceanic FIR	NAM	USA	Honolulu	PHFO	Oakland	KZOA
			NAM	USA	Kansas City	KKCI	Guam	PGZU
			APAC	Japan	Tokyo	RJTD	Saporo Tokyo Fukuoka Naha	RJCG RJTG RJDG RORG
			APAC	Australia	Darwin	YDRM	Darwin	YPDN
Wellington (New Zealand)	NZKL	Southward from the Equator and from E160 to W140[1)]	APAC	Australia	Brisbane[3)]	YBRF	Brisbane	YBBN
			APAC	Australia	Darwin	YDRM	Darwin	YPDN
			APAC	USA	Honolulu	PHFO	Oakland	KZOA
			APAC	Solomon I.	Honiara[2)]	AGGH	Honiara	AGGH
			APAC	Australia	Melbourne[3)]	YMRF	Melbourne	YMMM
			APAC	Fiji	Nadi	NFFN	Nadi	NFFF
			APAC	Nauru	Nauru[2)]	ANAU	Nauru	ANAU
			APAC	Australia	Sydney[3)]	YSRF	Sydney	YSSY
			APAC	French Polynesia	Tahiti	NTAA	Tahiti	NTTT
			APAC	New Zealand	Wellington	NZKL	Auckland Christchurch	NZZO NZZC

Notes: –

1) Coverage south of 60°S latitude is currently not feasible.
2) MWO not implemented.
3) MWO Darwin is designated to issue VA SIGMET for Brisbane and Melbourne FIRs.

APPENDIX D

LIST OF THE ABBREVIATIONS AND CODE WORDS USED IN SIGMET

ABV	Above
AND*	And
APRX	Approximate or approximately
AT	At *(followed by time)*
BLW	Below
BY*	By
CB	Cumulonimbus
CENTRE*	Centre *(used to indicate tropical cyclone centre)*
CLD	Cloud
CNL	Cancel *or* cancelled
CTA	Control area
DS	Duststorm
E	East *or* eastern longitude
ERUPTION*	Eruption *(used to indicate volcanic eruption)*
EMBD	Embedded in layer *(to indicate CB embedded in layer of other clouds)*
FCST	Forecast
FIR	Flight information region
FL	Flight level
FRQ	Frequent
FZRA	Freezing rain
GR	Hail
HVY	Heavy *(used to indicate intensity of weather phenomena)*
ICE	Icing
INTSF	Intensify *or* intensifying
ISOL	Isolated
KM	Kilometers
KMH	Kilometers per hour
KT	Knots
LINE*	Line
MOD	Moderate *(used to indicate intensity of weather phenomena)*
MOV	Move *or* moving *or* movement
MT	Mountain
MTW	Mountain waves
N	North *or* northern latitude
NC	No change
NE	North-east
NM	Nautical miles
NW	North-west
OBS	Observed
OBSC	Obscured
OCNL	Occasional
OF*	Of … *(place)*
RA	Rain
RDOACT*	Radioactive
S	South *or* southern latitude
SE	South-east
SEV	Severe *(used e.g. to qualify icing and turbulence reports)*

SFC	Surface
SIGMET	SIGMET *(used to indicate SIGMET information)*
SQL	Squall line
SS	Sandstorm
STNR	Stationary
SW	South-west
TC	Tropical cyclone
TO	To … *(place)*
TOP	Cloud top
TS	Thunderstorm
TURB	Turbulence
UIR	Upper flight information region
VA	Volcanic ash
VALID*	Valid
W	West *or* western longitude
WI	Within
WID	Width
Z	Coordinated Universal Time *(used in meteorological messages)*

** not in the ICAO Doc 8400, ICAO Abbreviations and Codes*

APPENDIX E

METEOROLOGICAL PHENOMENA TO BE REPORTED BY SIGMET

Phenomenon	Description	Meaning
TS	OBSC[2] TS EMBD[3] TS FRQ[4] TS SQL[5] TS OBSC TSGR EMBD TSGR FRQ TSGR SQL TSGR	Obscured thunderstorm(s) Embedded thunderstorm(s) Frequent thunderstorm(s) Squall line thunderstorm(s) Obscured thunderstorm(s) with hail Embedded thunderstorm(s) with hail Frequent thunderstorm(s) with hail Squall line thunderstorm(s) with hail
TC	TC (+ TC name)	Tropical cyclone (+ TC name)
TURB	SEV TURB[6]	Severe turbulence
ICE	SEV ICE SEV ICE FZRA	Severe icing Severe icing due to freezing rain
MTW	SEV MTW[7]	Severe mountain wave
DS	HVY DS	Heavy duststorm
SS	HVY SS	Heavy sandstorm
VA	VA (+ volcano name, if known)	Volcanic ash (+ volcano name)

<u>Notes:</u>

1 *Only one of the weather phenomena listed should be selected and included in each SIGMET*

2. *Obscured (**OBSC**) indicates that the thunderstorm (including, if necessary, CB-cloud which is not accompanied by a thunderstorm) is obscured by haze or smoke or cannot be readily seen due to darkness*

3. *Embedded (**EMBD**) – indicates that the thunderstorm (including, if necessary, CB-cloud which is not accompanied by a thunderstorm) is embedded within cloud layers and cannot be readily recognized*

4. *Frequent (**FRQ**) indicates an area of thunderstorms within which there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75% of the area affected, or forecasts to be affected, by the phenomenon (at a fixed time or during the period of validity)*

5. *Squall line (**SQL**) indicates thunderstorms along a line with little or no space between individual clouds*

6. *Severe (**SEV**) turbulence (**TURB**) refers only to:*

- *low-level turbulence associated with strong surface winds;*
- *rotor streaming;*
- *turbulence whether in cloud or not in cloud (CAT) near to jet streams.*

Turbulence is considered severe whenever the peak value of the cube root of EDR exceeds 0.7.

7. *A mountain wave (**MTW**) is considered severe – whenever an accompanying downdraft of 3.0 m/s (600 ft/min) or more and/or severe turbulence is observed or forecast.*

APPENDIX F

STANDARD FOR REPORTING GEOGRAPHICAL COORDINATES IN SIGMETS

When reporting geographical coordinates of points in SIGMET the following should apply:

1. Each point is represented by a latitude/longitude coordinates in whole degrees or degrees and minutes in the form:

N(S)nn[nn] W(E)nnn[nn]

Note: There is a space between the latitude and longitude value.

Examples: **N3623 W04515**
S1530 E12500
N42 E023

2. In describing lines or polygons, the lat,lon values of the respective points are separated by the combination space-hyphen-space, as in the following examples:

S0530 E09300 – N0100 E09530 – N1215 E11045 – S0820 E10330

S05 E093 – N01 E095 – N12 E110 – S08 E103

Note: It is not necessary to repeat the first point when describing a polygon.

3. When describing a volcanic ash cloud approximate form and position, a limited number of points, which form a simplified geometric figure (a line, or a triangle, or quadrangle, etc.) should be used in order to allow for a straightforward interpretation by the user.

3. Reporting a phenomenon occupying two different geographical areas within the FIR. This is frequently the case with two (or more) separate TS formations occurring in different parts of the FIR at the same time. The question is whether a separate SIGMET should be issued for each formation, or, one SIGMET could include location description for two (or more) geographical areas. The current SIGMET format does not allow for reporting of more than one phenomenon or two different TS areas. Therefore, in cases like this, two separate SIGMETs should be issued. The main concern with issuing separate SIGMETs is that, in general, a new SIGMET for the same FIR would replace the previous one; this may lead to rejecting valid information in case as described above. It should be noted in this regard, that the current SIGMET format allows for using different sequence numbers and thus, for keeping more than one SIGMET at a time valid for the FIR concerned; for instance, a series A1, A2,… could be used for “phenomenon A” and B1, B2, … , for “phenomenon B”.

4. Location with reference to **LINE. LINE** is defined as a straight line between two points drawn on a map in Mercator projection or a straight line between two points which crosses lines of longitude at a constant level.

Example: **NE OF LINE S2520 W11510 – S2730 W12010**

5.

APPENDIX G

EXAMPLES

Note: ***Most examples are based on real SIGMETs mainly from Asia/Pacific region with some exceptions. The real SIGMETs have been corrected in order to make them compliant with the Annex 3 format.***

1. SIGMET

1.1 SIGMET for thunderstorms

```
WSSR20 WSSS 091131
WSJC SIGMET 3 VALID 091140/091540 WSSS-
WSJC SINGAPORE FIR EMBD TS OBS AT 1130Z N OF N01 E OF E106 W OF E114 STNR NC=

WSNT03 KKCI 032340
KZNY SIGMET C17 VALID 032345/040345 KKCI-
KZNY NEW YORK OCEANIC FIR FRQ TS OBS WI AREA N2400 W05500 - N2300 W04930 -
N1845 W05645 - N2100 W05800 - N2400 W05500 TOP FL450 MOV E 15KT INTSF=

WSVS31 VVGL 122305
VVTS SIGMET 9 VALID 122330/130230 VVGL-
VVTS HOCHIMINH FIR EMBD TS OBS S OF LINE N1420 E10930 - N1000 E10400 TOP
FL280 MOV W 10KMH WKN=

WSUK31 EGGY 121120
EGTT SIGMET 01 VALID 121125/121525 EGRR-
EGTT LONDON FIR EMBD TSGR OBS AT 1115Z SE OF LINE N5130 E00200 - N5000 W00400
TOPS FL220 MOV NE 30KT NC=
```

1.2 SIGMET for severe turbulence

```
WSAU21 AMMC 280546
YBBB SIGMET BS02 VALID 280600/281200 YMMC-
YBBB BRISBANE FIR SEV TURB FCST WI S3900 E15100 - S4300 E15100 - S4300 E16000
- S4100 E16300 - S3700 E16300 - S3900 E16000 FL260/370 MOV E 20 KT NC=

WSNZ21 NZKL 280003
NZZC SIGMET 01 VALID 280002/280402 NZKL-
NZZC NEW ZEALAND FIR SEV TURB OBS NE OF THE SOUTH ISLAND BLW FL100 STNR NC=
```

1.3 SIGMET for severe icing

```
WSFR31 LFPW 280400
LFMM SIGMET 2 VALID 280500/280900 LFMM-
LFMM FIR MARSEILLE SEV ICE OBS AT 0400Z LION GULF FL040/100 STNR NC=

WSIY31 LIIB 032152
LIMM SIGMET 07 VALID 032200/040200 LIMM-
LIMM MILANO FIR SEV ICE FCST OVER ALPS AND N PART APPENNINIAN AREA FL030/120
MOV E NC=
```

1.4 SIGMET for heavy duststorm

```
WSAW31 LOWM 160530
OEJD SIGMET 4 VALID 160600/161000 OEJN-
OEJD JEDDAH FIR HVY DS OBS N OF N2200 S OF N3100 E OF E04440 W OF E04800 MOV
E 10KMH NC=
```

1.5 SIGMET for severe mountain wave

```
WSUK31 EGGY 150550
EGTT SIGMET 03 VALID 150600/151000 EGRR-
EGTT LONDON FIR SEV MTW FCST N OF N5100 FL090/140 STNR WKN=
```

2. VA SIGMET

2.1 VA SIGMET - full

```
WVPH01 RPLL 211110
RPHI SIGMET 2 VALID 211100/211700 RPLL-
RPHI MANILA FIR VA ERUPTION MT PINATUBO LOC S1500 E07348
VA CLD OBS AT 1100Z FL310/450 APRX 220KM BY 35KM S1500 E07348 – S1530 E07642
MOV SE 65KMH FCST 1700Z VA CLD APRX S1506 E07500 – S1518 E08112 – S1712
E08330 – S1824 E07836=
```

Note:

1. *The coordinates used in describing the VA cloud are fictitious.*

2.2 “Short” first SIGMET (no FCST)

```
YUDD SIGMET 2 VALID 211100/211700 YUSO-
YUDD SHANLON FIR/UIR VA ERUPTION MT ASHVAL LOC S1500 E07348
VA CLD OBS AT 1100Z FL310/450 APRX 220KM BY 35KM S1500 E07348 – S1530 E07642
MOV SE 65KMH FCST 1700Z VA CLD APRX S1506 E07500 – S1518 E08112 – S1712
E08330 – S1824 E07836=
```

or

```
YUDD SIGMET 2 VALID 211100/211700 YUSO-
YUDD SHANLON FIR/UIR VA ERUPTION MT ASHVAL LOC S1500 E07348
VA CLD OBS AT 1100Z FL100/180 APRX 220KM BY 35KM S1500 E07348 – S1530 E07642=
```

```
WVFJ01 NFFN 090900
NFFF SIGMET 03 VALID 090915/091515 NFFN-
NFFF NADI FIR VA ERUPTION MT LOPEVI LOC S1630 E16820 VA CLD OBS AT 0330Z
FL090 APRX 10NM BY 10NM MOV SE 25KT FCST 1515Z VA CLD APPRX S1630 E16820 -
S1900 E17600 - S1930 E17030=
```

2.3 SIGMET for VA CLD in the FIR but the volcano information is unknown

```
YUDD SIGMET 2 VALID 211100/211700 YUSO-
YUDD SHANLON FIR/UIR VA CLD OBS AT 1100Z FL310/450 APRX 220KM BY 35KM S1500
E07348 – S1530 E07642 MOV SE 65KMH FCST 1700Z VA CLD APRX S1506 E07500 –
S1518 E08112 – S1712 E08330 – S1824 E07836=
```

2.4 SIGMET for VA CLD forecast to affect the FIR

We assume that the responsible VAAC has issued an advisory at 0200Z with forecast positions of the VA CLD for 0800Z, 1400Z and 2000Z. From this forecast it is seen that the VA CLD will enter the YUDD FIR around 0800Z. The responsible MWO, YUSO receiving this advisory prepares a SIGMET for the expected penetration of the VA cloud in its FIR and this SIGMET is send at 0230Z.

```
WVXY01 YUSO 210230
YUDD SIGMET 2 VALID 210800/211400 YUSO-
YUDD SHANLON FIR/UIR VA CLD FCST FL310/450 APRX 220KM BY 35KM S1500 E07348 –
S1530 E07642 MOV SE 65KMH FCST 1400Z VA CLD APRX S1506 E07500 – S1518 E08112
– S1712 E08330 – S1824 E07836=
```

Notes:

1. *The forecast positions at 0800Z and 1400Z are taken from the VA advisory.*

3. TC SIGMET

3.1. TC Graham – SIGMET issued by MWO Perth - Australia

```
WCOC31 APRF 280453
YBBB SIGMET PH01 VALID 280500/281100 YPRF-
YBBB BRISBANE FIR TC GRAHAM OBS AT 0400Z S1806 E12145 CB TOP FL450 WI 120NM
OF CENTRE MOV SE 7KT INTSF FCST 1100Z TC CENTRE S1808 E12150
OTLK 281700 TC CENTRE S1835 E12218 010400 TC CENTRE S1910 E12240=
```

3.2. SIGMET messages issued in July 2003 during the passage of TC Koni

```
WCSS20 VHHH 200240
VHHK SIGMET 2 VALID 200900/201500 VHHH-
VHHK HONG KONG CTA TC KONI OBS AT 0000Z N1618 E11506 CB TOP FL500 WI 90NM OF
CENTRE MOV NW 8KT NC FCST 1500Z TC CENTRE N1749 E11347
OTLK 202100 TC CENTRE N1829 E11304 210300 TC CENTRE N1902 E11208=
```

Note: This SIGMET is issued before the TC Koni started affecting the Hong Kong CTA, as seen from the issuing time and the start of validity time

```
WCSS20 VHHH 201150
VHHK SIGMET 7 VALID 201200/201800 VHHH-
VHHK HONG KONG CTA TC KONI OBS AT 0900Z N1712 E11400 CB TOP FL500 WI 90NM OF
CENTRE MOV NW 10KT NC FCST 1800Z TC CENTRE N1810 E11300=
```

```
WCSS20 VHHH 201450
VHHK SIGMET 10 VALID 201500/202100 VHHH-
```

VHHK HONG KONG CTA TC KONI OBS AT 1200Z N1730 E11330 CB TOP FL500 WI 60NM OF CENTRE MOV NW 10KT NC FCST 2100Z TC CENTRE N1818 E11240=

Note: The two SIGMETs above are issued with an interval of 3 hours, which corresponds to the requirement for updating the TC SIGMETs at least *every 6 hours. In the case of Hong Kong, China, the update interval has been selected to be 3 hours.*

APPENDIX H

WMO HEADINGS FOR SIGMET BULLETINS
USED BY ASIA/PAC METEOROLOGICAL WATCH OFFICES

MWO location	ICAO location indicator	WMO SIGMET Headings			FIR/ACC served	Remarks
		WS	WC	WV	ICAO location indicator	
1	2	3	4	5	6	7
AUSTRALIA						*Note: Non-ICAO location indicators are used in the WMO headings*
ADELAIDE/Adelaide	YPRM	WSAU31			YMMM	APRM
BRISBANE/Brisbane	YBRF	WSAU31	WCAU01		YBBB YMMM	ABRF
DARWIN/Darwin	YDRM	WSAU31	WCAU01	WVAU01	YBBB YMMM	ADRM
HOBART/Hobart	YMHF	WSAU31			YMMM	AMHF
MELBOURNE/Melbourne	YMRF	WSAU31			YBBB YMMM	AMRF
PERTH/Perth	YPRF	WSAU31	WCAU01		YBBB YMMM	APRF
SYDNEY/Sydney	YSRF	WSAU31			YBBB YMMM	ASRF
TOWNSVILLE	YBTL	WSAU31			YBBB	ABTL
BANGLADESH						
DHAKA/Zia Intl	VGZR	WSBW20	WCBW20		VGFR	
CAMBODIA						
PHNOM-PENH/Pochentong	VDPP				VDPP	MWO not established
CHINA						
BEIJING/Capital	ZBAA	WSCI33		WVCI33	ZBPE	
GUANGZHOU/Baiyun	ZGGG	WSCI35	WCCI35	WVCI35	ZGZU	
HAIKOU/Meilan	ZJHK	WSCI35		WVCI35		
KUNMING/Wujiaba	ZPPP	WSCI36		WVCI36	ZPKM	
LANZHOU/Chongchuan	ZLLL	WSCI37		WVCI37	ZLHW	
SHANGHAI/Hongqiao	ZSSS	WSCI34	WCCI34	WVCI34	ZSHA	
SHENYANG/Taoxian	ZYTX	WSCI38		WVCI38	ZYSH	
TAIBEI/Taibei Intl	RCTP	WSCI31	WCCI31	WVCI31	RCTP	
URUMQI/Diwopu	ZWWW	WSCI39		WVCI39	ZWUQ	
WUHAN/Tianhe	ZHHH	WSCI35		WVCI35	ZHWH	
HONG KONG/Hong Kong Intl	VHHH	WSSS20	WCSS20	WVSS20	VHHK	

MWO location	ICAO location indicator	WMO SIGMET Headings			FIR/ACC served	Remarks
		WS	WC	WV	ICAO location indicator	
1	2	3	4	5	6	7
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA						
PYONGYANG/Sunan	ZKPY				ZKKK	No SIGMET issued
FIJI						
NADI/Nadi Intl	NFFN	WSFJ01,02,…	WCFJ01,02,…	WVFJ01,02,…	NFFF	
FRENCH POLYNESIA						
TAHITI/Faaa	NTAA	WSPF21,22	WCPF21	WVPF21	NTTT	
INDIA						
CALCUTTA/Calcutta	VECC	WSIN31	WCIN31		VECF	
CHENNAI/Chennai	VOMM	WSIN31	WCIN31		VOMF	
DELHI/Indira Ghandi Intl	VIDP	WSIN31	WCIN31		VIDF	
MUMBAI/Jawaharlal Nehru Intl	VABB	WSIN31	WCIN31		VABF	
INDONESIA						
JAKARTA/Soekarno-Hatta Intl	WIII	WSID20	WCID20	WVID20	WIIZ	
UJUNG PANDANG/Hasanuddin	WAAA	WSID21	WCID21	WVID21	WAAZ	
JAPAN						
TOKYO/Narita Intl	RJAA	WSJP31	WCJP31	WVJP31	RORG RJTG	
LAO PEOPLE'S DEMOCRATIC REPUBLIC						
VIENTIANE/Wattay	VLVT	WSLA31		WVLA31	VLVT	Not confirmed
MALAYSIA						
KOTA KINABALU/Kota Kinabalu Intl	WBKK	-	-	-	WBFC	
KUALA LUMPUR/Kuala Lumpur Intl	WMKK	WSMS31	WCMS31	WVMS31	WMFC	
MALDIVES						
MALE/Hulule	VRMM	WSMV31			VRMM	
MONGOLIA						
ULAN BATOR/Ulan Bator	ZMUB	WSMO31			ZMUB	Not confirmed

MWO location	ICAO location indicator	WMO SIGMET Headings			FIR/ACC served	Remarks
		WS	WC	WV	ICAO location indicator	
1	2	3	4	5	6	7
MYANMAR YANGON/Yangon Intl	VYYY	WSBM31	WCBM31		VYYY	Not confirmed
NAURU NAURU I./Nauru	ANAU				ANAU	No Information
NEPAL KATHMANDU/Tribhuvan Intl	VNKT	WSNP31			VNSM	Not confirmed
NEW ZEALAND WELLINGTON/Kelburn Intl	NZKL	WSNZ21 WSPS21	WCNZ21 WCPS21	WVNZ21 WVPS21	NZZC NZZO	Operational monitoring coverage south of 60˚S is limited due to the lack of information
NORTHERN MARIANA ISLANDS (United States) SAIPAN I. (OBYAN)/Saipan I.(Obyan) Intl	PGSN					No Information
PAKISTAN KARACHI/Quaid-E-Azam Intl LAHORE/Lahore	OPKC OPLA	WSPK31 WSPK31	WCPK31		OPKR OPLR	
PAPUA NEW GUINEA PORT MORESBY/Jacksons	AYPY	WSNG20	WCNG20	WVNG20 WVNG01	AYPY	
PHILIPPINES MANILA/Ninoy Aquino Intl	RPLL	WSPH31	WCPH31	WVPH31	RPHI	
REPUBLIC OF KOREA INCHEON/Incheon Intl	RKSI	WSKO31	WCKO31	WVKO31	RKRR	
SINGAPORE SINGAPORE/Singapore Changi	WSSS	WSSR20	WCSR20	WVSR20	WSJC	
SOLOMON ISLANDS HONIARA/Henderson	AGGH				AGGG	No Information
SRI LANKA COLOMBO/Katunayake	VCBI	WSSB31	WCSB31		VCBI	

MWO location	ICAO location indicator	WMO SIGMET Headings			FIR/ACC served	Remarks
		WS	WC	WV	ICAO location indicator	
1	2	3	4	5	6	7
THAILAND						
BANGKOK/Bangkok Intl	VTBD	WSTH31	WCTH31	WVTH31	VTBB	
UNITED STATES						
ANCHORAGE/Anchorage Intl	PAWU	WSAK01-09 PAWU	WCAK01-09 PAWU	WVAK01-09 PAWU	PAZA	
HONOLULU/Honolulu Intl	PHFO	WSPA01-13 PHFO	WCPA01-13 PHFO	WVPA 01-13 PHFO	KZOA	
(KANSAS CITY/Missouri)	KKCI	WSNT01-13 KKCI	WCNT01-13 KKCI	WVNT01-13 KKCI	KZNY KZMA KZHU TJZU	
(KANSAS CITY/Missouri)	KKCI	WSPN01-13 KKCI	WCPN01-13 KKCI	WVPN01-13 KKCI	KZOA	
VIET NAM						
Gia Lam MWO	VVGL	WSVS31	WCVS31	WVVS31	VVNB VVTS	

APPENDIX I

WMO HEADINGS FOR TROPICAL CYCLONE AND VOLCANIC ASH ADVISORY BULLETINS (FK and FV)

USED BY ASIA/PAC TCACs and VAACs

Explanation of Table

Col. 1: Name of the TCAC or VAAC

Col 2: ICAO location indicator used by the TCAC or VAAC

Col 3: WMO heading (TTAAii CCCC) of the FK or FV bulletin

Col 4: Remarks (e.g., Area of coverage of the advisory, or any other bulletin-specific information)

TCAC/VAAC (State)	**ICAO location indicator**	**WMO Heading TTAAii CCCC**	**Remarks**
1	2	3	4
TC Advisories (FK)			
Miami (United States)	KNHC	FKNT21-24 KNHC FKPZ21-25 KNHC	Atlantic For Northeast Pacific to 140W; ii = 21 – 25; up to 5 different bulletins possible at a time according to the number of TCs in the TCAC's area of resp.
Honolulu (United States)	PHFO	FKPA21-25 KHFO	For North Central Pacific: 140W – 180W; ii = 21 – 25; up to 5 different bulletins possible at a time according to the number of TCs in the TCAC's area of resp.
New Delhi (India)	VIDP	FKIN20 VIDP FKIN21 VIDP	Bay of Bengal Arabian Sea
Darwin (Australia)	ADRM	FKAU01 ADRM FKAU02 ADRM	Area bounded by Equator 125E, 15S 125E, 15S 129E, 32S 129E, 32S 138E, 14S 138E,10S 141E, Equator 141E, Equator 125E. (Advisories prepared by Darwin)
		FKAU03 ADRM FKAU04 ADRM	Area bounded by 10S 141E, 14S 138E, 32S 138E, 32S 160E, 5S 160E, 8S 155E, 12S 155E, 12S 147E, 9S 144E, 10S 141E and Port Moresby TCWC area. (Advisories prepared by Brisbane)

TCAC/VAAC (State)	**ICAO location indicator**	**WMO Heading TTAAii CCCC**	**Remarks**
1	2	3	4
		FKAU05 ADRM FKAU06 ADRM	Area bounded by 10S 90E, 36S 90E, 36S 129E, 15S 129E, 15S 125E, 10S 125E, 10S 90E, and the interim Indonesia area. (Advisories prepared by Perth)
Nadi (Fiji)	NFFN	FKPS01 NFFN	
Tokyo (Japan)	RJTD	FKPQ30-35 RJTD	
VA Advisories (FV)			
Anchorage (United States)	PAWU	FVAK21-25 PAWU	ii = 21 – 25; up to 5 different bulletins possible at a time according to the number of VA clouds in the VAAC's area of resp.
Darwin (Australia)	ADRM	FVAU01-06 ADRM	
Tokyo (Japan)	RJTD	FVFE01 RJTD	
Washington (United States)	KNES	FVXX20-27 KNES	ii = 20 – 27; up to 8 different bulletins possible at a time according to the number of VA clouds in the VAAC's area of responsibility
Wellington (New Zealand)	NZKL	FVPS01 NZKL	

APPENDIX J

ASIA/PAC SIGMET TEST PROCEDURES
(revision 8 Jan 2007)

1. Introduction

1.1 The MET Divisional Meeting (2002) formulated Recommendation 1/12 b), *Implementation of SIGMET requirements,* which called, *inter alia,* for the relevant planning and implementation regional groups (PIRGs) to conduct periodic tests of the issuance and reception of SIGMET messages, especially those for volcanic ash.

1.2 The Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) recognized that, since SIGMET was irregular non-scheduled information, periodic were necessary to monitor the SIGMET availability and identify deficiencies in the dissemination procedures. Based on the results of the tests, States would be provided with specific advice aimed at improving their SIGMET-related practices and procedures. Therefore, the fifteenth meeting of APANPIRG held in Bangkok, 23 to 27 August 2004, adopted Conclusion 15/42, as follows:

Conclusion 15/42 – Conducting SIGMET tests in the Asia/Pacific region

That, ICAO Regional Office invite all TCAC and VAAC Provider States in the Asia/Pacific region, and all Asia/Pacific States with MWOs responsible for issuance of SIGMET for volcanic ash and/or tropical cyclones, to take part in the SIGMET tests to be carried out according to procedures developed by the VA/TC Implementation Task Force.

Note: ICAO Regional Office will coordinate the tests and notify the participating States about their schedule and procedures.

1.3 The VA/TC Implementation Task Force (VA/TC/I TF), in coordination with the OPMET Management Task Force (OPMET/M TF) and the Regional Office, Bangkok, developed the procedures for conducting regional SIGMET tests as described in this document. The test procedures encompass all the three types of SIGMET, as follows:

- SIGMET for volcanic ash (WV SIGMET);
- SIGMET for tropical cyclones (WC SIGMET); and
- SIGMET for other weather phenomena (WS SIGMET).

1.4 The requirements for dissemination of SIGMET are specified in Annex 3, Appendix 6, 1.2. Regional guidance on the preparation and dissemination of SIGMET is provided in this *Regional SIGMET Guide*.

2. Purpose and Scope of SIGMET tests

2.1 The purpose of the SIGMET tests is to check the awareness of participating MWOs of the ICAO requirements for the issuance of SIGMET and the compliance of the States' procedures for preparation and dissemination of SIGMET bulletins with the relevant ICAO Standards and Recommended Practices (SARPs) and regional procedures.

2.2 In the case of SIGMET for tropical cyclones and volcanic ash clouds (referred hereafter as WC SIGMET and WV SIGMET respectively) the scope of the tests is to check also the interaction between the Tropical Cyclone Advisory Centres (TCAC) and Volcanic Ash Advisory Centres (VAAC), and the MWOs in their areas of responsibility. Therefore, during the WC and WV SIGMET tests the issuance of TEST SIGMET by the MWO should be triggered by a test advisory issued by the respective TCAC or VAAC.

2.3 The Regional OPMET Data Banks (RODB) will monitor the dissemination by filing all TEST SIGMETs and advisories and the corresponding reception times. The monitoring results will be provided in the form of summaries to the Rapporteurs of the VA/TC/I Task Force and the OPMET/M TF with a copy to the Regional Office, Bangkok.

2.4 Participating States, for which discrepancies of the procedures or other findings are identified by the tests, will by advised the Regional Office and requested to take necessary corrective action.

3. SIGMET test procedures

3.1 Procedures for WC and WV SIGMET tests

3.1.1 Participating units:

3.1.1.1 Tropical Cyclone Advisory Centre (TCAC):
Darwin
Honolulu
Miami
Nadi
New Delhi
Tokyo

3.1.1.2 Volcanic Ash Advisory Centres (VAAC):
Anchorage
Darwin
Tokyo
Washington
Wellington

3.1.1.3 Regional OPMET Data Banks (RODB):
Bangkok
Brisbane
Nadi
Singapore
Tokyo

3.1.1.4 Meteorological Watch Offices (MWO):
All MWOs listed in FASID Tables MET 3A and MET 3B of the ASIA/PAC Basic ANP and FASID (Doc 9673), under the responsibility of the corresponding VAACs and TCACs.

Note: Participation of MWOs of States outside ASIA/PAC region, but listed in FASID Tables MET 3A and MET 3B should be coordinated through the ICAO Regional Office concerned.

3.1.2 Test messages

3.1.2.1 On the specified date for the test **at 0200 UTC** (if not otherwise advised by the Regional Office) the participating VAAC and TCAC should issue a TEST VA or TC advisory. The structure of the TEST advisories should follow the standard format given in Annex 3 with indication that it is a test message as shown in Appendix A to the Procedures.

3.1.2.2 MWOs, upon receipt of the TEST VA or TC advisory, should issue a TEST SIGMET for volcanic ash or tropical cyclone, respectively, and send it to all RODBs. The WMO heading and the first line of the SIGMET should be valid ones, while the body of the message should contain only explanatory note regarding the test in plain language, as shown in Appendix A. The period of validity of the TEST SIGMET should be very short, e.g., 10 minutes.

3.1.2.3 To avoid over-writing of a valid SIGMET, TEST SIGMET for VA or TC should not be issued by the MWO in case that there is a valid SIGMET of the same type for its area of responsibility. Such MWOs are strongly encouraged to notify the Regional Office via e-mail of their non-participation in the test due to the said reasons.

3.2 Procedures for WS SIGMET tests

3.2.1 Participating units:

3.2.1.1 Regional OPMET Data Banks (RODB):
Bangkok
Brisbane
Nadi
Singapore
Tokyo

3.2.1.2 Meteorological Watch Offices (MWO):
All MWOs listed in FASID Table MET 1B of ASIA/PAC Basic ANP and FASID (Doc 9673).

3.2.2 Test SIGMET

3.2.2.1 The MWOs should issue a TEST SIGMET during the 10-minutes period between **0200 and 0210 UTC** (if not otherwise advised by the Regional Office) on the date agreed for the test.

3.2.2.2 The WMO heading and the first line of the SIGMET bulletin should be valid ones, while the body of the message should contain an explanatory text on the tests as shown in Appendix A. The period of validity of the TEST SIGMET should be very short, e.g., 10 minutes.

3.2.3 Special procedure to avoid overwriting of a valid SIGMET

3.2.3.1 It is vital to ensure that TEST SIGMET is not confused with operational SIGMET and avoid overwriting a valid operational SIGMET in an automated system. In order to prevent this it is suggested that:

a) If at the time of the SIGMET test NO SIGMET is current for the FIR, the number of the Test SIGMET should follow the normal numbering sequence; e.g. if the last “normal” SIGMET before the test was number “03”, the TEST SIGMET should be number “04”, and the first “normal” SIGMET after the test should be number “05”.

b) If a SIGMET is VALID at the time of the test then the TEST SIGMET should be issued and the valid SIGMET should be repeated immediately after the TEST SIGMET. E.g., if the following SIGMET is issued at 0100 on the date of the test:

WSAU01 YBRF 250100
YBBB SIGMET 1 VALID 250100/250500 YBRF-
BRISBANE FIR SEV TURB FCST WI ….=

A SIGMET test is scheduled for 0200 UTC on the 25th. The TEST SIGMET is issued with the next consecutive sequence number as follows:

WSAU01 YBRF 250200
YBBB SIGMET 2 VALID 250200/250210 YBRF-
THIS IS A TEST SIGMET PLEASE DISREGARD=

The original SIGMET is then retransmitted immediately after this with the next consecutive sequence number and the validity period is amended accordingly:

WSAU01 YBRF 250200
YBBB SIGMET 3 VALID 250200/250500
BRISBANE FIR SEV TURB FCST WI … =

3.3 Common procedures

3.3.1 Test date and time

3.3.1.1 ICAO Regional Office will set a date and time for each SIGMET test after consultation with the participating VAACs, TCACs and RODBs. The information about the agreed date and time will be sent to all States concerned by a State letter and copied to the States’ SIGMET Tests Focal Points.

3.3.1.2 Tests for different types of SIGMET should preferably be conducted on separate dates.

3.3.1.3 At least two SIGMET tests per year should be conducted.

3.3.2 Dissemination of test SIGMETs and advisories

3.3.2.1 All TEST SIGMETs and advisories should be sent to the five ASIA/PAC RODBs. The AFTN addresses to be used by the MWOs, TCACs and VAACs are as follows:

Bangkok	VTBBYPYX
Brisbane	YBBBYPYX
Nadi	NFZZRFXX
Singapore	WSZZYPYM
Tokyo	RJAAYPYX

3.3.2.2 RODB/IROG Singapore will relay the test bulletins to the corresponding IROG in the European Region where additional monitoring of those bulletins may be performed.

3.3.3 Coordination with the ATS units

3.3.3.1 MWOs should inform the associated ATS units of the forthcoming SIGMET tests by a suitable advanced notice.

3.4 Processing of the test messages and results

3.4.1 The RODBs should file all incoming TEST advisories and SIGMETs and perform an analysis of the availability, timeliness of arrival and the correctness of the WMO bulletin headings. The results should be presented by each RODB in SIGMET TEST Summary Tables, as shown in Appendix B. WV/WC SIGMET Summary Tables should be sent to the Rapporteur of the VA/TC/I TF, and WS SIGMET Summary Tables to the Rapporteur of the OPMET/M TF, with copies of all tables to the Regional Office.

3.4.2 A consolidated summary report will be prepared by both Rapporteurs and submitted to the Regional Office. The report should include recommendations for improvement of the SIGMET exchange and availability. The results of the tests should be reported to OPMET/M TF and CNS/MET Sub-group meetings.

3.4.3 The current contact information for sending Summary Tables is as follows:

WS SIGMET summary tables sent to:

Mr. Rick Houghton
National Manager Defence Weather Services
Bureau of Meteorology
6th Floor Bureau of Meteorology Building
700 Collins St. Docklands
Victoria
AUSTRALIA
Tel: +61 (3) 9669-4253
Fax: +61 (3) 9669-4695
e-mail: R.Houghton@bom.gov.au

WV/WC SIGMET summary tables sent to:

Mr. Masashi Kunitsugu
Senior Scientific Officer, Administration Division
Japan Meteorological Agency
Forecast Department
1-3-4, Otemachi
Chiyodaku
Tokyo 100-8122
JAPAN
Tel: +81 (3) 3212-8341 ext.3351
Fax: +81 (3) 3284-0180
e-mail: kunitsugu@met.kishou.go.jp

All Summary Tables and any enquiries about the SIGMET tests sent to:

ICAO Regional Office, Bangkok
e-mail: icao_apac@bangkok.icao.int
cc: divanov@bangkok.icao.int

ASIA/PAC SIGMET TEST PROCEDURES - Format of TEST advisories and SIGMETs

1. Format of TEST Volcanic Ash Advisory

```
VOLCANIC ASH ADVISORY
ISSUED:                 YYYYMMDD/0200Z
VAAC:                   (name of VAAC)
VOLCANO:                TEST
LOCATION:               UNKNOWN
AREA:                   (name of VAAC) VAAC AREA
SUMMIT ELEVATION:       UNKNOWN
ADVISORY NUMBER:        YYYY/nn (actual number)
INFORMATION SOURCE:     NIL
AVIATION COLOUR CODE:   NIL
ERUPTION DETAILS: NIL
OBS ASH DATE/TIME:      DD/0150Z
OBS ASH CLD:            ASH NOT IDENTIFIABLE FROM SATELLITE DATA
FCST ASH CLD +6 HR:     01/0800Z SFC/FL600 NO ASH EXP
FCST ASH CLD +12 HR:    01/1400Z SFC/FL600 NO ASH EXP
FCST ASH CLD +18 HR:    01/2000Z SFC/FL600 NO ASH EXP
NEXT ADVISORY:          NO FURTHER ADVISORIES
REMARKS: THIS IS A TEST VA ADVISORY. MWO SHOULD NOW ISSUE A TEST SIGMET FOR
VA, UNLESS THERE IS A VAILD SIGMET FOR VA.
PLEASE REFER TO THE LETTER FROM ICAO APAC OFFICE DATED xxxxxx=
```

2. Format of TEST Tropical Cyclone Advisory

```
TC ADVISORY
DTG:                    YYYYMMDD/0200Z
TCAC:                   (name of TCAC)
TC:                     TEST
NR:                     nn (actual number)
PSN:                    NIL
MOV:                    NIL
C:                      NIL
MAX WIND:               NIL
FCST PSN +12HR:         NIL
FCST MAX WIND +12HR:    NIL
FCST PSN +18HR:         NIL
FCST MAX WIND +18HR:    NIL
FCST PSN +24HR:         NIL
FCST MAX WIND +24HR:    NIL
NXT MSG:                NIL
REMARKS: THIS IS A TEST TC ADVISORY. MWO SHOULD NOW ISSUE A TEST SIGMET FOR
TC, UNLESS THERE IS A VAILD SIGMET FOR TC.
PLEASE REFER TO THE LETTER FROM ICAO APAC OFFICE DATED xxxxxx=
```

3. Format of TEST SIGMET for Volcanic Ash

```
WVXXii CCCC YYGGgg
CCCC SIGMET n(nn) VALID YYGGgg/YYGGgg CCCC–
THIS IS A TEST SIGMET PLEASE DISREGARD. TEST VA ADVISORY NUMBER XX RECEIVED
AT YYGGggZ=
```

Example:

```
WVHK31 VHHH 180205
VHHK SIGMET 01 VALID 180205/180215 VHHH-
THIS IS A TEST SIGMET, PLEASE DISREGARD. TEST VA ADVISORY NUMBER 01
RECEIVED AT 180200Z=
```

4. Format of TEST SIGMET for Tropical Cyclone

```
WCXXii CCCC YYGGgg
CCCC SIGMET n(nn) VALID YYGGgg/YYGGgg CCCC–
THIS IS A TEST SIGMET PLEASE DISREGARD. TEST TC ADVISORY NUMBER XX RECEIVED AT
YYGGggZ=
```

Example:

```
WCHK31 VHHH 180205
VHHK SIGMET 01 VALID 180205/180215 VHHH-
THIS IS A TEST SIGMET PLEASE DISREGARD. TEST TC ADVISORY NUMBER 01
RECEIVED AT 180200Z=
```

5. Format of TEST SIGMET for other weather phenomena

```
WSXXii CCCC YYGGgg
CCCC SIGMET n(nn) VALID YYGGgg/YYGGgg CCCC–
THIS IS A TEST SIGMET PLEASE DISREGARD=
```

Example:

```
WSHK31 VHHH 180200
VHHK SIGMET 04 VALID 180200/180210 VHHH-
THIS IS A TEST SIGMET PLEASE DISREGARD=
```

Notes: *1) "XX" in the WMO heading to be replaced by the respective WMO geographical designator*
2) Actual SIGMET number to be used in all TEST SIGMETs

— END —

Part VI

METEOROLOGY (MET)

INTRODUCTION

1. This part of the Asia and Pacific (ASIA/PAC) Basic Air Navigation Plan contains elements of the existing planning system and introduces the basic planning principles, operational requirements and planning criteria related to aeronautical meteorology (MET) as developed for the ASIA/PAC regions.

2. As a complement to the Statement of Basic Operational Requirements and Planning Criteria (BORPC) set out in Part I, Part VI constitutes the stable guidance material and considered to be the minimum necessary for effective planning of MET facilities and services in the ASIA/PAC regions. A detailed description/list of the facilities and/or services to be provided by States in order to fulfill the requirements of the plan is contained in the ASIA/PAC Facilities and Services Implementation Document (FASID). During the transition and pending full implementation of the future communications, navigation and surveillance/air traffic management (CNS/ATM) system, it is expected that the existing requirements will gradually be replaced by new CNS/ATM-related requirements. Further, it is expected that some elements of the CNS/ATM system will be subject to amendment, as necessary, on the basis of experience gained in their implementation.

3. The Standards, Recommended Practices and Procedures to be applied are contained in:

a) Annex 3 — *Meteorological Service for International Air Navigation*; and

b) *Regional Supplementary Procedures* (Doc 7030).

4. Background information of importance in the understanding and effective application of this part of the plan is contained in the *Report of the Third Asia/Pacific Regional Air Navigation Meeting* (Doc 9614, ASIA/PAC/3 (1993)), supplemented by information appropriate to the ASIA/PAC regions which is contained in the reports of the other regional air navigation (RAN) meetings.

5. A RAN meeting recommendation or conclusion, ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG) conclusion or ICAO operations group conclusion shown in brackets below a heading indicates the origin of all paragraphs following that heading. A RAN meeting recommendation or conclusion, APANPIRG conclusion or ICAO operations group conclusion shown in brackets below a paragraph indicates the origin of that particular paragraph.

METEOROLOGICAL SERVICE REQUIRED AT AERODROMES AND REQUIREMENTS FOR METEOROLOGICAL WATCH OFFICES

(FASID Tables MET 1A and MET 1B)

6. The service to be provided at international aerodromes listed in the Appendix to Part III of the Basic ANP is set out in Table MET 1A.
[ASIA/PAC/3, Recs. 8/1 and 8/16]

7. The service to be provided for flight information regions (FIRs), upper flight information regions (UIRs), control areas (CTAs) and search and rescue regions (SRRs) is set out in Table MET 1B.
[ASIA/PAC/3, Recs. 8/2 and 8/16]

8. Hourly routine observations should be made at all aeronautical meteorological stations, to be issued as local

routine reports and METAR, together with special observations to be issued as local special reports and SPECI.

9. Aerodrome forecasts should be issued as TAF, normally at intervals of six hours, with the period of validity beginning at one of the main synoptic hours (00, 06, 12, 18 UTC). The period of validity should be of eighteen or twenty-four hours' duration to meet the requirements indicated in Table MET 1A. The filing time of the forecasts should be approximately two hours before the start of the period of validity.
[ASIA/PAC/3, Rec. 8/16]

10. The forecast maximum and minimum temperature together with their respective times of occurrence should be included in TAF for certain aerodromes as agreed between the meteorological authorities and the operators concerned.
[ASIA/PAC/3, Rec. 8/16]

11. Trend forecasts should be provided at the aerodromes as indicated in Table MET 1A.
[ASIA/PAC/3, Recs. 8/1 and 8/16]

12. Meteorological service should be provided on a twenty-four-hour basis, except as otherwise agreed between the meteorological authority, the air traffic services (ATS) authority and the operators concerned.
[ASIA/PAC/3, Rec. 8/16]

13. At aerodromes with limited hours of operation, METAR should be issued prior to the aerodrome resuming operations to meet pre-flight and in-flight planning requirements for flights due to arrive at the aerodrome concerned as soon as it is opened for use. Furthermore, TAF should be issued with adequate periods of validity so that they cover the entire period during which the aerodrome is open for use.
[ASIA/PAC/3, Rec. 8/16]

14. When a meteorological watch office (MWO) is temporarily not functioning or is not able to meet all its obligations, its responsibilities should be transferred to another MWO and a NOTAM should be issued to indicate such a transfer and the period during which the office is unable to fulfil all its obligations.
[ASIA/PAC/3, Rec. 8/16]

15. Details of the service provided should be indicated in the Aeronautical Information Publication (AIP) in accordance with the provisions of Annex 15.
[ASIA/PAC/3, Rec. 8/16]

16. As far as possible, English should be among the

[ASIA/PAC/3, Rec. 8/16]

languages used in meteorological briefing and consultation.
[ASIA/PAC/3, Rec. 8/16]

17. Tables MET 1A and MET 1B should be implemented as soon as possible. ~~, on the understanding that only those parts of the briefing and documentation called for in Column 7 of Table MET 1A that are required for current operations need to be available, and that t~~The implementation of a new MWO~~s~~ or changes to the area served by existing MWO indicated in Table MET 1B, ~~Columns 1 and 3 respectively,~~ should take place coincidently with the implementation of, or changes to, the FIR/UIR/CTA/SRR concerned.
[ASIA/PAC/3, Rec. 8/16]

AIRCRAFT OBSERVATIONS AND REPORTS
(FASID Table MET 1B)

18. The meteorological authority should adopt the approved list of ATS/MET reporting points, as it relates to points located within and on the boundaries of the FIR for which the State is responsible. Those ATS/MET reporting points should be published in the AIP, under GEN 3.5.6 — Aircraft reports, of the State concerned.
[ASIA/PAC/3, Rec. 8/16]

Note.— The approved list of ATS/MET reporting points is published and kept up to date by the ICAO Regional Office concerned, on the basis of consultations with ATS and MET authorities in each State and the provisions of Annex 3 in this respect.

19. The MWOs designated as collecting centres for air-reports received by voice communication with the corresponding FIR/UIR are shown in Table MET 1B.

SIGMET AND AIRMET INFORMATION
(FASID Tables MET 3A and MET 3B)

~~20. The period of validity of SIGMET messages should not exceed four hours. In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, the validity period should be extended up to six hours and an outlook should be added giving information for an additional period of up to twelve hours concerning the trajectory of the volcanic ash cloud and positions of the~~

~~centre of the tropical cyclone respectively.~~
~~[ASIA/PAC/3, Rec. 8/16]~~

21. T~~In order to assist MWOs in the preparation of the outlook included in SIGMET messages for tropical cyclones, tr~~opical cyclone advisory centres (TCACs) Darwin, Honolulu, Miami, Nadi, New Delhi and Tokyo have been designated to prepare the required advisory information and disseminate it to the MWOs concerned in the ASIA/PAC regions. Table MET 3A sets out the area of responsibility, the period(s) of operation of the TCAC(s) and the MWOs to which the advisory information should be sent.~~ Advisory information should be issued for tropical cyclones in which the surface wind speed averaged over ten minutes is expected to equal or exceed 63 km/h (34 kt)~~.
[ASIA/PAC/3, Recs. 8/4 and 8/16]
[APANPIRG/12 Conc. 12/33]

22. ~~In order to assist MWOs in the preparation of the outlook included in SIGMET messages for v~~Volcanic ash, volcanic ash advisory centres (VAACs) Anchorage, Darwin, Tokyo, Washington and Wellington have been designated to prepare the required advisory information and disseminate it to the MWOs and area control centres (ACCs) concerned in the ASIA/PAC regions following notification/detection of the ash cloud. Table MET 3B sets out the areas of responsibility of the VAACs and the MWOs and ACCs to which the advisory information should be sent.
[IAVWOPSG~~/1,~~ Conc~~.~~lusion 1/1, Conclusion 3/2]]

23. In order for the VAACs to initiate the monitoring of volcanic ash from satellite data and the forecast of volcanic ash trajectories, MWOs should notify the relevant VAAC immediately on receipt of information that a volcanic eruption has occurred or volcanic ash has been observed in the FIR for which they are responsible. In particular, any special air-reports of pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud received by MWOs should be transmitted without delay to he VAAC concerned. Selected State volcano observatories have been designated for direct notification of significant pre-eruption volcanic activity, a volcanic eruption and/or volcanic ash in the atmosphere to their corresponding ACC, MWO and VAAC.
[IAVWOPSG~~/1,~~ Conc~~.~~lusion 1/1, Conclusion 2/2]

24. AIRMET messages are not required to be issued by MWOs.
[APANPIRG/7, Conc. 7/22]

EXCHANGE OF OPERATIONAL METEOROLOGICAL (OPMET) INFORMATION
(FASID Tables MET 2A, MET 2B, MET 4A, MET 4B and MET 4C)

Exchange of METAR, SPECI and TAF

25. Tables MET 4A and MET 4B set out the Regional OPMET Bulletin Exchange (ROBEX) Scheme for the collection and dissemination of METAR, SPECI and TAF. These tables contain information regarding the designated ROBEX centres and their respective areas of responsibility.
[ASIA/PAC/3, Recs. 9/6 and 9/8]
[APANPIRG/7, Conc. 7/20]

Note.— Details of the ROBEX procedures regarding the exchange of OPMET information required under the scheme are given in the ROBEX Handbook prepared by the ICAO Asia and Pacific Regional Office (Bangkok) in coordination with the ICAO Middle East Regional Office (Cairo).

26. Tables MET 4A and MET 4B should be updated, as necessary, by the ICAO Regional Office on the basis of changes in the pattern of aircraft operations, the Statement of Basic Operational Requirements and Planning Criteria and in consultation with those States and international organizations directly concerned.
[ASIA/PAC/3, Rec. 9/8]

27. Requirements for METAR, SPECI and TAF not carried on the ROBEX Scheme which should be available at meteorological offices are contained in Table MET 2A. This table should be updated, as necessary, by the ICAO Regional Office on the basis of changes in the pattern of aircraft operations, the Statement of Basic Operational Requirements and Planning Criteria, and in consultation with those States and international organizations directly concerned.
[ASIA/PAC/3, Recs. 9/1 and 9/8]

28. The exchanges indicated in Table MET 2A should be implemented as soon as possible, but only for those related to current aircraft operations. New exchanges should be started coincidently with the introduction of new aircraft operations. Any changes in this respect (i.e. additional OPMET information needed or OPMET information no longer required) should be notified to the corresponding meteorological authority which, in turn, should inform the ICAO Regional Offices concerned.
[ASIA/PAC/3, Rec. 9/8]

OPMET data banks

to support the ROBEX Scheme

29. The OPMET data banks in Bangkok, Brisbane, Nadi, Singapore and Tokyo have been designated to support the ROBEX scheme and serve States in the ASIA/PAC regions to access OPMET information which is required but not received. Table MET 4C sets out the responsibilities of the ASIA/PAC OPMET data banks for collection and dissemination of OPMET bulletins to support the ROBEX Scheme.
[APANPIRG/7, Rec. 7/20]

Note.— A list of the OPMET information available at the OPMET data banks to serve the ASIA/PAC regions, together with the procedures to be used in communicating with the data banks, is contained in the Asia/Pacific OPMET data banks interface control document prepared by the ICAO Regional Office, Bangkok.

Exchange of SIGMET information and air-reports

30. ~~The exchange requirements for SIGMET and special air-reports are contained in Table MET 2B. This table should be updated, as necessary, by the ICAO Regional Office on the basis of changes in the pattern of aircraft operations, the Statement of Basic Operational Requirements and Planning Criteria, and in consultation with those States and international organizations directly concerned.~~
~~[ASIA/PAC/3, Recs. 9/2 and 9/8]~~

31. Each MWO should arrange for the transmission to all aerodrome meteorological offices within its associated FIR of its own SIGMET messages and relevant SIGMET messages for other FIR, as required for briefing and, where appropriate, for flight documentation.
[ASIA/PAC/3, Rec. 8/16]

32. Each MWO should arrange for the transmission to its associated ACC/FIC of SIGMET information and special air-reports received from other MWOs.

33. Each MWO should arrange for the transmission of routine air-reports received by voice communication to all meteorological offices within its associated FIR. Special air-reports which do not warrant the issuance of a SIGMET should be disseminated by MWOs in the same way as SIGMET messages~~, in accordance with Table MET 2B~~.

Note.— Details of the procedures regarding the exchange of SIGMET information required by FASID Table MET 1B are provided in the ASIA/PAC SIGMET Guide *prepared by the ICAO Asia and Pacific Regional Office, Bangkok.*

WORLD AREA FORECAST SYSTEM (WAFS)
(FASID Tables MET 5, MET 6 and MET 7 and Charts MET 4, MET 5 and MET 6)

34. FASID Table MET 5 sets out the ASIA/PAC ~~regions'~~ Regions requirements for WAFS forecasts to be provided by WAFC London and WAFC Washington.
[WAFSOPSG~~/1,~~ Conc~~.~~lusion 1/2]

~~35. The levels for which forecasts of upper-air wind and temperature and SIGWX forecasts in chart form are to be provided by WAFC London and WAFC Washington, and the areas to be covered by these charts, are indicated in Table MET 5.~~
~~[WAFSOPSG/1, Conc. 1/2]~~

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

36. FASID Table MET 6 sets out the responsibilities of WAFC London and WAFC Washington for the production of WAFS forecasts. For back-up purposes, each WAFC should have the capability to produce WAFS forecasts for all the required areas of coverage.
[WAFSOPSG~~/1,~~ Conclusion~~.~~ 1/2]

~~37. The projection of the WAFS forecasts in chart form and their areas of coverage should be as indicated in Charts MET 4, MET 5 and MET 6 associated with Table MET 6; their scale should be 1:20 × 10[6], true at 22.5° in the case of charts in the Mercator projection, and true at 60° latitude in the case of charts in the polar stereographic projection.~~
~~[WAFSOPSG/1, Conc. 1/2]~~

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

38. 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 (ISCS/2) ~~To fulfill the requirements of long-distance flights, transmission of WAFS products should be completed not later than eleven hours before validity time.~~covering the reception area shown in FASID Table CNS4.
[WAFSOPSG~~/1,~~ Conclusion~~.~~ 1/2]

~~39. The amendment service to the SIGWX forecasts issued by WAFC London and WAFC Washington should be by means of amended binary universal form for the representing of meteorological data (BUFR) files disseminated through SADIS and ISCS2.~~
~~[WAFSOPSG/1, Conc. 1/2]~~

40. Each State should make the necessary arrangements to receive and make full operational use of WAFS products disseminated by WAFC London and WAFC Washington. FASID Table MET 7 lists the authorized users of the SADIS and ISCS2 satellite broadcasts in the ASIA/PAC regions and location of the operational VSATs.
[WAFSOPSG~~/1,~~ Conclusion~~.~~ 1/2]

Table MET 1B

METEOROLOGICAL WATCH OFFICES

EXPLANATION OF THE TABLE

Column

1 Location of the meteorological watch office (MWO). Locations, other than aerodromes, where an MWO is to be established are shown in parentheses.

2 ICAO location indicator, assigned to the MWO.

3 Name of the FIR, UIR and/or search and rescue region (SRR) served by the MWO.

4 ICAO location indicator assigned to the ATS unit serving the FIR, UIR and/or SRR.

5 Indication of requirement for the MWO to issue SIGMET for volcanic ash.

6 Indication of requirement for the MWO to issue SIGMET for tropical cyclones.

~~5~~7 Remarks.

Note. — Unless otherwise stated in column 5, the MWO listed in column 1 is the designated collecting centre for the air-reports received within the corresponding FIR/UIR listed in column 3.

MWO Location	ICAO loc. ind.	Area served		SIGMET		Remarks
		Name	ICAO loc. ind.	VA	TC	
1	2	3	4	5	6	7
AUSTRALIA						
ADELAIDE/Adelaide	YPRM	Melbourne FIR [1]	YMMM			MWOs have areas of responsibility (AOR) defined by specific forecast area boundaries. These boundaries are not aligned with FIR boundaries
BRISBANE/Brisbane	YBRF	Brisbane FIR [2] Melbourne FIR [3]	YBBB YMMM		X	
DARWIN/Darwin	YDRM	Brisbane FIR [4] Melbourne FIR [5]	YBBB YMMM	X	X	MWO Darwin is designated to issue VA SIGMET for the whole Brisbane and Melbourne FIR
HOBART/Hobart	YMHF	Melbourne FIR [6]	YMMM			
MELBOURNE/Melbourne	YMRF	Brisbane FIR [7] Melbourne FIR [8]	YBBB YMMM			
PERTH/Perth	YPRF	Brisbane FIR [9] Melbourne FIR [10]	YBBB YMMM		X	
SYDNEY/Sydney	YSRF	Brisbane FIR [11] Melbourne FIR [12]	YBBB YMMM			
TOWNSVILLE	YBTL	Brisbane FIR [13]	YBBB			
BANGLADESH						
DHAKA/Zia Intl	VGZR	Dhaka FIR and SRR	VGFR	X	X	
CAMBODIA						
PHNOM-PENH/Pochentong	VDPP	Phnom-Penh FIR and SRR	VDPP	X	X	MWO not implemented
CHINA						
BEIJING/Capital	ZBAA	Beijing FIR and SRR	ZBPE	X		
GUANGZHOU/Baiyun	ZGGG	Guangzhou FIR and SRR	ZGZU	X	X	
KUNMING/Wujiaba	ZPPP	Kunming FIR and SRR	ZPKM	X		
LANZHOU/Zhongchuan	ZLLL	Lanzhou FIR and SRR	ZLHW	X		
~~Sanya~~HAIKOU/Meilan	ZJSY	Sanya FIR and SRR	ZJSA	X	X	
SHANGHAI/Hongqiao	ZSSS	Shanghai FIR and SRR	ZSHA	X	X	
SHENYANG/Taoxian	ZYTX	Shenyang FIR and SRR	ZYSH	X		
TAIBEI/Taibei Intl	RCTP	Taibei FIR and SRR	RCAA	X	X	
URUMQI/Diwopu	ZWWW	Urumqi FIR and SRR	ZWUQ	X		
WUHAN/Tianhe	ZHHH	Wuhan FIR and SRR	ZHWH	X		
HONG KONG/Hong Kong Intl	VHHH	Hong Kong FIR and SRR	VHHK	X	X	
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA						
PYONGYANG/Sunan	ZKPY	Pyongyang FIR and SRR	ZKKK	X	X	MWO not implemented
FIJI						
NADI/Nadi Intl	NFFN	Nadi FIR and SRR	NFFF	X	X	
FRENCH POLYNESIA						
TAHITI/Faaa	NTAA	Tahiti FIR and SRR	NTTT	X	X	
INDIA						
CHENNAI/Chennai	VOMM	Chennai FIR and SRR	VOMF	X	X	
DELHI/Indira Ghandi Intl	VIDP	Delhi FIR and SRR	VIDF	X		

MWO Location	ICAO loc. ind.	Area served		SIGMET		Remarks
		Name	ICAO loc. ind.	VA	TC	
1	2	3	4	5	6	7
KOLKATA/Kolkata	VECC	Kolkata FIR and SRR	VECF	X	X	
MUMBAI/Jawaharlal Nehru Intl	VABB	Mumbai FIR and SRR	VABF	X	X	
INDONESIA						
JAKARTA/Soekarno-Hatta Intl	WIII	Jakarta FIR/UIR and SRR	WIIF	X	X	
UJUNG PANDANG/Hasanuddin	WAAA	Ujung Pandang FIR/UIR and SRR	WAAF	X	X	
JAPAN						
(TOKYO/Tokyo)	RJTD	Fukuoka FIR and Tokyo SRR	RJJJ	X	X	
LAO PEOPLE'S DEMOCRATIC REPUBLIC						
VIENTIANE/Wattay	VLVT	Vientiane FIR and SRR	VLVT	X		MWO not implemented
MALAYSIA						
KOTA KINABALU/Kota Kinabalu Intl	WBKK	Kota Kinabalu FIR and SRR	WBFC	X	X	
KUALA LUMPUR/Kuala Lumpur Intl	WMKK	Kuala Lumpur FIR and SRR	WMFC	X	X	
MALDIVES						
MALE/Hulule	VRMM	Male FIR and SRR	VRMM	X	X	
MONGOLIA						
ULAN BATOR/Ulan Bator	ZMUB	Ulan Bator FIR and SRR	ZMUB	X		
MYANMAR						
YANGON/Yangon Intl	VYYY	Yangon FIR and SRR	VYYY	X	X	
NAURU						
NAURU I./Nauru	ANAU	Nauru FIR and SRR	ANAU	X	X	MWO not implemented
NEPAL						
KATHMANDU/Tribhuvan Intl	VNKT	Kathmandu FIR and SRR	VNSM			
NEW ZEALAND						
(Wellington/Kelburn)	NZKL	Auckland Oceanic FIR and SRR New Zealand FIR AND SRR	NZZO NZZC	X		Operational monitoring coverage south of 60˚S is limited due to the lack of information
PAKISTAN						
KARACHI/Quaid-E-Azam Intl	OPKC	Karachi FIR and SRR	OPKR	X	X	
LAHORE/Lahore	OPLA	Lahore FIR and SRR	OPLR	X		
PAPUA NEW GUINEA						
PORT MORESBY/Jacksons	AYPY	Port Moresby FIR and SRR	AYPY	X	X	
PHILIPPINES						
MANILA/Ninoy Aquino Intl	RPLL	Manila FIR and SRR	RPHI	X	X	
REPUBLIC OF KOREA						
INCHEON/Incheon Intl	RKSI	Incheon FIR and SRR	RKRR	X	X	
SINGAPORE						
SINGAPORE/Singapore Changi	WSSS	Singapore FIR and SRR	WSJC	X	X	
SOLOMON ISLANDS						
HONIARA/Henderson	AGGH	Honiara FIR and SRR	AGGG	X	X	MWO not implemented

MWO Location	ICAO loc. ind.	Area served		SIGMET		Remarks
		Name	ICAO loc. ind.	VA	TC	
1	2	3	4	5	6	7
SRI LANKA						
COLOMBO/Katunayake	VCBI	Colombo FIR and SRR	VCBI	X	X	
THAILAND						
BANGKOK/Bangkok Suvarnabhumi Intl	VTBS	Bangkok FIR and SRR	VTBB	X	X	
UNITED STATES						
(ANCHORAGE)	PAWU	Anchorage FIR	PAZA	X		
HONOLULU/Honolulu Intl	PHFO	Oakland Oceanic FIR South of 30N, East of 130E and West of 140W; Honolulu SRR.	KZOA	X	X	
(KANSAS CITY/Missouri)	KMKC	Oakland Oceanic FIR North of 30N.	KZOA	X		
VIET NAM						
(Gia Lam)	VVGL	Hanoi FIR and SRR Ho-Chi-Minh FIR and SRR	VVNB VVTS	X	X	

1) limited by the coordinates: 27S/128E;27S/135E;26S/138E; 2806S/14012E;29S/142E; 3414S/14205E;3345S/14045E; 40S/14045E;45S/14045E; 45S/129E;33S/129E;30S/129E; 2715S/12830E.

2) outside the AOR of YBTL MWO and limited by the coordinates: 0937S/14102E;0916S/14203E; 0913S/14206E;0911S/14214E; 0914S/14217E;0922S/14230E; 0922S/14230E;0923S/14236E; 0919S/14248E;0908S/14352E; 0924S/14414E;0957S/14405E; 1130S/14402E;1144S/14404E; 12S/144E;12S/155E;14S/155E; 14S/16115E;1740S/163E; 2830S/163E;2830S/155E; 2850S/15316E;29S/150E; 29S/14330E;26S/138E; 14S/138E;0937S/14102E.

3) limited by the coordinates: 26S/138E;29S/143E;29S/142E; 2806S/14012E;26S/138E.

4) limited by the coordinates: 1055S/12447E;0920S/12650E; 07S/135E;0950S/13940E; 0950S/141E;14S/138E; 18S/138E;2215S/138E; 26S/138E;2218S/13638E; 2128S/13609E;2111S/13134E; 2151S/13058E;2313S/12828E; 2322S/12629E;2327S/12415E; 2250S/12330E;2030S/12330E; 20S/129E;16S/12915E; 1528S/12806E;1450S/12825E; 14S/12730E;1345S/12609E; 14S/124E;1055S/12447E.

5) limited by the coordinates: 2250S/12330E;2327S/12415E; 2322S/12629E;2313S/12828E; 2151S/13058E;2111S/13134E; 2128S/13609E;2218S/13638E; 26S/138E;27S/135E; 2715S/12830E;25S/12815E; 25S/12330E;2250S/12330E.

6) limited by the coordinates: 40S/14045E;40S/143E; 3953S/14353E;4006S/14759E; 40S/150E;45S/150E; 45S/14045E;40S/14045E.

7) limited by the coordinates: 3730S/15033E;3730S/163E; 45S/163E;45S/150E; 4434S/150E;4351S/15040E; 43S/151E;3811S/15019E; 3730S/15033E.

8) limited by the coordinates: 3345S/14045E;3414S/14205E; 3510S/14728E;3730S/150E; 3730S/15033E;3811S/15019E; 43S/151E;4351S/15040E; 4434S/150E;40S/150E; 4006S/14759E;3953S/14353E; 40S/143E;40S/14045E; 3811S/14045E;3345S/14045E.

9) limited by the coordinates: 12S/110E;12S/12320E; 1055S/12447E;14S/124E; 1345S/12609E;14S/12730E; 1450S/12825E;1528S/12806E; 16S/12915E;20S/129E; 2030S/12330E;2250S/12330E; 2153S/12226E; then along the major arc of a circle of 15 NM radius centred on 2143S 12213E; 2133S/12201E;2026S/12045E; then along the minor arc of a circle of 120NM radius centred on 2023S 11837E; 1823S/11825E;1753S/11822E; then along the minor arc of a circle of 150NM radius centred on 2023S 11837E; 1934S/11606E;1931S/11331E; 12S/110E.

10) limited by the coordinates: 06S/75E;02S/78E;02S/92E;12S/107E;12S/110E;1931S/11331E;1934S/11606E; then along the minor arc of a circle of 120NM radius centred on 2023S 11837E; 1753S/11822E;1823S/11825E; then along the minor arc of a circle of 120NM radius centred on 2023S 11837E; 2026S/12045E;2133S/12201E; then along major arc of a circle of 15.0NM radius centred on 2143S 12213E; 2153S/12225E;2250S/12330E; 25S/12330E;25S/12815E; 2715S/12830E;30S/129E; 30S/129E;33S/129E;45S/129E; 45S/75E;06S/75E.

11) limited by the coordinates: 29S/14632E;29S/150E; 2850S/15328E;2830S/155E; 2830S/163E;3730S/163E; 3730S/15033E 3657S/15045E; then east of the minor arc of a circle of 120NM radius centred on 3457S/15032E; 3519S/15256E;3421S/15140E; 3359S/15201E;3351S/15154E; 3328S/15148E;3315S/15126E; 3312S/15114E;3320S/15042E; 3327S/15033E;3206S/14850E; 29S/14632E.

12) limited by the coordinates: 29S/142E;29S/14330E; 29S/14632E;3206S/14850E; 3327S/15033E;3320S/15042E; 3312S/15114E;3315S/15126E; 3328S/15148E;3351S/15154E; 3359S/15201E;3421S/15140E; 3519S/15256E; then east of the minor arc of a circle of 120NM radius centred on 3457S 15032E; 3657S/15045E;3730S/15033E; 3730S/150;3510S/14728E; 3414S/14205E;29S/142E.

13) limited by the coordinates: 14S/138E;10S/141E;09S/142E; 09S/144E;13S/145E;15S/147E; 1817S/148E;2309S/15252E; 2334S/14811E;1818S/14332E; 18S/138E;14S/138E.

TABLE MET 3A

TROPICAL CYCLONE ADVISORY CENTRES

EXPLANATION OF THE TABLE

Column

1. Location of the tropical cyclon advisory centre (TCAC).
2. ICAO location indicator of TCAC (for use in the WMO heading of advisory bulletin).
3. Area of responsibility for the preparation of advisory information on tropical cyclones by the TCAC in Column 1.
4. Period of operation of the TCAC.
5. MWOs to which the advisory information on tropical cyclones should be sent.
6. ICAO location indicator of the MWOs in Column 5.

Note: MWOs in italics are situated outside the Asia/Pacific Region.

TROPICAL CYCLONE ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	PERIOD OF OPERATION[2)]	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT	
				Name	ICAO LOC. IND.
1	2	3	4	5	6
Darwin (Australia)	YDRM (ADRM)	South-East Indian Ocean[1)] N: 0°S S: 36°S W: 90°E E: 141°E South-West Pacific Ocean[2]: N: 0°S S: 40°S W: 141°E E: 160°E	November – April	Adelaide[3)] Brisbane Colombo Darwin Hobart[3)] Honiara[4)] Jakarta Melbourne[3)] Perth Port Moresby Sydney[3)] Townsville[3)] Ujung Pandang	YPRM YBRF VOMM YDRM YMHF AGGH WIII YMRF YPRF AYPY YSRF YBTL WAAA
Honolulu (United States)	PHFO	Central Pacific: N: 60°N S: 0°N W: 180°W E: 140°W	May – November	Anchorage Honolulu Kansas City Tahiti	PAWU PHFO KKCI NTAA
Miami (United States)	KNHC	Eastern Pacific: N: 60°N S: 0°N W: 140°E E: Coastline	May – November	Honolulu Kansas City ~~Miami~~ Tahiti	PHFO KKCI ~~KNHC~~ NTAA
Nadi (Fiji)	NFFN	Southern Pacific: N: 0°S S: 40°S W: 160°E E: 120°W	November – April	Brisbane Hobart[3)] Honiara[4)] Honolulu Melbourne[3)] Nadi Sydney[3)] Tahiti Townsville[3)] Wellington	YBRF YMHF AGGH PHFO YMRF NFFN YSRF NTAA YBTL NZKL
New Delhi (India)	VIDP	1) Bay of Bengal 2) Arabian Sea N: Coastline S: 5°N	April – June October – December	Chennai Colombo Dhaka	VOMM VCBI VGZR

TROPICAL CYCLONE ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	PERIOD OF OPERATION[2)]	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT	
				Name	ICAO LOC. IND.
1	2	3	4	5	6
		W: 60°E E: 100°E		~~Delhi~~ Jakarta Karachi Kuala Lumpur Male Mumbai *Tehran* Yangon	~~VIDP~~ WIII OPKC WMKK VRMM VABB *OIII* VYYY
Tokyo (Japan)	RJTD	Western Pacific (incl. South China Sea)		Bangkok Guangzhou Gia Lam Hong Kong Honolulu Jakarta Kansas City Kota Kinabalu Kuala Lumpur Manila Nadi Phnom-Penh[4)] Pyongyang[4)] Shanghai Singapore Incheon Taibei Tokyo Ujung Pandang	VTBS ZGGG VVGL VHHH PHFO WIII KMKC WBKK WMKK RPLL NFFN VDPP ZKPY ZSSS WSSS RKSI RCTP RJTD WAAA

NOTES:

1) Co-ordinates of the areas of responsibility of the Darwin and Nadi Tropical Cyclone Advisory Centres to be confirmed.
2) Indicates approximately the main seasons for tropical cyclones.
3) Tropical cyclone SIGMET for the Australian FIRs is issued by MWOs: Brisbane, Darwin and Perth.
4) MWO not implemented

FASID TABLE MET 3B — VOLCANIC ASH ADVISORY CENTRES

EXPLANATION OF THE TABLE

Column

1. Location of the volcanic ash advisory centre (VAAC).
2. ICAO location indicator of VAAC (for use in the WMO heading of advisory bulletin).
3. Area of responsibility for the preparation of advisory information on volcanic ash by the VAAC in column 1.
4. ICAO Region of the State in column 5.
5. State of the MWO in column 6.
6. MWOs to which the advisory information on volcanic ash should be sent.
7. ICAO location indicator of the MWOs in column 6.
8. ACCs to which the advisory information on volcanic ash should be sent.
9. ICAO location indicator of the ACCs in column 8.

VOLCANIC ASH ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	ICAO REGION	STATE	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT		ACC TO WHICH ADVISORY INFORMATION IS TO BE SENT	
					Name	ICAO LOC. IND.	Name	ICAO LOC. IND.
1	2	3	4	5	6	7	8	9
Anchorage (United States)	PAWU	Anchorage Oceanic Anchorage Continental Anchorage Arctic and west to E150, north of N60	NAM	USA	Anchorage	PAWU	Anchorage	PAZA
			APAC	Japan	Tokyo	RJTD	Saporo Tokyo Fukuoka Naha	RJCG RJTG RJDG RORG
Darwin (Australia)	YDRM (ADRM)	Southward from N10 and from E100 to E160 and the Perth FIR between E100 and E75, Colombo FIR and those parts of the Kuala Lumpur, Bangkok, Chennai, Yangon and Kolkata FIRs lying within N10 E100 to N20 E100 to N20 E82 to N10 E82 to N6 E78 to S2 E78 to E6 E75	APAC	Australia	Adelaide[3)]	YPRM	Adelaide	YPAD
			APAC	Thailand	Bangkok	VTBS	Bangkok	VTBB
			APAC	Australia	Brisbane[3)]	YBRF	Brisbane Cairns	YBBN YBCS
			APAC	India	Chennai	VOMM	Chennai	VOMF
			APAC	Australia	Darwin	YDRM	Darwin	YPDN
			APAC	Viet Nam	Gia Lam	VVGL	Hanoi Ho-Chi-Minh	VVNB VVTS
			APAC	Australia	Hobart[3)]	YMHF	Hobart	YMHB
			APAC	Solomon I.	Honiara[2)]	AGGH	Honiara	AGGH
			APAC	Indonesia	Jakarta	WIII	Jakarta	WIIF
			APAC	Malaysia	Kota Kinabalu	WBKK	Kota Kinabalu	WBFC
			APAC	Malaysia	Kuala Lumpur	WMKK	Kuala Lumpur	WMFC
			APAC	Philippines	Manila	RPLL	Manila	RPHI
			APAC	Australia	Melbourne[3)]	YMRF	Melbourne	YMMM
			APAC	Australia	Perth[3)]	YPRF	Perth	YPPH
			APAC	Papua New Guinea	Port Moresby	AYPY	Port Moresby	AYPM
			APAC	Singapore	Singapore	WSSS	Singapore	WSJC
			APAC	Australia	Sydney[3)]	YSRF	Sydney	YSSY
			APAC	Australia	Townsville[3)]	YBTL	Townsville	YBTL
			APAC	Indonesia	Ujung Pandang	WAAA	Ujung Pandang	WAAF
			APAC	Myanmar	Yangon	VYYY	Yangon	VYYY
Tokyo (Japan)	RJTD	N60 to N10 – and from E90 to Oakland Oceanic and	APAC	Thailand	Bangkok	VTBS	Bangkok	VTBB
			EUR	Russian Federation	Blagovesche nsk	UHBB	Blagoveschens k	UHBB

VOLCANIC ASH ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	ICAO REGION	STATE	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT		ACC TO WHICH ADVISORY INFORMATION IS TO BE SENT	
					Name	ICAO LOC. IND.	Name	ICAO LOC. IND.
1	2	3	4	5	6	7	8	9
		Anchorage Oceanic and Continental FIR boundaries	APAC	China	Beijing	ZBAA	Beijing Huhhot Taiyuan	ZBPE ZBHH ZBYN
			EUR	Russian Federation	Bratsk	UIBB	Bratsk	UIBB
			EUR	Russian Federation	Chita	UIAA	Chita	UIAA
			APAC	Viet Nam	Gia Lam	VVGL	Hanoi Ho-Chi-Minh	VVNB VVTS
			APAC	China	Guangzhou	ZGGG	Guangzhou Changsha Guilin Nanning	ZGZU ZGCS ZGKL ZGNN
			APAC	China	HAIKOU/Meilan	ZJSY	Sanya	ZJSA
			APAC	China	Hong Kong	VHHH	Hong Kong	VHHH
					Incheon	RKSI	Incheon	RKRR
			EUR	Russian Federation	Irkutsk	UIII	Irkutsk	UIII
			EUR	Russian Federation	Khabarovsk	UHHH	Khabarovsk	UHHH
			EUR	Russian Federation	Kirensk	UIKK	Kirensk	UIKK
			APAC	China	Kunming	ZPPP	Kunming Chengdu Chongqing	ZPKM ZUDS ZUCK
			APAC	China	Lanzhou	ZLLL	Lanzhou Xi'an	ZLAN ZLSN
			EUR	Russian Federation	Magadan	UHMM	Magadan	UHMM
			EUR	Russian Federation	Magdagachi	UHBI	Magdagachi	UHBI
			APAC	Philippines	Manila	RPLL	Manila	RPHI
			EUR	Russian Federation	Nik.-na-Amure	UHNN	Nik.-na-Amure	UHNN
			EUR	Russian Federation	Okha	UHSH	Okha	UHSH
			EUR	Russian Federation	Okhotsk	UHOO	Okhotsk	UHOO
			EUR	Russian Federation	Pet.-Kamchatsky	UHPP	Pet.-Kamchatsky	UHPP
			APAC	Cambodia	Phnom-Penh[2)]	VDPP	Phnom-Penh	VDPP
			APAC	DPR Korea	Pyongyang[2)]	ZKPY	Pyongyang	ZKKK

VOLCANIC ASH ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	ICAO REGION	STATE	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT		ACC TO WHICH ADVISORY INFORMATION IS TO BE SENT	
					Name	ICAO LOC. IND.	Name	ICAO LOC. IND.
1	2	3	4	5	6	7	8	9
			APAC	China	Shanghai	ZSSS	Shanghai Hefei Jinan Nanchang Nanjing Xiamen Qingdao	ZSHA ZSOF ZSTN ZSCN ZSNJ ZSAM ZSQD
			APAC	China	Shenyang	ZYTX	Shenyang Dalian Hailar Harbin	ZYSH ZYTL ZBLA ZYHB
			APAC	China	Taibei	RCTP	Taibei	RCAA
			APAC	Japan	Tokyo	RJTD	Saporo Tokyo Fukuoka Naha	RJCG RJTG RJDG RORG
			APAC	Mongolia	Ulan-Bator	ZMUB	Ulan-Bator	ZMUB
			APAC	China	Urumqi	ZWWW	Urumqi	ZWWW ZWUQ
			APAC	Lao PDR	Vientiane	VLVT	Vientiane	VLVT
			EUR	Russian Federation	Vladivostok	UHWW	Vladivostok	UHWW
			APAC	China	Wuhan	ZHHH	Wuhan	ZHWH
			EUR	Russian Federation	Yuzhnosakhalinsk	UHSS	Yuzhnosakhalinsk	UHSS
Washington (United States)	KNES	Oakland Oceanic FIR	NAM	USA	Honolulu	PHFO	Oakland	KZOA
			NAM	USA	Kansas City	KKCI	Guam	PGZU
			APAC	Japan	Tokyo	RJTD	Saporo Tokyo Fukuoka Naha	RJCG RJTG RJDG RORG
			APAC	Australia	Darwin	YDRM	Darwin	YPDN
Wellington (New Zealand)	NZKL	Southward from the Equator and from E160 to W140[1]	APAC	Australia	Brisbane[3]	YBRF	Brisbane	YBBN
			APAC	Australia	Darwin	YDRM	Darwin	YPDN
			APAC	USA	Honolulu	PHFO	Oakland	KZOA
			APAC	Solomon I.	Honiara[2]	AGGH	Honiara	AGGH
			APAC	Australia	Melbourne[3]	YMRF	Melbourne	YMMM
			APAC	Fiji	Nadi	NFFN	Nadi	NFFF

VOLCANIC ASH ADVISORY CENTRE	ICAO LOC. IND.	AREA OF RESPONSIBILITY	ICAO REGION	STATE	MWOs TO WHICH ADVISORY INFORMATION IS TO BE SENT		ACC TO WHICH ADVISORY INFORMATION IS TO BE SENT	
					Name	ICAO LOC. IND.	Name	ICAO LOC. IND.
1	2	3	4	5	6	7	8	9
			APAC	Nauru	Nauru[2)]	ANAU	Nauru	ANAU
			APAC	Australia	Sydney[3)]	YSRF	Sydney	YSSY
			APAC	French Polynesia	Tahiti	NTAA	Tahiti	NTTT
			APAC	New Zealand	Wellington	NZKL	Auckland Christchurch	NZZO NZZC

Notes: –
1) Coverage south of 60°S latitude is currently not feasible.
2) MWO not implemented.
3) MWO Darwin is designated to issue VA SIGMET for Brisbane and Melbourne FIRs.

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
AUSTRALIA	ATN tests were conducted. BIS Router and Backbone BIS Router and AMHS implemented	AFTN based AIDC Implemented between Brisbane and Melbourne, Auckland, Nadi and Auckland. AIDC is also in use between Melbourne and Mauritius.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented.	Implemented.	5 ADS-B sites are operational. A total of 28 ground stations are expected to become operational throughout 2007. Additional 20 stations will be delivered in June 2007 for installation at enroute radar site and other sites. 5NM Separation service being introduced. NFRM on the carriage and use of ADS-B avionics to be issued in Apr.07	FANS 1/A ADS-C implemented.	
BANGLADESH	BIS Router and AMHS planned for 2007.							
BHUTAN	ATN BIS Router and UA service 2008.			Procedures developed for NPA.				

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
BRUNEI DARUSSALAM	ATN BIS Router planned for Sept 2008 and AMHS planned for 2008-2011							
CAMBODIA	BIS Router and AMHS planned for 2007			Procedure developed for NPA				

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
CHINA	ATN BIS Router AMHS will be implemented from 2006. - Tripartite BBIS trial completed with Bangkok and Hong Kong, China in Jan. 2003. - ATN trial with Hong Kong, China conducted 2003/2004. - AMHS with Hong Kong, China planned to conduct in 2006. - AMHS/ATN trial with Macau is under planning. - AMHS/ATN trial with Kuwait is under planning.	AIDC between some of ACCs within China has been implemented. AIDC between several other ACCs are being implemented. Operational trial on the AFTN based AIDC between Sanya and Hong Kong commenced on Aug. 2006 and put into operational use in Feb 2007.	Implemented to support certain AIS Rout. - L888 route, polar routes and Chengdu-Lhasa route. - Trial on HF data link conducted for use in western China.	RNAV (GNSS) implemented in certain airports. - Beijing, Guangzhou, Tianjin and Lhasa airports.	Implemented in certain airspace. - L888, Y1 and Y2 routes.	ADS-B trial has been conducted in 2006. 5 UAT ADS-B sites are operational and used for flight training of CAFUC. Another ADS-B of 1090ES trial will be commenced in 2007.	FANS 1/A ADS-C implemented to support certain routes. - L888 route polar routes and Chengdu-Lhasa route.	

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
HONG KONG, CHINA	-ATN and AMHS technical trial with Japan conducted in 2003 -64 Kbps ATN Link with Bangkok put into operational use in June 2004. -ATN/AMHS technical trials with China (Beijing) using VPN over Internet connection conducted in September, 2006 -Further ATN/AMHS technical trials with Thailand and China planned for 2007 -ATN/AMHS trials with Philippines planned for 2007.	Trial on the AFTN based AIDC with Guangzhou and Sanya, China commenced. Operational trial with Sanya commenced in Aug. 2006 and put into operational use in Feb. 2007.	FANS 1/A based CPDLC conducted. D-ATIS D-VOLMET and PDC implemented. VDL Mode-2 technical trial completed in Dec. 2002 and planning on further trials is in progress.	RNAV (GNSS) departure procedures implemented in July 2005.	Implemented in certain airspace.	”ASMGCS” trial using ADS-B/ Multilateration system commenced in 2004/2005. A dedicated ADS-B trial evaluation system was installed in early April 2007	FANS 1/A trials for ADS-C conducted.	

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
	-ATN/AMHS technical trials with China (Macao) planned for 2008.							
MACAO, CHINA	ATN BIS router and AMHS planned for 2008. Trial with China and Hong Kong, China in planning stage.					"A-SMGCS" being planned with ADS-B as option for consideration.		ATZ within Hong Kong and Guangzhou FIRs. In ATZ full VHF coverage exist. Radar coverage for monitoring purposes.
COOK ISLANDS								
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA								

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
FIJI	AMHS in-house trials completed in 2006. AMHS trials completed in 2007. ATN BIS Router and AMHS plans to be implemented in 2008.	AFTN based AIDC with Brisbane and Auckland operational in 2005. AFTN based AIDC implement with Oakland	FANS-1 implemented	NPA procedures for (S) completed in Dec. 2002.	Implemented as (S).	ADS-B implementation in 2008/2009. Estimate 10 Ground Stations	ADS-C implemented in oceanic airspace using EUROCAT 2000 X.	
FRANCE (French Polynesia Tahiti)		Implementation of limited message sets with adjacent centres under discussion.	FANS-1. Implemented since 1996.				FANS 1/A ADS-C implemented since March 1999.	
INDIA	ATN BBIS router and AMHS planned for implementation at Mumbai in March 2008.	AFTN Based AIDC 1. between Mumbai and Karachi 2007 2. between Kolkata and Dhaka 2008	FANS-1 implemented at Kolkata, Chennai, Mumbai and Delhi.		SBAS - Technical developments in 2007. - Implementation planed for 2009.	Trial planned for 2006. ASMGCS Implemented at IGI Airport New Delhi.	FANS 1/A ADS-C implemented at Kolkata, Chennai, Delhi and Mumbai.	

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
INDONESIA	ATN BIS Router and AMHS planned for trial in 2008.	AFTN based AIDC planned for implementation between Brisbane and Jakarta in 2010. Brisbane and Makassar in 2008.	FANS-1/A. CPDLC in Jakarta, Ujung Pandang FIRs trial planned for 2007.	Procedure to be completed in 2006 for NPA.		2 ADS-B ground stations to be installed in 2007. Upgrading ATC automation at Makasar for ADS-B application capabilities in 2007.	FANS 1/A ADS-C trial planned at Jakarta and Ujung Pandang ACC in 2007.	
JAPAN	ATN BBIS already implemented. AMHS implemented between Japan and USA in 2005 and between Japan and Hong Kong, China planned for 2009-2010.	AIDC based. AFTN procedure implemented with Oakland and Anchorage. Planned between Incheon ACC and Fukuoka ATMC 2008.	FANS1/A system Implemented in Fukuoka FIR	NPA implemented at 4 aerodromes.	SBAS Operational In 2007	Amendment work to be radio law regulations for using ADS-B out (1090 MHz ES) is under way.	FANS 1/A. ADS-C implemented in Fukuoka FIR	
KIRIBATI								

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
LAO PDR	ATN BIS Router and AMHS planned for implementation with Bangkok in 2006.	AIDC with Bangkok planned for 2008	FANS-1/A Planned for Bay of Bengal and South China Sea areas. Equipment is under test operation.		Implemented.		FANS-1/A. ADS-C planned for Bay of Bengal and South China Sea areas. Equipment under test operation.	
MALAYSIA	ATN BIS Router completed 2007. AMHS planned in 2008.	AFTN AIDC planned with Bangkok ACC in 2010.	Planned for Bay of Bengal and South China Sea areas in 2006.	NPA at KLIA implemented.		Implementation of ADS-B proposed in 2008-2010.	FANS 1/A ADS-C planned for Bay of Bengal and South China Sea areas in 2006.	
MALDIVES	ATN BIS Router/AMHS planned for implementation in the 2008.	Planned for 2008.	FANS1/A installed Trials planned in last quarter of 2007		Trials planned for 2005-2008. Implementation in late 2008.	Trials planned for 2007-2008. Implementation in late 2008.		
MARSHALL ISLANDS				NPA implemented at Majuro Atoll.				
MICRONESIA FEDERATED STATES OF								

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
Chuuk				Implemented				
Kosrae				Implemented				
Pohnpei				Implemented				
Yap				Implemented				
MONGOLIA	ATN BIS Router and AMHS planned for 2005 and 2006. Trial with Bangkok conducted		Function available. Regular trials are conducted.	GPS procedures are being developed and implemented at 10 airports.	Implemented.	ADS-B trial in progress implementation planned for 2006.	FANS 1/A ADS-C implemented since August 1998.	
MYANMAR	Trial for ATN BIS Router with Thailand planned for 2006. Test with China planned for 2006.		Implemented since August 1998				Implemented since August 1998	
NAURU								
NEPAL	BIS Router and AMHS planned for 2010.	AFTN/AMHS based AIDC between KTM-CAL, KTM-BAN, KTM-LHASA planned for 2010		GPS departure and approach has been developed for 8 airports and planned for implementation in 2008.	will be implemented as required.	ADS-B feasibility study planned for 2007		

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
NEW CALEDONIA						Tontouta ACC 2009 Tontouta APP 2009		
NEW ZEALAND	BIS Router and AMHS implementation planned for 2008.	AFTN based AIDC implemented between New Zealand, Australia, Fiji, Tahiti, Chile and USA.	FANS-1/A. Implemented	Implemented.	will be implemented as required.	Domestic trial was conducted in 2005. Use will be re-evaluated in 2008. Trial of Area MLAT conducted in 2006. ADS-B planned as an element of MLAT at specific sites for domestic use.	FANS 1/A Implemented.	
PAKISTAN	Implementation of ATN considered for Phase II (2005-2010).	Implemented between Karachi and Lahore ACCs	Implementation planned from 2005-2010.	Arrival and departure NPA procedure are being developed.	Planned for 2005-2010.	Feasibility study for using ADS-B is in hand. One station planned for 2009 to establish confidence.	Planned for 2005-2010	Existing Radar system being upgraded.
PAPUA NEW GUINEA				Implemented at certain aerodromes.	Implemented.			

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
PHILIPPINES	ATN G/G BIS Router/AMHS implemented in 2006 AMHS trials with Singapore and Hong Kong planned in 2007.	Planned for 2011.	CPDLC Planned for 2011.			Included in CNS/ATM Project and scheduled for implementation in 2011.	FANS 1/A ADS-C planned for 2011.	
REPUBLIC OF KOREA	ATN BIS Router/AMHS planned for 2005-2010.	AFTN based AIDC planned for 2008 between Incheon ACC and Fukuoka ATMC	PDC & D-ATIS implemented 2003.	NPA planned for 2008 at Incheon International Airport		ADS-B trials planned for 2008.	Trial for FANS 1/A ADS-C implemented since 2003.	
SINGAPORE	ATN BBIS Router trial with Hong Kong conducted between April and June 2003. Planned for ATN and AMHS implementation in 2006.	ATN based AIDC to be implemented in 2010	Implemented since 1997. Integrated in the ATC system in 1999.	NPA procedure developed. RNAV (SID/STAR) in 2005	Implemented.	Trial commenced in 2006. Operational in 2010. 2007 for ASMGCS	FANS 1/A ADS-C implemented since 1997. Integrated with ATC system in 1999.	

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
SRI LANKA	ATN BIS Router Planned for 2009. AMHS planned along with BIS in 2009.		PDLC in trial operation since November 2000.			ADS-B Trials planned for 2010 and implementation in 2011.	FANS 1 /A ADS-C trial since November 2000.	GPS based domestic route structure being developed.
THAILAND	BBIS/BIS Routers already implemented. Target date for AMHS in 2008.	AFTN based AIDC planned for 2010.	FANS-1/A Implemented .		Implemented.	Multilateration implemented in 2006 at Suvarnbhumi Intl. Airport. 22 ADS-B ground Stations will be implemented in 2008	FANS 1/A ADS-C Implemented.	
TONGA	AMHS planned for 2008.			NPA planned for 2007.		Trial planned for 2010		CPDLC and ADS-C is not considered for lower airspace
United States	AMHS implemented	AFTN based AIDC implemented	FANS-1/A based CPDLC implemented	Implemented	Implemented	Implemented	Implemented	
VANUATU								

CNS/ATM Implementation Planning Matrix								
State/ Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**GNSS**		**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
				RNAV (GNSS)	**En-route**			
VIET NAM	BIS Routers planned for 2009.	AFTN based AIDC planned in 2009 Trial for ATN based AIDC planned in 2010.	CPDLC operational trial conducted in early 2007.	RNAV	For en-route TBD.	TBD	FANS 1/A ADS-C operational trial conducted for oceanic area of Ho Chi Minh FIR since March 2002.	

KEY PRIORITIES FOR CNS/ATM IMPLEMENTATION IN THE ASIA/PACIFIC REGION

No.	KEY PRIORITIES	DESCRIPTION	MILESTONES	SUB-GROUP	STATUS	DISCUSSION/ACTION
1.	Performance Based Navigation (RNP/RNAV) Implementation	Implement performance based navigation, operation and procedures to improve the efficiency and flexible use of airspace.	Report to APANPIRG	ATM/AIS/SAR CNS/MET	On-going Phased implementation.	Reflect performance based navigation, not just RNP.
2.	ADS-C	The implementation of ADS-C in oceanic or remote areas in accordance with the Regional CNS/ATM Plan is required for the enhancement of safety and ATM.	Report to APANPIRG FIT-BOB reconvened September 2003. Bay of Bengal operational trial of ADS/CPDLC commenced February 2004, trial on going. FIT-SEA inaugural meeting May 2004. South China Sea operational trial of ADS/CPDLC expected 2006/2007.	ATM/AIS/SAR	Phased implementation. Implementation focus and timetable need to be developed. States are gaining experience in the use of ADS-C.	

KEY PRIORITIES FOR CNS/ATM IMPLEMENTATION IN THE ASIA/PACIFIC REGION

No.	KEY PRIORITIES	DESCRIPTION	MILESTONES	SUB-GROUP	STATUS	DISCUSSION/ACTION
3.	Co-operation in Regional CNS/ATM Planning, Implementation & Training.	The continuation and enhancement of ICAO's co-ordinating role of technical co-operation in CNS/ATM planning and implementation, in close co-operation with all partners and taking into account the regional approach, is required.	Report to APANPIRG	All	Sub-Groups to identify requirements.	Emphasis needs to be on sharing information and training. Title 'Technical Co-operation" is confusing with assistance programs. Need to inform States of opportunities for training well in advance of scheduled date. Training opportunities should include ICAO programs as well as associated organizations programs. ATN Seminar was conducted. Two ADS-B Seminars were conducted QMS Seminar SAIDS-2G MET/ATM Coordination Seminars were conducted PBN Seminar was conducted in Beijing by ICAO

KEY PRIORITIES FOR CNS/ATM IMPLEMENTATION IN THE ASIA/PACIFIC REGION

No.	KEY PRIORITIES	DESCRIPTION	MILESTONES	SUB-GROUP	STATUS	DISCUSSION/ACTION
~~4.~~	Preparation for WRC-2011	The co-operative participation of States is required with their respective telecommunications regulatory authorities, regional groups, at the APT forums and at the WRC regional preparatory meetings for WRC-2011 to ensure that aviation spectrum requirements are fulfilled and protected.	WRC-2007	All	States are designating contact points responsible for preparation for WRC 2011 and are providing contact details for posting on the website to facilitate coordination.	High importance task. Spectrum must be available to enable CNS/ATM implementation. Of the 35 States 31 States have nominated the focal point of contact
5.	GNSS Implementation • GBAS • SBAS	To implement GNSS in accordance with the Asia Pacific Regional Strategy. Facilitate market available GBAS ground system *(CAT I)* certified to Annex 10 SARPs.	On-going 2008	CNS/MET	SBAS receivers - (TSO C145/6) now available Lead aircraft with certified GBAS avionics now in service.	Strategy for Approach, Landing and Departure identified GBAS as a preferred CAT I option. No ground equipment is available that is certified to Annex 10 SARPs.
6.	MET support for the new CNS/ATM System.	To identify the ATM requirements for new MET products supporting CNS/ATM systems and update the plan accordingly.	2006	CNS/MET	MET/ATM TF has surveyed the new requirements and is preparing an update for the MET chapter of the ASIA/PAC Regional Plan for the New CNS/ATM Systems.	MET/ATM coordination seminar provided information for updating the Regional Plan

KEY PRIORITIES FOR CNS/ATM IMPLEMENTATION IN THE ASIA/PACIFIC REGION

No.	KEY PRIORITIES	DESCRIPTION	MILESTONES	SUB-GROUP	STATUS	DISCUSSION/ACTION
		Implementation of the transition to GRIB and BUFR coded WAFS products	2006		MET/ATM coordination seminar was conducted 8-10 February 2006. GRIB coded products have been implemented. BUFR coded SIGWX charts are being implemented with the deadline for implementation 30 Nov 2006	
7.	ADS-B	Operational Standards to support proposed separation standards. Airline aircraft certificated to participate in ADS-B operations. Avionic packages available to meet GA and low capacity operations.	2006 2006 2006	ADS-B Task Force ADS-B Task Force ADS-B Task Force	Progressed by Task Force in AIGD and completed by SASP & OPLINK. Doc4444 being amended. Lead aircraft certified for initial ADS-B OUT operation Avionics package to meet GA & low capacity operation is available.	Focus on activities to enable successful ADS-B OUT implementation. Roll-out of ADS-B considered an on-going activity.
8.	Implementation of APV and RNAV (GNSS) Approaches.	Review applicability of APV and RNAV (GNSS) Approach Design Standards, aircraft certification and augmentation system availability for Asia Pacific.	2006	CNS/MET ATM/AIS/SAR	APV and RNAV (GNSS) Design standards now in PANS OPS. Aircraft certified for RNAV (GNSS) and APV approaches.	Completed ATM/AIS/SAR/SG to consider operational issues including charting.

KEY PRIORITIES FOR CNS/ATM IMPLEMENTATION IN THE ASIA/PACIFIC REGION

No.	KEY PRIORITIES	DESCRIPTION	MILESTONES	SUB-GROUP	STATUS	DISCUSSION/ACTION
		Develop implementation strategy.	2007			
9.	Data Link Flight Information Services (DFIS) applications	To implement the following applications via request/response mode of data link in the Asia and Pacific Regions: a) Data link –automatic terminal information services (D-ATIS); b) VOLMET data link service (D-VOLMET); c) Pre-Departure Clearance (PDC) delivery via data-link; d) DCL	2008	ATM/AIS/SAR CNS/MET	Trials and demonstrations are conducted and some operational services are provided by States.	Implementation of D-ATIS is progressing Expected to be implemented at all locations except one by 2008 PDC implemented at several locations

KEY PRIORITIES FOR CNS/ATM IMPLEMENTATION IN THE ASIA/PACIFIC REGION

No.	KEY PRIORITIES	DESCRIPTION	MILESTONES	SUB-GROUP	STATUS	DISCUSSION/ACTION
10.	Safety Management Systems.	States to establish national safety management systems and effective application of safety programmes which are required for the provision of air traffic services. Required monitoring services available to support operational enhancements.		ATM/AIS/SAR RASMAG RASMAG	Annex 11 provisions effective 27 November 2003. On-going RASMAG activities. Operational enhancements suspended where effective monitoring is not available.	
11.	Air Traffic Flow Management.	States to consider and implement aspects of air traffic flow management (ATFM) including: a) centralized ATFM b) inter-regional cooperative ATFM; c) establishment of ATFM databases; d) application of strategic ATFM planning; and e) application of tactical ATFM planning	2006	ATM/ ATIS/ SAR	On going	

TERMS OF REFERENCE OF THE

COMMUNICATIONS, NAVIGATION, SURVEILLANCE/METEOROLOGY (CNS/MET) SUB-GROUP OF APANPIRG

TERMS OF REFERENCE

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

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

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

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

5. Review and identify inter-regional co-ordination issues in the fields of CNS/MET and recommend actions to address those issues.

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SUBJECT/TASKS LIST IN THE CNS/MET FIELDS

The priorities assigned in the list have the following connotation:
A = Tasks of a high priority on which work should be expedited;
B = Tasks of medium priority on which work should be under taken as soon as possible but not to the detriment of Priority "A tasks; and
C = Tasks of medium priority on which work should be undertaken as time and resources permit but not to the detriment of priority "A" and "B" tasks.
TOR = Terms of Reference of the Sub-Group

TASKS NO. 1-29 HAVE BEEN COMPLETED AND REMOVED FROM THE LIST

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action By	Target Date
2 (32)	RAN/3 C.8/14 APANPIRG/14 (TOR 3)	A-Safety E-Continuity GPI-19	Subject: Inadequate implementation of procedures for advising aircraft on volcanic ash and tropical cyclones Task: Monitoring of the implementation of international airways volcano watch (IAVW) and tropical cyclone advisories and SIGMETs	A	Monitor and provide assistance in the implementation of volcanic ash and tropical cyclone advisories and SIGMETs procedures to ensure provision of timely information on volcanic ash and tropical cyclones to aircraft.	CNS/MET SG Task Force on the implementation of Volcanic Ash and Tropical Cyclone advisories and SIGMETs (VA/TC/I TF)	On going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action By	Target Date
3 (35)	(TOR 3)	D – Efficiency All GPIs	Subject: To facilitate regional implementation of CNS/ATM Tasks: a) coordinate training/workshops to allow States to develop and implement new CNS/ATM procedures; b) encourage States to participate in the evaluation and training of new CNS/ATM systems; c) progress the adoption of WGS-84 co-ordinate system and introduction of high integrity systems for the management of the co-ordinate data.	A	1) Identify topics for training, develop syllabi and plan training programme; 2) Encourage States in the evaluation and training of new CNS/ATM systems; 3) Co-ordinate with States and monitor progress; 4) Collect information and suggest methods of resolving problems commonly faced by States.	CNS/MET SG ATM/AIS/SAR CNS/MET SG	On-going On-going On-going On-going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action By	Target Date
4 (36)	APANPIRG D. 4/46 RAN/3 C.12/3 APANPIRG 5/3 (TOR 3)	D – Efficiency All GPIs	Subject: Provision of adequate CNS/MET services Task: Monitor CNS/ATM systems research and development, trials and demonstrations in the fields of CNS/MET and facilitate the transfer of this information and expertise between States.	A	1) Encourage States to conduct R&D, trials & demonstrations of new CNS/MET services; 2) Monitor global developments that may have beneficial consequences on regional planning activities; 3) Consolidate information on new capabilities in the CNS/ATM system, for the Sub-Groups review and action; 4) Serve as a focal point for review of ongoing work of Regional formal and informal working groups that is relevant to CNS/MET; 5) Provide for coordinated training/seminars to keep all States informed on developments of trials and demonstrations.	CNS/MET	On-going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action By	Target Date
5 (37)	C 12/24	D – Efficiency GPI-19	Subject : Transition to the GRIB and BUFR coded WAFS products Task : Implementation of the transition to the GRIB and BUFR coded WAFS products	A	1) Monitoring of implementation of BUFR coded SIGWX forecasts 2) Monitoring of the migration to SADIS 2G 3) Assist in preparation for the new gridded products for turbulence and icing	CNS/MET SG WAFS Implementation Task Force (WAFS/I TF)	Completed 2008 2010

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action By	Target Date
6 (38)	C12/36 APANPIRG C14/45	D – Efficiency GPI-19	Subject: Lack of ATM requirements for MET components of the ASIA/PAC CNS/ATM Plan. Task: Developing the MET Chapter for the ASIA/PAC CNS/ATM Plan.	A	1) Development of the initial draft of the MET Chapter; 2) Development of the MET components of the CNS/ATM concept/ strategy; 3) Inclusion of ATM requirements for MET information in the CNS/ ATM Plan; 4) MET/ATM Coordination Seminar – February 2006. 5) Conduct survey on ATM requirements for MET information	CNS/MET SG with assistance of MET WG on CNS/ATM Plan CNS/MET SG METATM TF MET/ATM TF	Completed Completed Completed Completed 2007
7 (39)	APANPIRG/13 D 13/28	A - Safety D – Efficiency GPI-19	Subject: To improve the efficiency of the regional and inter-regional OPMET exchange and the availability of OPMET information from the ASIA/PAC Region Task: Review and optimize the ROBEX scheme and other OPMET exchanges; introduce monitoring and management procedures for the ROBEX centres and Regional OPMET data banks	A	1) Review and update regional ROBEX tables and relevant documents; 2) Propose optimization changes to the ROBEX scheme; 3) Improve the availability of OPMET data at the Regional OPMET Data Banks (RODB); 4) Improve the availability of OPMET information from the Pacific States; 5) Introduce monitoring and management Procedures.	CNS/MET SG OPMET Management Task Force (OPMET/M TF)	Completed Completed on-going on-going Completed

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action By	Target Date
10 (43)		D- Efficiency GPI17,18,19,22	Subject: Implementation of data link Task: Encourage implementation	A	Encourage States to implement CPDLC, D-ATIS, D-VOLMET, PDC and DPC	CNS/MET SG	2008
11 (44)		D-Efficiency GPI22	Subject: FASID Task: Updating of Table CNS-2	A	Seek State revisions of Table CNS-2 prior to May 2006. Review and update Table CNS-2 with the assistance of the Secretariat	CNS/MET SG	Completed
12 (45)	APANPIRG List of deficiencies	A – Safety GPI - 19	Subject: Implementation of SIGMET Task: Improve regional procedures and availability of SIGMET from ASIA/PAC States	A	1) Assist States in implementing SIGMET requirements; 2) Conduct regular SIGMET tests; 3) Produce training and guidance material; 4) Regular monitoring on the availability and quality of SIGMET and advisories.	CNS/MET SG VA/TC/I TF	Recurrent task
13 (46)	**APANPIRG/17 C 17/23**	D-Efficiency GPI-5 GPI-11	Subject: To implement Performance Based Navigation Concept in Asia/Pacific Region Task: Implement Performance Based Navigation in the Region.	A	1) To conduct Workshops/Seminars in the Region to familiarize the States about PBN Concept 2) To develop roadmap for implementation of RNP and RNAV procedures	CNS/MET SG (ATM/AIS/SAR) SG CNS/MET SG	2007 2008

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action By	Target Date
14 (47)		D-Efficiency GPI22	Subject: FASID Task: Updating of FASID Table CNS-1E	A	Seek State revisions of Table CNS-1E prior to May 2008. Review and update Table CNS-1E with the assistance of the Secretariat	CNS/MET SG	2008

*** Number in bracket indicates sequential number since establishment of the Sub-group.**

Agenda Item 3.4: ATS Coordination Group Activities

3.4 ATS Coordination Groups' Activities

3.4.1 The meeting was updated on the activities since APANPIRG/17 (August 2006) of the ICAO and State ATS Coordination Groups that contribute to the regional work of APANPIRG. The outcomes of the First meeting of the Trans Regional Airspace and Supporting ATM Systems Steering Group (TRASAS/1) were also reviewed, as discussed in Agenda Item 3.2

3.4.2 Meeting dates of the regional ATS Coordination Groups and subordinate task forces, FIT, etc. that are currently active in the Asia/Pacific Region are shown in **Appendix A** to Agenda item 3.4. It was noted that the events of ICAO meetings and the vast majority of State meetings are comprehensively recorded in a report of each meeting. Full reports of ICAO meetings are available on the ICAO Asia/Pacific Regional Office website at http://www.bangkok.icao.int/ under the 'Meetings' menu.

ICAO ATS Coordination Groups

18th Meeting of the Bay of Bengal ATS Coordination Group (BBACG/18)

3.4.3 BBACG/18 reviewed and noted relevant parts of the reports of APANPIRG/17, RASMAG/6, FIT-BOB/8, and ATFM/TF/9. Of particular interest were the developments dealing with funding requirements and related activities for safety monitoring in the Asia Pacific Region being addressed by APANPIRG and RASMAG. Also, RASMAG had drawn attention to APANPIRG Conclusion 16/5 requiring States to comply with Annex 11, Chapter 2, safety management provisions for implementing reduced separation minima.

3.4.4 BBACG/18 noted that MAAR's RVSM safety assessment showed that the TLS for the Bay of Bengal area continued to satisfy the agreed TLS, and that a standardized approach to the collection of vertical and horizontal traffic sample data had been adopted by APANPIRG.

ATS Routes

3.4.5 Australia provided information on developments to expand the Australian Organized Track Structure (AUSOTS) to routes to the Middle East and India through the Indonesian, Sri Lankan and Indian airspaces. The States concerned and the Regional Office were supporting implementation as soon as arrangements could be put in place. Also, the BBACG/18 noted the benefits of implementing conditional ATS routes and supported the efforts of APANPIRG in this regard.

Civil Military Coordination

3.4.6 BBACG/18 was informed of preparations for the Civil and Military Air Traffic Management Summit 2007 (CMAC07, February - March 2007) that would be hosted by AEROTHAI in Bangkok, Thailand. CMAC07 was jointly sponsored by the Air Traffic Control Association, the American Association of Airport Executives and the US Department of Defence, with support from the US FAA. CMAC07 was the largest forum of its kind where senior civil and military leaders discuss visions, opportunities and plans for civil/military collaboration to meet the evolving needs of the worldwide aviation community.

Interregional ATS Coordination

3.4.7 BBACG/18 noted with disappointment that the limited resources at the Regional Office had led to the deferral of plans for the Regional Office to pursue a periodic 'Whole of Indian Ocean' meeting. This had obliged States, IATA and airspace users to undertake informal activities and had led to the formation of the Informal Indian Ocean ATS Coordination Group (IIOACG) and, more recently, the Arabian Sea Indian Ocean ATS Coordination Group (ASIOACG).

3.4.8 Although there had previously been an active ICAO Indian Ocean ATS Coordination Group (IOACG) and the ICAO South West Asia ATS Coordination Group (SWACG) for the Arabian Sea, no current ICAO forum exists in these areas. However, after an abeyance of 10 years, attempts were being made to reactivate SWACG meeting under the auspices of the Cairo Office of ICAO and a meeting had tentatively been scheduled for May 2007. However, the May 2007 meeting of the SWACG was not held and the reconvening of the SWACG had been deferred indefinitely.

Air Traffic Flow Management Task Force (ATFM/TF)

3.4.9 The meeting noted that the main focus of the recent work of the ATFM/TF had been towards the implementation of flow management in order to regulate the flow of traffic across the Bay of Bengal transiting the Kabul FIR during the night time peak traffic period (2000-2359 UTC). Full details of the current work of the ATFM/TF have been included in Agenda Item 3.2.

FANS 1/A Implementation Team for the Bay of Bengal (FIT-BOB)

3.4.10 FIT-BOB/7 (July 2006) and FIT-BOB/8 (Jan 2007) addressed the matters summarized below.

Review of Bay of Bengal ADS/CPDLC Operational Trial

3.4.11 Almost 90 percent of the data link equipped aircraft operating in the Bay of Bengal were logging on to the Chennai ACC services. Data link equipped aircraft represented about 45 % of the total traffic. The problem reports were now mostly repetitive in nature and related mainly to CPDLC connectivity, particularly with certain aircraft types such as A334 and B772 series.

Review of Arabian Sea ADS/CPDLC Operational Trial

3.4.12 The data link systems in Mumbai were in operation for almost 17 hours per day. No serious problems had been encountered so far. Very few problem reports had been raised for the Mumbai FIR trial operations. SITA was providing regular updates on unexpected service interruptions as well as planned outage.

3.4.13 The creation of the Arab Civil Aviation Commission FANS Implementation Group (AFIG) in May 2006 by the Arab Civil Aviation Commission (ACAC) to oversee the co-ordinated implementation of FANS Services across the Middle East and North African regions would require harmonizing operational aspects of the AFIG and the FIT-BOB ADS/CPCLC implementation plans.

Data link capacity

3.4.14 Due to Ground Earth Station (GES) capacity limitations, a table of State ADS/CPDLC implementation planning for all FIT-BOB and FIT-SEA FIRs was prepared, and would be kept up to date to assist the Data Service Providers (DSPs) to provide and plan for future provision of data link facilities and services.

FIT/CRA Funding

3.4.15 Noting the extensive delay that had occurred in establishing financial arrangements that enabled the provision of CRA services for the Bay of Bengal and Arabian Sea airspaces, India reported that the Government of India had approved funding arrangements**.** Once the formal agreement and other necessary arrangements were completed between IATA and Boeing, full implementation of data link services was expected to result. However, as of August 2007, arrangements for the CRA had still not been formalised. The inability to access CRA services had contributed to extensive delays in the Bay of Bengal and Arabian Sea data link trials. India requested IATA to expedite the agreement with Boeing.

14th Meeting of the South-East Asia ATS Coordination Group (SEACG/14)

3.4.16 SEACG/14 reviewed and noted relevant parts of the reports of APANPIRG/17, RASMAG/6, and FIT-BOB/7 and 8. SEACG/14 noted that MAAR's RVSM safety assessment showed that the TLS for the Western Pacific/South China Sea (WPAC/SCS) area was again not satisfied and that the WPAC/SCS RVSM Scrutiny Group established by APANPIRG/17 was addressing this matter.

Safety Assessment for RNP10 Operations in the SCS Area

3.4.17 In follow up to APANPIRG/17 (Conclusion 17/6) concerning the lack of current horizontal safety assessment for the South China Sea (SCS) route structure, Thailand, recognizing the urgency of the situation, had decided to offer their full commitment in providing appropriate staffing and resources to MAAR in order to satisfy this additional task.

Radar Provision across Southeast Asia Region

3.4.18 Thailand proposed a harmonized programme to enhance traffic flow in the Southeast Asia region by providing radar handover across boundaries, and proposed to all ANSPs involved to arrange for an operational trial by using consistent radar spacing along the ATS routes A1, P901, M750 and G581.

3.4.19 SEACG/14 noted the advantages of reducing the spacing on those routes, and was of view that that it was feasible to implement radar spacing along the proposed ATS routes. States were encouraged to carry out bilateral coordination to apply radar spacing and report outcomes to the next meeting. SEACG/14 reviewed and updated the table of the Status of Application of Radar Handover in the Southeast Asia developed at SEACG/13.

ATS Routes

3.4.20 Information was provided by Viet Nam on the establishment and revision of ATS/RNAV routes within the Hanoi and the Ho Chi Minh FIRs. Thailand updated the SEACG/14 on progress with the establishment of an ATS route connecting Kota Bharu (VKB) to Ranong (RAN) to support traffic flow during the peak period of Europe-bound flight. RNAV route M752 was changed from the original proposal as referred to in the Route Catalogue, Version 3.

Development of State Contingency Plans

3.4.21 SEACG/14 noted the development of the Indonesia Contingency Plan and that APANPIRG/17 had endorsed the draft as a model to be used by other States in preparation of a similar national contingency plan, in accordance with Annex 11 requirements**.**

FANS 1/A Implementation Team for the South East Asia (FIT-SEA)

3.4.22 Following are the main points of interest arising from the FIT-SEA/4 (July 2006), FIT-SEA/5 (Jan 2007) and FIT-SEA/6 (May 2007) meetings:

a) March 2007 was agreed as an achievable target date to commence Phase 1 of the joint ADS/CPDLC operational trial in the Singapore and Ho Chi Minh FIRs, the operational trial would commence on 15 March 2007;

b) the States involved in the South China Sea area operational trial accepted an offer from CRA-Japan to provide CRA services;

c) due to unresolved funding issues it was not possible for the Philippines to obtain a standalone ADS/CPDLC system, therefore it was not possible to determine a specific target date when they could join the operational trial in the Manila FIR;

d) the operational status of ADS/CPDLC in the Singapore FIR should be considered as “regular operation”, not as “in operational trial;

e) an interim report of Phase 1 would be made by Singapore, Viet Nam and FIT-SEA CRA for a period of 7 or 8 weeks to FIT-SEA/6, and Phase 2 implementation would be based on this interim report;

f) the FIT-SEA/6 meeting reviewed the reports from Singapore, Viet Nam and FIT-SEA CRA, and agreed that the results of Phase 1 were satisfactory and Phase 2 of the operational trial would commence 2 August 2007;

g) the FIT-SEA CRA concluded that the data link system performance of the Ho Chi Minh and Singapore ACCs met the FOM criteria, and there was no significant problem identified from PRs submitted from Singapore and Viet Nam;

h) FIT-BOB/8 agreed that using the Ho Chi Minh procedures as the basis for the Bay of Bengal/Arabian Sea procedures would assist regional standardization; and

i) The CRA-Japan would kindly provide initial CRA services at no cost to States in order to assist the commencement of the trial, however States concerned would be expected to implement appropriate cost recovery arrangements to support an agreed CRA provider in the longer term.

Western Pacific/South China Sea RVSM Scrutiny Working Group

3.4.23 The meeting reviewed the outcomes of the WPAC/SCS RSG/1 (Jan 2007) and WPAC/SCS RSG/2 (June 2007) meetings. It was recalled that the WPAC/SCS was formed by APANPIRG/17 (Decision 17/5 refers) to urgently address the following:

a) the TLS for WPAC/SCS RVSM operations was being exceeded and showing an adverse trend, and

b) problems with the RVSM interface arrangements between the modified single alternate FLOS used in the WPAC/SCS and the single alternate FLOS used in areas surrounding the WPAC/SCS.

3.4.24 The WPAC/SCS RSG meetings reviewed and considered the issues. The following significant issues were identified and were being progressed:

a) as the regional TLS had been exceeded and an adverse trend exhibited, the initial attention and efforts of the WPAC/SCS RSG was heavily focused on reversing this adverse trend, with the objective of returning the safety assessment to compliance with the TLS as soon as possible;

b) MAAR had identified that the main cause contributable to the RVSM TLS infringement was the significant number of operational errors;

c) a significant tightening of existing ATC coordination procedures and practices was necessary to ensure that effective coordination was completed, and this was a primary function of ANSPs;

d) clarification was sought from RASMAG on what constituted a LHD and to promulgate a user friendly definition of LHD;

e) the most recent safety assessment by MAAR placed the overall risk estimate at 6.09 x 10^{-9} fatal accidents per flight hour, thus reversing the adverse trend;

f) remedial actions taken by States as a result of discussions during the WPAC/SCS RSG/1 meeting were considered to have contributed directly to reversing the negative trend;

g) concern was expressed at the number of States that had not yet submitted LHD reports to MAAR for the period up to April 2007;

h) any changes that were made to the WPAC/SCS FLOS arrangements would need to be compatible with the FLOS adopted for China's RVSM implementation;

i) a general agreement was reached on the Scenario 3 FLOS proposal, an ICAO compliant single alternate FLOS with specific high capacity arrangements for the parallel route structure, which combined the best aspects of many of the submissions,

j) provided that no safety issues were identified with the Scenario 3 FLOS by the safety analyses, and subject to consensus being reached between States, the Scenario 3 FLOS would be implemented during early 2008;

CMRI/5

3.4.25 The meeting was provided with information on the main outcomes of the Fifth Special ATS Co-ordination Meeting – China, Mongolia, the Russian Federation and IATA (CMRI/5) as summarized below.

China - Expansion of flexible use of Entry/Exit Points on Polar Routes and revision of applicable procedures

3.4.26 There were currently seven entry/exit points on polar routes in China, comprising four entry/exit points between China and the Russia Federation and three entry/exit points between China and Mongolia. From June 2003, China had adopted a flexible approach allowing airlines to select entry/exit points POLHO, SIMLI and ARGUK, as well as relevant routes for traffic over flying the polar area. From July 5, 2007, China would be expanding the range of flexible choice of entry/exit points by adding MORIT and SADLI. In addition, the *Management Rules of Polar Routes Operations* would replace the existing *Provisional Management Rules of Polar Routes Operations.*

Mongolia – Enhancing Safety and Increasing Capacity

3.4.27 Mongolia would implement radar services within congested areas in Mongolian airspace during the period of 2007-2009. In this regard, China expressed its wishes that Mongolia would consider implementing the new radars before the 2008 Olympic Games.

3.4.28 In regard to RVSM implementation planning underway in China and the Russian Federation, Mongolia fully supported implementation of RVSM within its airspace and the need for harmonization with neighboring FIRs. CMRI/5 commented on the importance of Mongolia implementing RVSM not later than implementation of RVSM in the adjacent airspaces of the Russian Federation, and also consideration should be given to an earlier implementation to match the RVSM arrangements in China.

ICAO Special Coordination Meetings

SCM ATS Routes A593 and B576 - SCM A593/B576

3.4.29 SCM A593/B576 (August-September 2006, Bangkok) acknowledged the cooperative and collaborative approach which had been exhibited by China, Japan and the Republic of Korea, in ensuring the safety and efficiency of operations based on the 1983 Memorandum of Understanding (MOU) arrangements agreed between States under the guidance of the President of the ICAO Council.

3.4.30 Although the MOU arrangements had proved robust and had resulted in safe and efficient operations for many years, SCM A593/B576 recognized that it was important to consider current circumstances and future changes and continued the work programme accordingly.

SCM for Indonesia Contingency Plan Finalization

3.4.31 It was noted that APANPIRG Conclusion 17/11 called for the adoption of the Indonesian Contingency Plans as a model for Asia/Pacific States in the preparation of national ATM contingency plans. The SCM (April 2007, Jakarta) finalized and formally adopted the Indonesia Contingency Plan, which was signed by the DGCA Indonesia and ATS providers AP-I and AP-II.

State ATS Coordination Groups

IPACG25 - FIT/12 and IPACG/26 - FIT/13

3.4.32 The meeting was provided with summaries of the agreements reached at the Twenty-fifth Meeting of the Informal Pacific Air Traffic Control (ATC) Coordinating Group and the Twelfth Meeting of the Future Air Navigation System (FANS) Interoperability Team (IPACG 25/FIT 12, October 2006) that met in Tokyo, Japan and the IPACG 26/FIT 13 meetings (May 2007) that were held in Anchorage, United States. The meeting noted the following highlights:

a) The FAA and JCAB were now both utilizing the ADS distance-based separation standard of 50 NM for RNP 10 aircraft in the Fukuoka and Oakland FIRs;

b) The FAA and JCAB have had an Air Traffic Service Inter-facility Data Communications (AIDC) system in place for many years. Currently, AIDC transfers were backed up with a voice transfer. The FAA and JCAB agreed on a concept to begin AIDC transfers without voice coordination;

c) The FAA and JCAB reached an agreement to expand User Preferred Routes (UPR) trials between Japan and New Zealand/New Caledonia;

d) The FAA and JCAB reached an agreement to revise the ATS routes northwest of Guam. The changes were to be effective on August 30, 2007 and are projected to save 220,000 flying miles annually;

e) A significant problem with the data link network GES affecting the expansion of the 30 NM/30 NM trials in the Oakland FIR had been resolved and the FAA was planning on resuming the use of ADS distance-based separation standards for continued in-trail aircraft separation;

f) The FAA reported on Russia Trans East (RTE) airborne trials that were conducted in March of 2007. Thirty-two flights flew the Dynamic Oceanic Tracking System (DOTS) generated tracks. The airborne trials showed an average savings of 6.3 minutes per flight. One flight saved 21 minutes of flying time;

g) JCAB reported that they had commenced a study of a flexible route system between Australia and Japan including evaluation of the advantage/disadvantage of UPR; and

h) Successful implementation of 10 minutes without application of Mach number longitudinal separation minima has been achieved in the Oakland Oceanic FIR.

ISPACG/21 - FIT/14

3.4.33 The meeting was provided with details of ongoing activities and future plans agreed during the Twenty First meeting of the Informal South Pacific ATS Coordination Group (ISPACG/21) and the Fourteenth Meeting of the Future Air Navigation System Interoperability Team (FIT/14). Noteworthy items include:

a) Blanket approval for implementing Dynamic Airborne Re-routing Procedures (DARP) between the Auckland and Oakland Flight Information Regions (FIRs) had been given and the ISPACG Planning Team was actively working to expand the capability to the Tahiti and Nadi FIRs, as well as Brisbane FIR;

b) RFE trials in Oakland FIR had commenced with average savings of 16 minutes and 4600 lbs of fuel on 16 flights sampled between Los Angeles and Hong Kong;

c) Expanded “Rule of 11” separation standard provision were implemented in Auckland Oceanic FIR to allow controllers to apply this separation standard between aircraft crossing the same waypoint outside radar coverage;

d) The FAA is conducting a concept analysis for an Oceanic In-Trail Climb/Descent Procedures (ITP); and

e) In light of the reduced separation standards currently employed in the South Pacific (50NM & 30NM), the meeting considered that the maximum speed variation that aircrew can employ without advising ATC should be reduced. Also there were significant differences of understanding as to how speed information was used by operators and ATC.

ANSP Conference

3.4.34 In August 2006, Airservices Australia initiated an inaugural meeting of Asia and Pacific Regional Air Navigation Service Providers designed to promote practical cooperation between regional ANSPs and airlines with the objective of improving regional service and safety. The ANSP Conference was aiming at complementing the work of the Regional Office and APANPIRG. The Second ANSP Conference, held in Bali, Indonesia during July 2007, adopted the comprehensive Terms of Reference shown as **Appendix B** to the report on Agenda Item 3.4.

3.4.35 ANSP/1 established two working groups to further the process of improved regional cooperation and coordination initiated by the Conference. The two working groups would focus on: smooth transitions across flight boundaries - 'seamless airspace'; and the creation of a regional safety road map to underpin the Global Aviation Safety Roadmap endorsed by ICAO. The working groups were considered to be informal working groups similar to other ATS Coordination Groups established for Oceanic airspace within the Asia/Pacific region.

3.4.36 The Regional Safety Roadmap Working Group (RSRWG, December 2006) agreed that a pilot project would be undertaken by Airservices Australia, supported by other interested ANSPs, with the aim of adopting the Roadmap guidance and disseminating the results regionally.

3.4.37 The first meeting of the Seamless Airspace Working Group (SAWG/1, May 2007) adopted the following Terms of Reference:

a) To develop strategies, initiatives and dialogue necessary for the smooth transitions across Flight Information Regions - i.e. “Seamless Airspace”;

b) To maximize capacity and optimize the flow of air traffic utilizing existing and near-term CNS/ATM systems.

c) To enhance and facilitate the orderly and efficient flow of air traffic along the major traffic flows within the Asia region;

d) Identify areas where capacity constraints presently exist or are forecast to emerge.

e) To assess the economic and environmental benefits that will flow from the implementation of a harmonized ATM environment.

ATS Coordination Group Activities for period August 2006 – August 2007 approx

1. <u>ICAO ATS Coordination Groups</u>

- **Bay of Bengal ATS Coordination Group (BBACG)**

  - BBACG/18 (Bangkok, 22 - 26 January 2007)

  - Air Traffic Flow Management Task Force (ATFM/TF)

    - ATFM/TF/7 (Bangkok, 31 July − 3 August 2006)
    - ATFM/TF/8 (Bangkok, 21 − 24 November 2006)
    - ATFM/TF/9 (Bangkok, 22-26 January 2007, with BBACG/18)
    - SCM ATFM/SWG (Lahore 27 – 29 March 2007)
    - ATFM/TF/10 (Bangkok, 30 April – 3 May 2007)

  - FANS 1/A Implementation Team, Bay of Bengal (FIT-BOB)

    - FIT-BOB/7 (Bangkok, 25 − 28 July 2006, with FIT-SEA/4)
    - FIT-BOB/8 (Bangkok, 22 − 26 January 2007, with BBACG/18)

- **South-East Asia ATS Coordination Group (SEACG)**

  - SEACG/14 (Hanoi, 28 May - 1 June 2007)

  - South East Asia RNP Implementation Task Force (RNP-SEA/TF)

    - Did not meet, last meeting RNP/SEA/TF/1 March 2006

  - FANS 1/A Implementation Team, South -East Asia (FIT-SEA)

    - FIT-SEA/4 (Bangkok, 25 - 28 July 2006, with FIT-BOB/7)
    - FIT-SEA/5 (Ho Chi Minh, 16 − 19 January 2007)
    - FIT-SEA/6 (Hanoi 28 May – 1 June 2007, with SEACG/14)

- **Western Pacific/South China Sea RVSM Scrutiny Working Group (WPAC/SCS RSG)**

    - WPAC/SCS RSG/1 (Singapore, 29 January – 2 February 2007)
    - WPAC/SCS RSG/2 (Bangkok, 12 – 15 June 2007)

- **China, Mongolia, Russian Federation, IATA ATS Coordination Group (CMRI)**

    - CMRI/5 (Bangkok, 20 -22 June 2007)

- **Trans-Regional Airspace and Supporting ATM Systems Steering Group (TRASAS)**

    - TRASAS/1 (Paris, 2 – 3 May 2007)

2. ICAO Special Coordination Meetings

- SCM ATS Routes A593 and B576 – (SCM A593/B576, Bangkok, 30 August – 1 September 2006)

- SCM for Contingency Plan Finalization (Jakarta, 25 - 27 April 2007)

3. ICAO Interregional Coordination Meeting

- Second Interregional Coordination Meeting between APAC, MID and EUR/NAT Offices of ICAO (IRCM/2, Paris, 11-13 September 2006)

4. State ATS Coordination Groups

- **Informal South Pacific ATS Coordinating Group (ISPACG)**
  - ISPACG/21 and ISPACG-FIT/14 (Auckland, 5 – 8 March 2007) (http://www.faa.gov/ats/ato/ispacg.htm

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- **Informal Pacific ATS Coordination Group (IPACG)**
  - IPACG/25 and IPACG-FIT/12 (Tokyo, 23 - 27 October 2006)
  - IPACG/26 and IPACG-FIT/13 (Anchorage, 14 – 18 May 2007) (http://www.faa.gov/ats/ato/ipacg.htm)

- **Asia/Pacific Regional Air Navigation Service Providers Conference (ANSP Conf)**
  - ANSP/1 (Gold Coast, 16 – 18 August 2006)
  - ANSP/2 (Bali, 5 – 6 July 2007)

- **Informal Indian Ocean ATS Coordination Group (IIOACG)**
  - Did not meet, last meeting IIOACG/4 (December 2004, Plaine Magnien, Mauritius) −

- **Arabian Sea/Indian Ocean ATS Coordination Group (ASIOACG)**
  - Did not meet, last meeting ASIOACG/1 (Dubai, 22-23 May 2006)

- **Russian-American Coordinating Group for Air Traffic Control (RACGAT)**
  - Did not meet, last meeting RACGAT/13 (Vladivostok, October 2003)

ANNEX B

Terms of Reference

Asia Pacific Regional Air Navigation Service Providers Conference

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1. PURPOSE

1.1. This document defines the Terms of Reference for the Asia Pacific Air Navigation Service Providers Conference.

2. OBJECTIVE

2.1. The objective of the Asia Pacific Air Navigation Service Providers Conference is to improve the safety, services, efficiency and governance of Air Navigation Services within the region through the exchange of information and experiences, best practices, and collaborative experimentation.

2.2. The specific goals of the Asia Pacific Air Navigation Service Providers Conference is to promote regional cooperation through sharing of information, knowledge, experiences and resources as recommended by the ICAO Global Aviation Safety Plan, ICAO Global Air Navigation Plan, Asia Pacific Regional Plan for CNS/ATM Systems and guidelines produced by CANSO for Air Navigation Service Providers.

2.3. The focus of the Asia Pacific Air Navigation Service Providers Conference is to promote the harmonisation and standardisation of Air Traffic Management and Aeronautical Information Services through focusing on commissioning, transitioning, operations, maintenance, reporting and service delivery activities.

3. PROCEDURES

3.1. The Asia Pacific Air Navigation Service Providers Conference will meet approximately annually.

3.2. Membership of the Asia Pacific Air Navigation Service Providers will be open to all organisations providing Air Traffic Management and Aeronautical Information Services in the Asia Pacific Region.

3.3. The presence of ICAO, international and domestic airlines, as well as interested industry stakeholders, that operate in the region is encouraged.

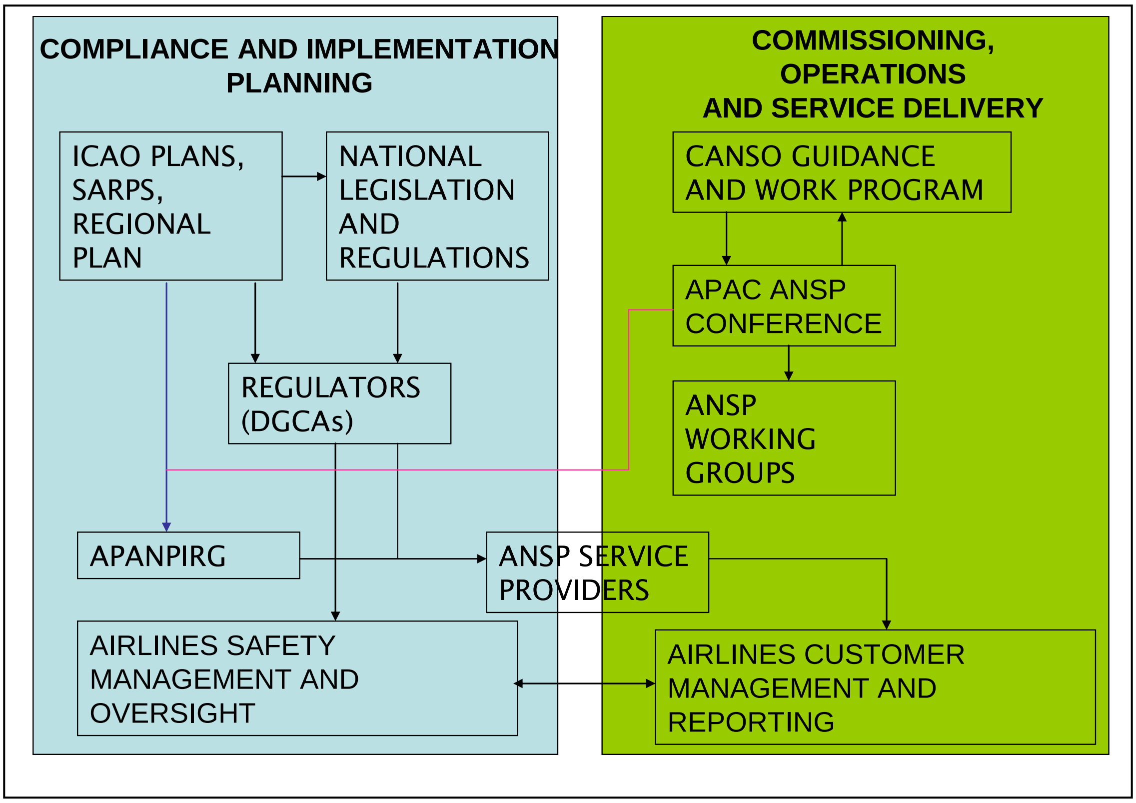
3.4. The Chairmanship shall reside with the organisation hosting the Conference.

3.5. A standing agenda is presented below.

3.6. The Conference will establish Working Groups, as required, to work on identified projects. Such projects will focus on sharing of information, best practices, commissioning, transitioning and service delivery activities. Projects will not duplicate any current work being conducted by ICAO through APANPIRG and it's sub-groups.

3.7. A report of the activities of the Asia Pacific Air Navigation Service Providers will be presented to APANPIRG through the ATM/AIS/SAR Sub-Group.

4. RELATIONSHIP WITH OTHER BODIES



5. STANDING AGENDA

5.1. Welcome

5.2. Keynote Address

5.3. Stakeholder Needs

5.4. Guest Speaker

5.5. Industry Technology and Service Developments

5.6. Update of FAA NextGen and Europe's SESAR Programs

5.7. Reports from Working Groups

5.8. Review of Progress and Outcomes of Conference and Working Groups

5.9. Presentations of Topics of Interest

5.10. Establishment of Next Annual Work Program

Agenda Item 3.5: Other Air Navigation Matters

3.5 Other Air Navigation Matters

Performance Based Navigation (PBN)

3.5.1 The meeting was advised of the worldwide growing importance of PBN in respect of aviation safety and developing plans to ensure a globally harmonized and coordinated transition to PBN by 2016 for international and domestic operations. The Eleventh Air Navigation Conference (September-October 2003, Montreal) recommended that ICAO, as a matter of urgency, address and progress the issues associated with the introduction of RNP and area navigation (RNAV) (Recommendation 6/5 refers). Discussions during the Worldwide Symposium on Performance of the Air Navigation System also identified a need to accelerate the implementation of PBN.

3.5.2 The meeting noted the considerable activities undertaken by ICAO in relation to PBN. The ICAO Required Navigation Performance Special Operational Requirements Study Group (RNPSORSG) addressed a divergence of implementation that resulted in a lack of harmonization between RNP applications and the significant confusion that had developed regarding concepts, terminology and definitions. As a result of the Study Group's work, ICAO developed the PBN concept. This concept includes two key "building block" elements: RNAV and RNP. PBN brings together, under one umbrella, a number of diverse RNAV and RNP applications encompassing all regimes of flight, from enroute to approach. PBN provides a framework of harmonized modern navigation operational approval requirements that make use of available navigation systems and aircraft capability. In addition to enhanced safety, PBN would provide significant benefits in terms of fuel savings, accessibility and flexibility in terminal areas and in addressing environmental problems (emissions and noise).

3.5.3 The meeting recognized that the State letter AN 11/45-07/22, *Guidance material for the issuance of performance based navigation (PBN) operational approvals,* was distributed on 27 April 2007 in order to avoid proliferation of operational approval requirements. The State letter contained guidance material on implementing PBN and provided the globally harmonized navigation specifications that could be used as the basis for operational approvals for PBN operations. This guidance material will become Volume II of the *Performance Based Navigation Manual* (Doc 9613).

3.5.4 Volume II of the new ICAO PBN Manual would contain detailed technical "Navigation Specifications" with standardized, harmonized airworthiness and operator requirements for several RNAV and RNP operations. These standardized Navigation Specifications draw from the extensive experience in technical requirements definition of States that have implemented PBN and also contain detailed recommendations for pilot and controller training.

3.5.5 The meeting noted that the RNPSORSG would resume work in 2008 to develop additional Navigation Specifications, possibly for RNP 2 and Advanced RNP 1. These specifications would be included in a future edition of the PBN Manual. Provisions are under development by the responsible ICAO groups and panels to align the Annexes and PANS-OPS with the PBN Manual.

3.5.6 The meeting noted that nine "Introduction to PBN" Seminars would be conducted over the next year in different ICAO Regions to familiarize States and stakeholders with the PBN concept and how to implement PBN. The next seminars were 11-14 September 2007 in Bangkok, Thailand and 17-21 September 2007 in New Delhi, India. Maximum participation by all stakeholders in PBN implementation was encouraged. The target audience was ATM planners, air navigation service providers, air operators, aerodrome operators, regulators, air traffic controllers and procedure designers, among others. Additional information on the seminars and on PBN in general, including a Web-based PBN training course developed by EUROCONTROL for ICAO, can be found on the ICAO PBN website www.icao.int/pbn.

3.5.7 Recognizing that the PBN concept was now established, the meeting noted the need for ensuring a globally harmonized and coordinated transition to PBN for international and domestic operations. In this regard, the meeting urged States to ensure that all RNAV and RNP operations and procedures were in accordance with the PBN concept as detailed in State letter AN 11/45-07/22 and the PBN manual.

3.5.8 The meeting noted that a paper would be presented by the ICAO Secretariat to the 36th Assembly of ICAO in September 2007 proposing a resolution to be adopted by the Assembly setting the following global goals for implementation of PBN.

a) where RNAV operations are required, enroute (oceanic and continental) and terminal ATS routes should be implemented according to PBN by 2016, with intermediate milestones as follows:

   1) enroute oceanic and remote airspace (RNAV 10 or RNP 4): 100 per cent implementation by 2010;

   2) enroute continental airspace (RNAV 5, 2 and 1): 70 per cent by 2010, 100 per cent by 2014; and

   3) terminal area (RNAV 1 and 2, and basic RNP 1): 30 per cent by 2010, 60 per cent by 2014, 100 per cent by 2016; and

b) all instrument runway ends should have an approach procedure with vertical guidance (APV), either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014.

3.5.9 The meeting considered that implementation of PBN in the region was very important and would yield efficiency and safety benefits in the short term. The meeting anticipated that for PBN to become widely implemented considerable effort would need to be put into planning and identifying what airspace measures could be introduced and the level of air navigation service required. Additionally, PBN activities would require participation from the many disciplines involved, such as flight operations, air navigation service providers, safety management, industry partners both technical and operational, etc. Noting that the participation of all stakeholders in the development of a PBN implementation plan was essential, the meeting agreed that the establishment of a PBN Task Force would likely be the best vehicle to achieve the objective of an accelerated PBN implementation programme regionally. After consideration of the information provided and in order to ensure timely progress in PBN planning and implementation in the region, the meeting agreed to the following Conclusion.

Conclusion 18/52 – Establishment of a Regional Performance Based Navigation Task Force (PBN/TF)

That, an Asia/Pacific PBN Task Force, with terms of reference as outlined in **Appendix A** to the APANPIRG/18 Report on Agenda Item 3.5, be established to develop a PBN implementation plan for the Asia/Pacific Region and address related regional PBN implementation issues.

3.5.10 The meeting noted the need to convene the first meeting of the Task Force as soon as practicable in order to continue the impetus expected to be created by the upcoming PBN seminars.

3.5.11 The meeting noted that implementation of PBN would be enhanced by the development by States of a PBN implementation plan, geared towards achieving the global PBN implementation performance objectives. Guidance on developing the PBN implementation plan is contained in the PBN Manual. The PBN implementation plan should be developed in full cooperation and coordination with all stakeholders, including regulators, air navigation service providers (ANSPs), aerodrome operators, air operators and others, as appropriate. Some States may wish to implement PBN sooner than the performance objectives stated above in order to more quickly take advantage of the benefits that PBN has to offer. Other States might not be able to comply with all aspects of the performance objectives (e.g. operational constraints); however, this should be clearly substantiated in the implementation plan. In order to achieve the global goals mentioned above State PBN implementation plans should be in place by 2009. Accordingly the meeting formulated the following Conclusion.

Conclusion 18/53 – Development of State PBN Implementation Plans

That, the Regional Office encourages States to begin development of their State PBN implementation plans in harmony with the development of the Asia/Pacific Regional PBN implementation plan being coordinated by the Asia/Pacific PBN Task Force for submission to APANPIRG/19 (2008).

3.5.12 The meeting noted that there was a need for more information and understanding of how application of the PBN would impact upon the ATM system requirements and flight operations and what changes would need to be made to airspaces to gain PBN based benefits. Experience gained in implementation of airspace changes requiring safety assessments to be performed such as under RVSM and RNP has demonstrated the complexities involved in undertaking such work and highlighted the resource limitations of many States in this area. Implementation of PBN with related changes to airspaces, procedures and separation, etc would likely place new and challenging requirements on States who would require considerable assistance and guidance through seminars, workshops and guidance material. Recalling that one of the main requirements to operate aircraft in RNP and RVSM environments was State approval of aircraft and operators, the meeting considered that this would also be the case with PBN approvals. In this regard, the provision of model approval documentation and gaining the technical expertise to manage the process was an important consideration. In addition, as implementation of PBN proceeds, there will likely be a need to develop and/or maintain the currency of Standards and Recommended Practices (SARPs) and guidance material in order to ensure a globally harmonized response to operational demands. To facilitate progress in these specific areas, the meeting formulated the following Conclusion:

Conclusion 18/54 – Globally Harmonized SARPS and Guidance Material for PBN

That, ICAO be invited to continue to ensure development and maintenance of globally harmonized PBN SARPs and guidance materials to keep pace with operational PBN implementation demands, including development of model documentation suitable for adaptation by State regulatory authorities in implementing State aircrew and airframe approvals processes for PBN.

3.5.13 As well as encouraging States to participate in the upcoming Introduction to PBN Seminars, the meeting considered that States should also nominate a focal point of contact responsible for PBN implementation. In view of this, the meeting formulated a Conclusion as follows:

Conclusion 18/55 – Designation of Contact Person for PBN Implementation

That, by 31 December 2007, States designate a focal contact person responsible for performance based navigation implementation and provide details of the contact person to ICAO Asia/Pacific Regional Office accordingly.

3.5.14 The meeting noted that the coordinated effort generated by the development of Regional and State PBN implementation plans would support Global Planning Initiatives (GPIs) as defined in the latest edition of the ICAO Global Air Navigation Plan as well as the Global Safety Initiatives (GSIs) as defined in the recent edition of the ICAO Global Aviation Safety Plan. It would also constitute an expansion of the programme envisaged by the 33rd Session of the Assembly which adopted Resolution A33-16, *ICAO Global Aviation Safety Plan (GASP)* that requested the Council "to develop a programme to encourage States to implement approach procedures with vertical guidance (APV) utilizing such inputs as GNSS or DME/DME, in accordance with ICAO provisions."

Implementation of RNAV5 and RNAV1 in Japan

3.5.15 The meeting noted that Japan had updated its RNAV Roadmap which details implementation plans for RNAV for enroute, terminal and approach for Japan. Japan planned to implement new RNAV1 Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs) from 2007. As a result, RNAV operations will be available at major city pairs in Japan by 2010, and available at most other airports by 2012. RNAV routes currently being promulgated in the Japan AIP will require RNAV5 operational approvals from early 2008. Track-to-track spacing of current RNAV routes will be reduced with RNAV5, and airspace capacity will be expanded producing a more efficient operation. In addition, the meeting was informed that Japan planned an evolutionary implementation of RNAV (GNSS) approaches with Baro-VNAV, and implementation of RNP AR approaches at airports where beneficial.

Funding of Regional Airspace Safety Monitoring

3.5.16 In continuing to consider the complex issues surrounding implementation of feasible and sustainable funding solutions for regional airspace safety monitoring, the meeting recalled that APANPIRG/17 established the Regional Airspace Safety Monitoring Committees Task Force (RASMC/TF) to study the issues, and among other tasks, develop proposals for the establishment of Regional Airspace Monitoring Committees and establish a formula for the basis of cost recovery, as well as a cost recovery mechanism for Asia/Pacific airspace safety monitoring.

3.5.17 Subsequent to this, the 43rd Conference of the Directors General of Civil Aviation in Asia and Pacific (DGCA, December 2006) noted the concern expressed by RASMAG - that progress had been slow in establishing sustainable financing mechanisms to support regional safety monitoring entities. Endorsing APANPIRG Decision 17/47, the 43rd DGCA adopted Action Item 43/4 – *Funding of Safety Monitoring,* urging the administrations associated with the RASMC/TF to designate appropriately empowered experts to participate in the Task Force.

Outcomes of the First Meeting of the RASMC/TF

3.5.18 The first meeting of the RASMC/TF/1 (RASMC/TF/1, February 2007) considered the steps that would be required to designate CRA, RMA and SMA services as multinational facilities/services in accordance with the guidance provided in the Air Navigation Plan (Doc 9673), Volume II, FASID and in accordance with the ICAO "step-by-step" guidance. The Task Force determined that due to the complexities of Asia/Pacific in terms of the number of States concerned and the varying circumstances, size and characteristics of the airspace across the Region; the matter would take a longer time to resolve than afforded the Task Force. In addition, the Task Force felt it did not possess the legal and financial expertise necessary to understand and fully implement such an arrangement.

3.5.19 With the guidance of the RASMC/TF/1, the United States drafted a bi-lateral “Memorandum of Agreement” that was intended to be concluded between the FAA and respective participating States for the purpose of funding PARMO. The Draft Agreement was viewed by RASMC/TF/1 as a constructive development and it was agreed that the United States should work with affected States to prepare and implement cost sharing bi-lateral agreements for the provision of RMA and SMA safety monitoring services.

3.5.20 RASMC/TF/1 recommended that this approach could also be extended elsewhere in the Asia/Pacific Region, and also expanded to include CRA and SMA services. RASMC/TF/1 felt that this action would address the immediate short-term situation. As the formation of Regional Airspace Monitoring Committees would take some time, and the other items in their Terms of Reference could be addressed by RASMAG, RASMC/TF/1 concluded the Task Force should be dissolved.

Update on RASMC/TF/1 from United States

3.5.21 The meeting noted that, immediately after the RASMC/TF/1 meeting, the FAA completed an internal analysis of the scope and effort required to draft, negotiate, sign and implement new bilateral agreements with all associated CRA and RMA States. This analysis included a determination of the types and numbers of agreements required, the human resources required to draft each agreement and complete all internal FAA and U.S. Government review and approvals and to coordinate approval of each agreement with the respective States.

3.5.22 This FAA analysis determined that the amount of internal resources required to complete the aforementioned bilateral agreements to establish cost sharing of CRA and RMA services would be significantly higher than the approximately $40,000 USD that would be collected annually for the CRA services and $14,000 USD that would be collected annually for the RMA services. Therefore, in relation to the provision of CRA and RMA services in the Pacific, the FAA has fully analyzed the business case associated with establishing “monetary” cost sharing bilateral agreements with all CRA and RMA partner States, and has decided to continue completely funding the provision of CRA and RMA services for the foreseeable future.

3.5.23 However, the FAA requires active assistance from the affected States to properly and efficiently provide the RMA services, and thus the FAA intends to establish “non-monetary” bilateral agreements outlining requirements for the timely provision of the data that the FAA requires to adequately provide safety assessment in the respective FIRs. The FAA plans to establish new bilateral agreements with affected States (Australia, Fiji, France, Japan, New Zealand, Papua New Guinea, and the Republic of Korea), focusing on requirements for States to commit to timely submission of data and flight information in exchange for the FAA’s management of PARMO activities and the provision of RMA services in their respective FIRs.

Review of RASMC/TF/1 by RASMAG/7

3.5.24 RASMAG/7 (June 2007, Bangkok) expressed its strong appreciation for the ongoing support of both Thailand and the United States in absorbing the costs in order to continue to provide RMA and additional safety monitoring services on behalf of many States regionally.

3.5.25 RASMAG/7 considered that it was clearly necessary to continue the work in establishing robust and sustainable funding mechanisms for regional safety monitoring agencies. In reflecting on the outcome of the RASMC/TF/1, the RASMAG/7 meeting considered that appropriate financial and legal experts need to be involved in discussions in order to progress the complex matters involved with the establishment of Regional Airspace Monitoring Committees. RASMAG/7 also considered that it was not appropriate for it to accept the additional responsibilities suggested by the RASMC/TF, as it would detract from its primary technical functions. In addition, RASMAG/7 considered it does not possess the appropriate skill set needed to address the problem. RASMAG/7 considered that the matter would best be addressed by an appropriately skilled dedicated body to provide the focus necessary. Therefore, the RASMAG/7 did not support the dissolution of the RASMC/TF. The decision by the United States to continue completely funding regional safety monitoring services in the Pacific overcame the immediate difficulty and meant that the RASMC/TF had more time to identify a sustainable long-term solution. However, RASMAG/7 considered that some of the proposed amendments to the RASMAG Terms of Reference (TOR) from the RASMC/TF would enhance the functions of RASMAG, and agreed to recommend suitably amended TORs o the APANPIRG/18 for consideration.

Review of RASMC/TF/1 and RASMAG/7 by ATM/AIS/SAR/SG/17

3.5.26 During its review of these matters, the ATM/AIS/SAR/SG/17 expressed its strong support for the actions taken by RASMAG/7 and, noting the long delays to CNS/ATM implementation attributable to an inability to fund safety monitoring services, the imminent implementation of long-term RVSM height monitoring requirements, and the associated additional workload/costs thereby accruing to existing voluntarily funded Asia/Pacific RMAs, requested APANPIRG take all actions necessary to resolve the long standing difficulties in establishing robust and equitable arrangements for the regional funding of airspace safety monitoring, including:

a) re-tasking the Regional Airspace Safety Monitoring Committees Task Force, and

b) ensuring the attendance of appropriately prepared and empowered legal and financial experts from States and ICAO at relevant regional meetings.

APANPIRG/18 Outcomes

3.5.27 The meeting acknowledged that the matters under consideration were extremely complex and had defied any real solution for some years. The meeting agreed on and recognised several principles concerning the provision of safety monitoring services as follows:

a) Existing safety monitoring services would continue.

b) RASMAG would continue to provide the safety monitoring oversight and coordination role for APANPIRG.

c) States would provide promptly data to the safety monitoring agencies so that the necessary safety assessments can be conducted in time.

3.5.28 The meeting felt that the decision by the United States to continue to completely fund RMA and CRA services in the Pacific had overcome the immediate threat to the provisions of these services in this part of the Asia/Pacific Region. Japan and China committed to provide safety monitoring services in their airspace areas at no cost. In addition, the United States confirmed that the CRA services provided by Boeing would also continue at no cost. Singapore offered to provide SMA services free of cost as required in the region. The meeting commended the States currently absorbing the costs of regional safety monitoring and acknowledged with gratitude the reassurance of the continuation of their services as long as required.

3.5.29 The meeting agreed with the submissions from the RASMAG/7 in relation to an expanded TOR for the RASMAG. Accordingly, the meeting adopted the following Decision:

Decision 18/56 – Revised Terms of Reference for RASMAG

That, the revised Terms of Reference for the Regional Airspace Safety Monitoring Advisory Group (RASMAG) provided in **Appendix B** of the APANPIRG/18 Report on Agenda Item 3.5 be adopted.

3.5.30 Given this situation, the meeting considered that there is no immediate need for the RASMC/TF to continue. Accordingly, the meeting adopted the following decision.

Decision 18/57 – Dissolution of RASMC/TF

That, there being no need for further activity for the foreseeable future on mechanisms for regional funding arrangements for Asia/Pacific airspace safety monitoring, the RASMC/TF be dissolved.

First Meeting of the Regional Performance Framework Task Force (PFRTF/1)

3.5.31 The meeting reviewed the outcome of the first meeting of the Performance Framework Task Force which was held on 2 September 2007 at the ICAO Regional Office. The objective of PFRTF/1 was to review recent developments of the performance based approach for developing a proposal/framework in accordance with APANPIRG Decision 17/10.

3.5.32 With respect to the task of examining regional planning documentation as specified in the TOR of the Task Force, the meeting noted that the CNS/MET SG/11 had reviewed the Asia and Pacific Air Navigation Plan (Doc 9673) and the Asia/Pacific Regional Plan for the New CNS/ATM Systems and proposed discontinuation of the later. The ICAO Secretariat will develop by 2009 detailed proposals for incorporating useful information contained in the Regional Plan for the New CNS/ATM Systems into the Asia Pacific Air Navigation Plan (Doc 9673). Therefore, the meeting considered that the task of examining regional planning documentation has been pursued and, to avoid duplication, no further efforts by the Task Force are required.

3.5.33 The meeting was informed of the availability on the ICAO-NET of Part I of the Manual on Global Performance of the Air Navigation System (Doc.9883) entitled Performance-Based Transition Guidelines. One objective of the Document is to provide awareness to PIRGs on how to integrate a performance-based approach into their work. Part II of the manual is expected to be completed by the end of 2007 and is expected to provide detailed guidance on how to adopt a performance-based approach in the transition from today's ATM system towards the future ATM system.

3.5.34 Taking into consideration the new development of performance based planning approach taking place in ICAO, the meeting agreed to defer actions for developing regional performance objective projects until more detailed guidance material contained in the second part of Doc.9883 is made available. The meeting considered that training on the subject is required in order for regions and States to fully understand and implement the new performance based planning approach. In addition, there is a need for ALLPIRG level training to bring together planners from all PIRGs for a common workshop and training.

3.5.35 The Secretariat will propose a date for the next meeting to the members of the Task Force as soon as the Part II Doc.9883 is published.

Asia Pacific Air Navigation Planning and Implementation Regional Group
Performance Based Navigation (PBN) Task Force

Terms of Reference

1) Develop an Asia Pacific Regional PBN implementation plan, based on a gap analysis, and in line with the ICAO PBN goals and milestones. This PBN implementation plan must be based on the following strategic objectives and guiding principles.

Strategic objectives:

a) To ensure that the implementation of the navigation item of the CNS/ATM system is based on clearly established operational requirements.
b) To avoid undue equipage of multiple on board equipment and/or ground-based systems.
c) To avoid the need for multiple airworthiness and operational approvals for intra- and inter-regional operations.
d) To explain in detail the contents of the Regional Air Navigation Plan and of the Regional CNS/ATM Plan, describing potential navigation applications.

Guiding principles:

a) Pre- and post-implementation safety assessments will be conducted to ensure the application and maintenance of the established target levels of safety.
b) Continued application of conventional air navigation procedures during the transition period, to guarantee the operations by users that are not RNAV- and/or RNP-equipped.
c) The first regional PBN implementation plan should address the short term (2008-2012) and medium term (2013-2016).
d) Target date for completion of the first regional PBN implementation plan is APANPIRG/19.

2) Carry out specific studies, develop guidance material and facilitate training to assist States with RNAV/RNP implementation in the en-route, terminal, and approach flight phases, taking into account the performance based navigation (PBN) concept, according to the ICAO Strategic Objectives and Global Plan Initiatives (GPI) on this matter (GPI 5, 7, 10, 11, 12, 20, 21)

3) Identify other issues/action items arising from the work of ICAO or for consideration by ICAO in order to facilitate regional and global harmonization of existing applications as well as future implementation of Performance Based Navigation operations;

4) Review the States' PBN implementation documentation to ensure regional harmonization and for possible inclusion in ICAO-developed model documentation.

5) Address other regional PBN implementation issues as needed.

6) The Task Force should report to the APANPIRG, through the CNS/MET Sub-group in coordination with the ATM/AIS/SAR Sub-group and RASMAG.

Membership
Proposed membership of the Task Force should include, but is not limited to, the following: Australia, China, Hong Kong-China, India, Japan, New Zealand, Singapore, Thailand, United States and IATA and IFALPA.

Rapporteur
At the first meeting the Task Force will elect a Rapporteur from among its members to Chair its meetings.

AMENDED TERMS OF REFERENCE PROPOSED BY RASMAG/7

(Note: Proposed changes in redline and ~~strikeout~~).

REGIONAL AIRSPACE SAFETY MONITORING ADVISORY GROUP (RASMAG)

TERMS OF REFERENCE OF THE RASMAG

The objectives of the Group are to:

a) facilitate the safe implementation of reduced separation minima and CNS/ATM applications within the Asia and Pacific Regions in regard to airspace safety monitoring; and

b) assist States to achieve the established levels of airspace safety for international airspace within the Asia and Pacific Regions.

To meet these objectives the Group shall:

a) review airspace safety performance in the Asia and Pacific Regions at the regional level and within international airspace;

b) review and develop as necessary, guidance material for airspace safety monitoring, assessment and reporting activities, including the duties, responsibilities and scope of regional monitoring entities;

c) recommend, and facilitate as necessary, the implementation of airspace safety monitoring and performance assessment services;

d) review and recommend on the competency and compatibility of monitoring organizations and recommend to APANPIRG specific airspace responsibility for individual regional monitoring entities;

e) review, coordinate and harmonize regional and inter-regional airspace safety monitoring activities;

f) review regional and global airspace planning and developments in order to anticipate requirements for airspace safety monitoring and assessment activities;

g) address other airspace safety related issues as necessary;

h) facilitate the distribution of safety related information to States, and

i) provide to APANPIRG comprehensive reports on regional airspace safety and coordinate with other contributory bodies of APANPIRG as appropriate.

TASK LIST

To review the safety monitoring programmes in the Asia and Pacific Regions for implementation and operation of:

a) reduced vertical separation minimum (RVSM);

b) reduced horizontal (lateral and longitudinal) separation minima using RNP;

c) aircraft separation applications using data link, e.g. ADS and CPDLC; and

d) *ATS Unit to ATS Unit operational messaging using AIDC.*

……………………..

AGENDA ITEM 4: REGIONAL AIR NAVIGATION DEFICIENCIES

Agenda Item 4: Regional Air Navigation Deficiencies

Report of the third meeting of the Deficiency Review Task Force (DRTF)

4.1 APANPIRG/18 reviewed the report of the third meeting of the Deficiency Review Task Force (DRTF/3) convened from 23 to 24 July 2007.

4.2 The meeting recalled that APANPIRG Decision 17/55 called for the DRTF to conduct a meeting in early 2007 with the task to develop appropriate follow-up action to ALLPIRG Conclusions 5/14 and 5/15 and to review the implementation aspects of the regional supplement to the uniform methodology, including an assessment of the current list of deficiencies. Accordingly, the DRTF/3 met and completed the task defined by APANPIRG.

4.3 The meeting reviewed the proposed regional database designed to provide more structured information on deficiencies. The database will be available through the ICAO APAC website via secure access provided by the Regional Office to States and authorities concerned. A detailed description is provided in **Appendix A** to the report on Agenda Item 4. The Chairman noted that suggestions for improvements of the database to make it more user friendly would be considered by the Regional Office. The meeting, considering the advantages in establishing and maintaining a regional on-line database of air navigation deficiencies, adopted the following Conclusion.

Conclusion 18/58-– ASIA/PACIFIC On-line Air Navigation Deficiency Data Base

That,

a) Asia/Pacific Air Navigation Deficiency Data Base be adopted and linked to the ICAO APAC web site; and

b) Regional Office provide secured access to the on-line Deficiency Data Base to all CAA and other authorities concerned within the ASIA/PAC States.

4.4 Recognized the long standing ATM and OPS deficiencies in the South West Pacific Small Island Developing States, the meeting agreed to a proposal for resolving deficiencies through a Technical Cooperation Project and developed the following conclusion.

Conclusion 18/59– Resolution of ATM and OPS Deficiencies in the South West Pacific Small Island Developing States (SIDS)

That, in recognizing the safety implications of the long-standing ATM and OPS deficiencies in the South-West Pacific SIDS included in the APANPIRG Deficiency Data Base, ICAO, in coordination with the international organizations and regional bodies concerned, considers providing urgent assistance to these States in order to build their capacity to provide the required services in a sustainable and cost-efficient manner

Note: It is suggested that the appropriate form of providing assistance to the South-Pacific SIDS would include establishment of an ICAO technical cooperation project for the sub-region and an extended SIP.

4.5 The meeting noted the key requirements essential for the successful implementation of the procedures contained within the Asia Pacific supplement and the necessity to update the supplement to include the provision of a regional on-line database for deficiencies. The meeting accordingly, adopted the following Conclusion.

Conclusion 18/60– Implementation aspects of the Regional Supplement to the Uniform Methodology for resolution of deficiencies.

That, the Regional Office promulgates the amended Supplement to the Uniform Methodology as shown in the **Appendix B** to the report on Agenda Item 4 and draws attention to the need to comply with the Supplement, in particular, with the following key implementation requirements:

- Designation of a contact officer by all States to coordinate with the Regional Office matters related to deficiencies ;
- Timely provision of corrective action plans by the States for all identified deficiencies
- User organizations obligation to provide periodically information on identified or resolved deficiencies.

4.6 The meeting noted that the Task Force has completed the work assigned by APANPIRG Conclusion 17/55 and reached the following decision.

Decision 18/61 – Dissolution of DRTF.

That, the DRTF, having completed its task of developing procedures and guidelines in the management of air navigation deficiencies, according to its Terms of Reference, be dissolved

Review of Air Navigation Deficiencies in the ATM/AIS/SAR Fields

4.7 The meeting expressed concern at the slow progress in eliminating safety related deficiencies. It was again stressed that the States listed in the APANPIRG List of Deficiencies should make firm commitments and undertake decisive actions to resolve the deficiencies as soon as possible. The meeting strongly recommended that States should apply cooperative efforts and a sub-regional approach to resolution of deficiencies.

4.8 The meeting recalled Conclusion 17/54 to establish a performance objective related to the resolution of deficiencies calling upon States to establish action plans, target dates and to inform the Regional Office by mid 2007 of their plans. The meeting took note that despite the concerted efforts from APANPIRG/17 and the 43rd DGCA Conference very little information had been received from States.

4.9 The meeting was informed that the ICAO Technical Cooperation Bureau (TCB) is willing to extend its services for the resolution of deficiencies. New Zealand informed the meeting that it is providing support to some States in the Pacific for the publication of their AIPs.

Non-Provision of Safety-Related Data

4.10 As detailed in Agenda Item 3.2, the RASMAG/7 drew attention to the issue of non-provision of safety-related data raised at the APANPIRG/16. Recalling that problems in the submission of appropriate quantity and quality of data had led to APANPIRG endorsing Conclusions 16/4 and 16/6, the meeting adopted the Conclusion 18/2 to include Fiji, Lao PDR, Myanmar, Papua New Guinea and Tahiti in the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields in accordance with APANPIRG Conclusion 16/6.

Special Implementation Project to Assist States in the Rectification of Air Navigation Deficiencies

4.11 The meeting was provided with information on the ICAO special implementation project (SIP) undertaken by a Regional Officer ATM and a CNS expert to Bangladesh from 5 to 8 June 2007 in follow-up to APANPIRG Conclusion 17/51 to assist with the rectification of deficiencies in the air navigation fields. The SIP was intended to address difficulties with air/ground and ground/ground communications, poor ATC practices, and non compliances with Annexes 14 and 15.

4.12 The SIP proposed recommendations to the Civil Aviation Authority of Bangladesh on: training and testing for English language proficiency; prior coordination procedures between Dhaka and Kolkata ACCs; coordination with neighboring FIRs/ACCs; a study of the full use of the approach radar at Dhaka Airport; resumption of ATIS operation at Dhaka Airport; reduction of access time on ATS direct speech circuits; and the need to arrange a co-ordination visit to India. Based on the recommendations, an Action Plan was formulated urging the Administration to take actions accordingly to mitigate identified deficiencies.

IATA IFBP Procedure – Yangon FIR

4.13 IATA advised the meeting that the IATA In-Flight Broadcasting Procedures (IFBP) requiring pilots to transmit their position regularly on 128.95 MHz while transiting the Yangon FIR have been in force since 29 August 2003. IATA wished to withdraw the procedure if it could be confirmed that the air-ground communications were at the level which would ensure regular and continuous communications between aircraft and air traffic services. However, to date all the indications to IATA were that the air-ground communications were still deficient. IATA requested the Regional Office to consider mounting a mission Myanmar in order to:

a) undertake a comprehensive study of the situation in order to understand the issues giving rise to the problem; and

b) propose interim measures and long-term sustainable solutions to assist the State concerned to provide a regular and effective communications service.

4.14 The meeting recalled that the issue of inadequate air-ground communications being provided by Myanmar had been the subject of many missions conducted by ICAO in recent times, and the problems were well known and documented. Also, APANPIRG had considered the matter previously, and as a result, the Myanmar authorities have been formally informed of the issues and concerns arising and have been urged on a number of occasions to rectify these problems.

4.15 Myanmar provided an update to the ATM/AIS/SAR/SG/17, highlighting the many technical activities, installation of enhanced equipment and surveys that been completed in attempts to address these problems. Myanmar was disappointed that the recent surveys by IATA, although identifying some improvement, were still highlighting that problems existed.

4.16 The meeting noted that most of the recent missions to Myanmar had consisted predominantly of CNS experts. The meeting considered that the next step in assisting all parties to gain a deeper understanding of the reasons behind these persistent communication difficulties should be for the ICAO Regional Office to lead a small mission comprising one ICAO ATM officer and one IATA ATM officer to visit Yangon in order to review the ATS operations in company with ATC experts from Myanmar. Myanmar and IATA agreed to this proposal and the Regional Office will coordinate the mission arrangements later in 2007.

4.17 The updated List of Air Navigation Deficiencies in the ATM/AIS/SAR Fields is in **Appendix C** to the report on Agenda Item 4.

Review of Deficiencies in the AOP field

4.18 The meeting was updated by States on the deficiencies in the AOP field as follows.

4.19 Airports Authority of India advised that the road lights that were blending with runway lighting have since been disconnected following the Order of High Court, Chennai. In his mission report (May 2007) to Kathmandu, Nepal, the ICAO CNS expert noted that the high ground in the vicinity of the airport had been removed completely. Philippines have reported that "Currently, projects are incessantly being pursued to further minimize, if not all eliminate stray animals and wildlife related incidents'.

4.21 The updated List of Air Navigation Deficiencies in the AOP field is given in **Appendix D** to the report on Agenda Item 4.

Deficiencies in the CNS/MET fields

4.22 The CNS/MET SG/11 meeting (July 2007) reviewed and updated the List of Deficiencies in the CNS and MET fields. The updated information of the CNS deficiencies is in **Appendix E** and MET deficiencies in **Appendix F** to the Report on Agenda Item 4. The meeting noted the following development and major areas of concern.

Deficiencies in the CNS fields

4.23 The deficiency of air ground VHF communication in Yangon FIR was brought to the attention of the higher authority in the government. Action was taken by Myanmar to implement the action plan. The VHF system within the entire country was upgraded using 6 RCAG sites supported by VSAT links to Yangon ACC and is now in operation. An ICAO mission was conducted to Myanmar in November 2006 to review the situation as the reliability of the RCAG VHF was not adequate to meet the operational requirement. Recommendations were made to correct the problems. The need to improve reliability of HF air ground communication provided in the area outside VHF coverage in Yangon FIR was also noted by the meeting. The HF and VHF equipment were reported to be in place and were in operation however; the deficiency has not been completely eliminated as IATA recent reports still indicate communication difficulties are experienced by pilots. ATS/AIS/SAR SG/17 identified that the problem may have been caused by operational issues and has suggested missions be conducted by ATM experts to address the issue.. The shortage of manpower in ATS in Myanmar was identified and highlighted in previous mission reports for urgent attention by the Administration.

4.24 A CNS mission was conducted specifically to deal with the HF communication deficiency in Ujung Pandang FIR in Indonesia from 19 to 24 November 2006. The HF transmitters and receivers were moved from Bali to Makassar. During the mission, tests were conducted and by the end of December 2006 the new system was in normal operation at Makassar in accordance with Action Plan developed by the ICAO mission.

4.25 A CNS mission was also conducted to Mumbai and Kolkata, India. The communications issues identified by ATS/AIS/SAR/SG/16 have been addressed by the Airports Authority of India. The air/ground HF communication at Mumbai has been improved. Further recommendations for improvement of ground/ground communication with neighboring ACC were provided to India for consideration.

4.26 The ATIS function has not been operational in Dhaka and Kathmandu for a considerable period of time due to an equipment problem and other reasons. This deficiency has adversely affected the quality of VHF communication. There is heavy traffic density at peak hours and serious congestions have been caused on the Tower and approach control frequencies by the exchange of MET and other operational information which should have been broadcasted by ATIS. This deficiency identified at both locations needs to be corrected as soon as possible by implementing ATIS. Nepal indicated that the ATIS at Kathmandu will be implemented by the target date specified in the corrective action plan.

4.27 Manila-Hong Kong AFTN circuit has been interrupted since February 2007 and it is urgently required to be restored to meet the requirement for the exchange of safety messages between Manila and Hong Kong within the established transit time of 5 minutes. The current diversion routing of AFTN messages is to be continued until the link is restored. Hong Kong, China confirmed the deficiency and expressed deep concern about this prolonged outage of AFTN circuit. In response to a request to take urgent action to restore the circuit, the Philippines indicated that the circuit will be restored by the end of September 2007 as specified in the corrective action plan

Deficiencies in the MET field

4.28 The meeting recalled APANPIRG Conclusion 17/52 on providing special assistance for resolution of MET deficiencies in the South-West Pacific Small Island Developing States (SIDS) in the form of a technical cooperation project and noted the progress of the follow up action on this Conclusion as follows:

- Coordination with the WMO has been established.

- ICAO Technical Cooperation Bureau (TCB) has submitted a TC project for approval by the International Financial Facility for Aviation Safety (IFFAS).

- IFFAS approved a grant of US$ 95,000 for this project, which would allow an ICAO recruited expert to work in the SW Pacific sub-region for three months and assist the States' meteorological authority in improving the national regulatory framework and planning for sustainable MET services for aviation, as required by the Regional ANP.

- WMO committed to contribute another grant to support the training programme of the TC project.

- New Zealand agreed to host the project; therefore the ICAO expert will be based in New Zealand.

The meeting expressed appreciation to New Zealand for the support to the project.

4.29 The meeting agreed to the inclusion of the following new deficiencies based on the SIGMET and OPMET monitoring conducted for the Region for inclusion in the APANPIRG Deficiency list in accordance with the established procedure:

- Bhutan – no METAR (and no TAF) for the AOP aerodrome Paro (VQPR);
- Lao PDR – no MWO established;
- Nauru – no MET service and MWO established;
- Solomon Islands – no MWO established;
- DPR Korea – no SIGMET service (no information about MWO);

- Indonesia – METAR shortfalls for AOP aerodromes.

4.30 In light of the discussion, the meeting formulated the following conclusion for the resolution of air navigation deficiencies:

Conclusion 18/62- Resolution of air navigation deficiencies

That,

a) States establish action plans with fixed target dates for resolution of safety related deficiencies and inform the ICAO Regional Office;

b) States consider utilizing the services of the ICAO Technical Cooperation Bureau for rectification of deficiencies; and

c) States, financial institutions, industry and other partners be requested to provide funding support or assistance in kind to technical cooperation projects developed to rectify deficiencies identified.

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DATABASE DESCRIPTION

ICAO Regional Office has prepared a database of deficiencies in MS Access 2003 format. The database allows search of deficiencies by State or by air navigation field.

The database will generate a single data sheet for each deficiency which consists of two main parts.

a) description of the deficiency
b) description of the corrective action plan

The database format consists of the following elements:

DB ID	internal ID number for the database	
DEF ID	Unique ID composed of-	ICAO Region AN Field Number Sub number
DEF AN Field	indicator of the air navigation field ATM, AOP, CNS, MET, OPS	
DEF Status	Current Status of deficiency- open closed, resolved	
DEF priority	U- urgent, A- Top priority, B- normal priority	
State	State to which the deficiency refers and responsible for resolving the deficiency.	
Other states concerned	other states that have the responsibility for resolving the deficiency	
DEF Type	Specific area in the air navigation field concerned	
DEF Req-ICAO Doc	ICAO Doc containing the requirement which is not fulfilled	
DEF Req-detail	further detail- Volume, Para, table etc on the ICAO requirement not fulfilled	
DEF Descr	concise description of deficiency	
Date reported	date DEF has been reported	

Reported By	State, organization or other body which reported the deficiency
DEF Rmk	Remark on deficiency as appropriate
Cor Action Recom ICAO	Concise description of the recommended corrective action by ICAO Secretariat or APANPIRG to be undertaken by the State concerned.
CAP submitted	indication whether the state concerned has submitted a CAP
CAP Date	date of submission of CAP to ICAO
Cap Description	Concise description of the corrective action plan submitted by State to the ICAO secretariat
CAP Exec Body	Responsible executive body in the State for resolving the deficiency (taken from corrective action plan)
CAP Target date	Target date for resolving deficiency (taken from CAP)
CAP monitoring	interim information on progress of the CAP made available to APANPIRG
Last review	Date of the last review
Date removed	Date of removal of the deficiency from the Open list

The database contains one main table ‘Deficiencies’ which contains all data and has been constructed on the basis of the APANPIRG Deficiencies list as reviewed by the 17th meeting of the group.

The database sheet will be sent by the Regional Office to the States concerned for the formulation of corrective action plan..

The database will be updated by the regional Office based on the information provided by States and users as per the procedures outlined in Uniform Methodology and the Asia/PAC supplement. The database is available on line on the ICAO APAC web site and States will be provided with user name and password.

ASIA/PACIFIC SUPPLEMENT TO THE UNIFORM METHODOLOGY FOR THE IDENTIFICATION, ASSESSMENT AND REPORTING OF AIR NAVIGATION DEFICIENCIES

1. INTRODUCTION

1.1. Considerable attention is being given by ICAO to eradicate deficiencies in the air navigation field. On 30 November 2001, the Council of ICAO approved the *Uniform Methodology for the Identification, Assessment and Reporting of Air Navigation Deficiencies* (hereinafter referred to as "Uniform Methodology") for the efficient identification, assessment and clear reporting of air navigation deficiencies. A copy of the Uniform Methodology contained in the APANPIRG Procedural Handbook is available on the ICAO website: http://www.bangkok.icao.int/edocs/procedural_1998.pdf. This Asia/Pacific Supplement to the Uniform Methodology provides more detailed procedures and a management tool to assist the APANPIRG in applying the Methodology.

1.2. The Uniform Methodology contains the following definition of a deficiency.

> A deficiency is a situation where a facility, service or procedure does not comply with a regional air navigation plan approved by the Council, or with related ICAO Standards and Recommended Practices (SARPs), and which situation has a negative impact on safety, regularity and/or efficiency of international civil aviation.

1.3. The first edition (2006) of the restructured Asia/Pacific Air Navigation Plan (ASIA/PAC ANP, Doc 9673), which is in two volumes: Volume I, Basic Air Navigation Plan (BANP), and Volume II, Facilities and Services Implementation Document (FASID) was published and circulated to States in 2006. An electronic version of the ANP is available on the ICAONET website. Access to ICAONET through username and password has been provided to all civil aviation administrations in the Region.

1.4. In certain areas, there may be deficiencies related to the organization, management and institutional aspects which affect the operation of civil aviation organizations. This could have a direct impact on the provision of air navigation facilities, services and procedures, which are elements listed in the ICAO Regional Plan. Deficiencies related to the primary national legislation and regulations and related to States' safety oversight functions are dealt with by the ICAO Universal Safety Oversight Audit Programme (USOAP).

2. BACKGROUND

2.1 States, in recognition of their responsibilities under Article 28 of the Convention on International Civil Aviation for the provision of safe air navigation services, undertake to accord highest priority to the rectification and elimination of all identified air navigation deficiencies.

2.2 As required by APANPIRG, the ICAO Asia/Pacific Regional Office maintains an on-line database of deficiencies that exist in the Asia/Pacific Region and adopts the necessary procedures for the collection of information in order to identify, evaluate and classify deficiencies and priorities in accordance with the Uniform Methodology.

2.3 The purpose of this database of deficiencies is to share among States information about deficiencies in a transparent manner, to assist States to define their implementation priorities and to indicate remedial action required. Information on deficiencies from the database is provided to

APANPIRG meetings for review under its terms of reference, *inter alia*, make detailed assessment of the safety impact of the deficiencies as shown and propose remedial action required by States for subsequent review by the Air Navigation Commission and Council.

2.4 The format of reporting of resolution of deficiencies by provider States is in accordance with the Uniform Methodology. States are required to provide to the Regional Office, in a timely manner, an action plan comprising a detailed description of the actions to be taken for the expeditious rectification of the listed deficiencies.

2.5 The Regional Office submits the updated information to APANPIRG for further actions as deemed necessary, and coordinates with the provider States concerned on decisions taken by APANPIRG, the Council and Air Navigation Commission on the deficiencies.

2.6 APANPIRG and its respective Sub-Groups, as part of their TORs and Subject Tasks Lists, are intensifying their efforts in dealing with deficiencies, with a greater focus on prioritization and monitoring of corrective action taken by States and other responsible bodies.

3. OBJECTIVE

3.1 The main objective of this Supplement to the Uniform Methodology is to provide for a systematic approach to the management of deficiencies in the Asia/Pacific Region by detailing the procedures to be followed by the Users, States and the Asia/Pacific Regional Office in implementing the Uniform Methodology.

3.2 In addition, an objective of this Supplement is to provide clear definition of the responsibilities and obligations of the parties involved in the management of the deficiencies.

4. REGIONAL PROCEDURES

4.1 The process of dealing with deficiencies involves a number of stages as follows:

- Identification
- Assessment, prioritization and verification against ICAO documents
- States' validation of deficiencies reported
- Development of action plans for rectification and elimination
- Monitoring of follow-up actions
- Rectification of deficiency and removal from the list of Open deficiencies

4.2 The purpose of this section is to outline the procedures to be followed by the parties involved at each of the above stages to deal with the deficiencies. These procedures are presented in the form of a structured flow chart attached to this Supplement aimed at facilitating the actions required to eliminate the deficiencies.

<u>Identification</u>

4.3 In Appendix M to Assembly Resolution A35-14, Users of air navigation facilities and services are urged to report any serious problems encountered due to lack of implementation or unsatisfactory operation of air navigation facilities or services required by the air navigation plans. States should act on such reports to resolve the problem and when remedial action is not taken, Users should inform ICAO, through the medium of an international organization where appropriate.

Notification/Sources

- Users
- States
- Regional Office (information from missions, meetings, accident/incident reports)

4.4 The deficiencies identified shall follow the SMART concept where the description of a deficiency will be:

- Specific – clear task on what needs to be done
- Measurable – precise requirements
- Achievable – task sensible in scope
- Realistic – task has deadlines and completion requirements
- Time-bounded – sensible guide for completion and imposes a schedule

Assessment, Prioritization and Verification against ICAO documents

4.5 An assessment is made by the Regional Office to determine whether the reported deficiency is non-compliant with the ASIA/PAC ANP or relevant SARPs. If a deficiency exits, it is evaluated as to its effect on safety, efficiency and regularity, and under the Uniform Methodology, prioritized as follows:

U - Urgent requirements having a direct impact on safety and requiring immediate corrective actions

A - Top priority requirements necessary for air navigation safety

B - Intermediate requirements necessary for air navigation regularity and efficiency

4.6 To facilitate the prioritization process, the Regional Office is guided by the principal that a deficiency with respect to an ICAO Standard is accorded a "U" status, while a non-compliance with a Recommended Practice or a PANS is considered as "A" or "B" subject to additional expert evaluation. The final prioritization of the deficiencies is the prerogative of APANPIRG.

Validation by States

4.7 The Regional Office, on determining that a reported deficiency exists and after initial assessment and prioritization, informs the State(s) concerned of the full details of the report and results of the assessment and advises that the deficiency will be recorded in the APANPIRG Deficiencies Database. The State(s) are requested to acknowledge and validate the deficiency, and to develop a Corrective Action Plan (CAP) to resolve the deficiency.

4.8 In the event of deficiencies which impose immediate large scale safety risks and their resolution by the State(s) concerned is not feasible in an acceptable timeframe, the Regional Office will notify the Air Navigation Commission as a matter of priority.

Development of CAPs

4.9 States are required to develop CAPs to rectify deficiencies in consultation with appropriate bodies with defined target dates based on the prioritization determined by the Regional Office. The following factors should be taken into account:

- deficiencies with “U” priority must be dealt with on a high priority basis;
- in developing the CAP, advice may be sought from the Regional Office, in particular, when international assistance (via the ICAO Technical Cooperation Programme or other means) is required;
- the CAP should be submitted to the Regional Office not later than one month after receiving the notification from the Regional Office;
- CAPs should in a concise and concrete format for inclusion in the Deficiency Database; if more detailed information is necessary, it should be provided as an Attachment;
- The CAPs are reviewed by the relevant APANPIRG contributing bodies where an assessment of the Plan is done at expert level and, if necessary, feed-back is provided to the State(s) concerned to optimize the Plan.
- APANPIRG at its regular meetings reviews the status of progress of all CAPs and provides advice to States as necessary.

Monitoring of follow-up actions

4.10 States should keep the Regional Office informed on progress with action taken to rectify deficiencies. The Regional Office may request updates as necessary to keep APANPIRG and its contributory bodies informed. Periodic annual updates should be made to the Regional Office no later than April each year.

4.11 The Regional Office will maintain regular contact with States and before the holding of APANPIRG and Sub-Group meetings, updates will be requested. An agenda item on deficiencies will be included on the Agenda of APANPIRG Sub-Groups and afforded a high priority by the meetings.

4.12 Users who reported deficiencies will be kept informed of progress and contacted before APANPIRG and Sub-Group meetings to seek their views on the status of deficiencies and any changes in circumstances.

Rectification of Deficiency & Removal from the Open List

4.13 States, on reporting that a deficiency recorded on the APANPIRG Deficiency Database has been rectified, will submit in writing an official report to the Regional Office providing full details of the action taken. On receipt of a report, the Regional Office will validate the action taken with the User who made the report. In the event that the User does not agree with the action taken, the deficiency will remain open until confirmation has been gained by all concerned. Once confirmation is made, APANPIRG will be informed, the status of the deficiency reviewed and removed from the Open List.

5. RESPONSIBILITIES

Regional Office

5.1 The Regional Office, as a primary party in the management of deficiencies, will keep under review and record the implementation by States of the requirements of the ASIA/PAC Basic ANP and FASID. This information will also be used to identify possible non-compliance that should be further assessed against the definition of deficiency. Records will also be kept on the differences to SARPs filed by States and follow-up actions taken as appropriate.

5.2 The main tool for managing the deficiency identification and resolution process is the APANPIRG Deficiency Database established and maintained by the Regional Office. Description of the database structure and functionality is provided in Attachment … . Secure access to the database is controlled by the Regional Office through a username and password.

5.3 When missions to States are conducted by the Officers, the mission reports should include a section on the status of existing deficiencies and identification of new deficiencies.

5.4 In line with its primary function of assisting States to which it is accredited to implement SARPs and Regional procedures, the Regional Office provides assistance to States in developing adequate remedial actions to correct air navigation deficiencies. This is done through regular correspondence and, when necessary, through missions to States for on-site evaluation and assistance in the development and implementation of CAPs.

States

5.5 For each deficiency that has been identified, evaluated and prioritized, the State(s) concerned need to establish a CAP for resolving the deficiency. Normally, a recommended action concerning the implementation of the respective ICAO SARP or regional procedure for which the deficiency is filed would be provided by the APANPIRG or the Regional Office. States are required to allocate sufficient resources for the timely elimination of deficiencies in order to reduce the negative impact on safety and/or efficiency.

5.6 Sufficient notification will be provided to States regarding the deficiencies as a first step towards establishing the corresponding CAP. This will be achieved primarily through such mechanisms as correspondence, review by APANPIRG sub-groups, working groups, task forces and other regional and sub-regional meetings. The Regional Office and States should use email where available for communications about deficiencies, including the provision of datasheets to States and corresponding CAPs from States.

5.7 States, upon receipt of the notification of identified deficiencies, should review, validate and comment upon the deficiency. Where actions have already been taken, the State should provide detailed information to the Regional Office in order to evaluate whether the deficiency has already been resolved.

5.8 States are required to keep deficiencies confirmed and included in the Database under review through the on-line facilities and provide updates as necessary to identify the progress on the action plan. The Regional Office may use periodic automated messages generated by the database to remind States to provide input to the Database.

5.9 States are required to respond promptly to regular correspondence sent by the Regional Office with an attached list of deficiencies as retrieved from the Database for each individual State. States should fill-in the necessary details in the datasheet forms in order to provide APANPIRG and its sub-groups, working groups and task forces with up-to-date material for review and consideration of the status of deficiencies and any further actions necessary to be taken by States to expedite eliminate the deficiencies. An updated Status of deficiencies working document will be presented as core material to every APANPIRG meeting in accordance with the Terms of Reference of APANPIRG.

5.10 States' CAPs should include the corrective measures to be taken by the State and a target date by which the identified deficiencies will be resolved. The information provided through this formal coordination process will include:

- a description of the deficiency
- risk assessment
- evaluation of possible solutions and selection of the optimum solution
- Description of agreed action to be taken
- time-line including a firm target date for completion of the planned action
- responsible body in the State to undertake the corrective action including contact details of a designated person/position
- financing source (if applicable) or an indication of the international assistance required if the State is unable to resolve the deficiency on its own due to a lack of resources
- progress report as per the established timeline.

5.11 In accordance with the 11th Air Navigation Conference Recommendation 4/8, States are urged to identify areas of air navigation facilities and services where the establishment of multinational agreements or informal coordination groups may contribute to the resolution of deficiencies. This may be especially applicable to deficiencies which are region wide in nature and affecting a group of States, thus leading to general resolution at a regional or wider level.

<u>Users</u>

5.12 Appropriate international organizations, in their capacity as Users of air navigation facilities, should provide and update information on deficiencies on a regular basis to the Regional Office for validation and action in accordance with Assembly Resolution A35-14 Appendix M. In addition to this, the Users should notify the Regional Office as soon as a new deficiency is identified.

5.13 International Organizations should provide assistance in the independent verification of remedial actions taken by State(s). The 11th Air Navigation Conference Recommendation 4/8 encouraged Users of air navigation facilities and services to report to the Regional Office once they note that the remedial action on the deficiency they had reported has been taken.

<u>APANPIRG</u>

5.14 APANPIRG, as the primary coordinating body in the Asia/Pacific Region for all activities conducted within ICAO concerning the planning and implementation of the regional air navigation systems, meets at regular intervals. Its terms of reference includes *inter alia*, to identify specific problems in the air navigation field and propose in appropriate form, actions aimed at solving these problems. The List of Deficiencies in the air navigation field form part of the core material reviewed by APANPIRG meetings and recommendations for remedial actions are developed.

5.15 In order to ensure that a support mechanism is in place to deal with deficiencies, States must be fully committed to taking follow-up actions on the outcome of APANPIRG meetings. A person or position should be nominated with sufficient decision-making authority to coordinate and oversee the States' CAP for the elimination of deficiencies.

6. OTHER MECHANISMS

6.1 The Regional Office, in coordination with States, will utilize other mechanisms for establishing measures for the resolution of deficiencies.

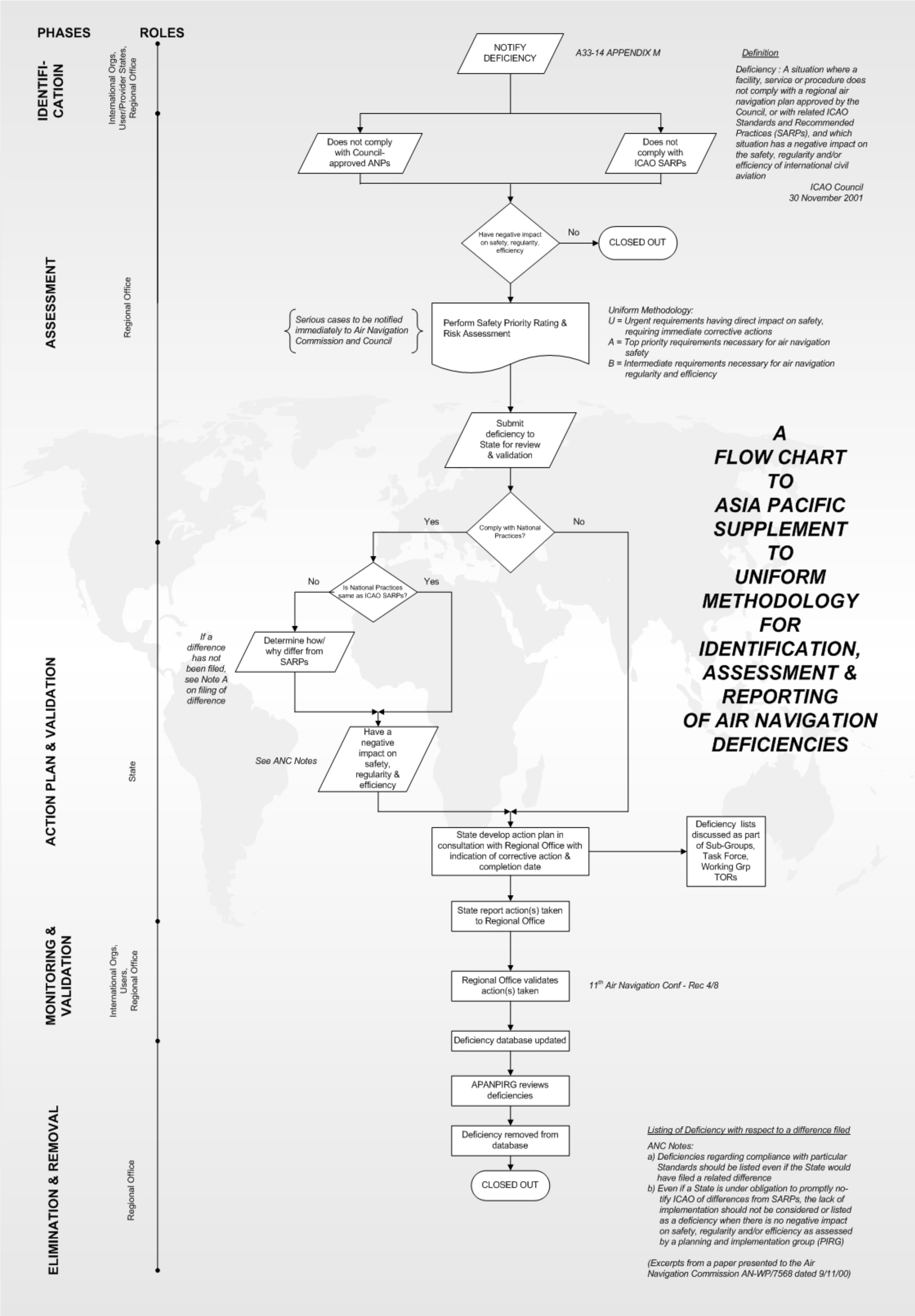
6.2 The various APANPIRG sub-groups, working groups, task forces and other regional and sub-regional meetings and special implementation projects (SIPs) will be utilized to discuss the implementation of ICAO SARPs and the requirements of the ASIA/PAC ANP in order to eliminate deficiencies.

6.3 The Annual Conference of Directors General of Civil Aviation is attended by State representatives in civil aviation at the highest level. Every opportunity should be taken at these conferences to address the need for political will to instill awareness and allocate appropriate and sufficient resources through effective plans of action that will eliminate deficiencies in a timely manner.

6.4 The International Financial Facility for Aviation Safety (IFFAS) has been established by the ICAO Council to assist States in financing aviation safety-related projects identified primarily through the ICAO Universal Safety Oversight Audit Programme (USOAP). The purpose of IFFAS is to provide financial assistance to States that need to apply corrective measures flowing from the USOAP audits but are unable to obtain the necessary funding through traditional means of financing. IFFAS will be operated in complete independence from ICAO's programme budget and is to be funded through voluntary contributions. The IFFAS mechanism will complement existing ICAO fund-raising mechanisms.

6.5 Other ICAO tools that may be used to address deficiencies include ICAO technical cooperation programmes (including COSCAPs), special implementation projects (SIP), seminars, workshops and training programmes.

6.6 Deficiencies identified during the USOAP audits will be dealt with under a separate programme in accordance with the Memorandum of Understanding between the Contracting State and ICAO. Until such time an appropriate mechanism is developed for the management of such deficiencies by the planning body, they shall not be included in this procedure.


PHASES
ROLES
IDENTIFI-CATIOIN
International Orgs, User/Provider States, Regional Office
ASSESSMENT
Regional Office
ACTION PLAN & VALIDATION
State
MONITORING & VALIDATION
International Orgs, Users, Regional Office
ELIMINATION & REMOVAL
Regional Office
NOTIFY DEFICIENCY
A33-14 APPENDIX M
Definition
Deficiency : A situation where a facility, service or procedure does not comply with a regional air navigation plan approved by the Council, or with related ICAO Standards and Recommended Practices (SARPs), and which situation has a negative impact on the safety, regularity and/or efficiency of international civil aviation
ICAO Council 30 November 2001
Does not comply with Council-approved ANPs
Does not comply with ICAO SARPs
Have negative impact on safety, regularity, efficiency
No
CLOSED OUT
Serious cases to be notified immediately to Air Navigation Commission and Council
Perform Safety Priority Rating & Risk Assessment
Uniform Methodology:
U = Urgent requirements having direct impact on safety, requiring immediate corrective actions
A = Top priority requirements necessary for air navigation safety
B = Intermediate requirements necessary for air navigation regularity and efficiency
Submit deficiency to State for review & validation
A FLOW CHART TO ASIA PACIFIC SUPPLEMENT TO UNIFORM METHODOLOGY FOR IDENTIFICATION, ASSESSMENT & REPORTING OF AIR NAVIGATION DEFICIENCIES
Comply with National Practices?
Yes
No
Is National Practices same as ICAO SARPs?
No
Yes
Determine how/ why differ from SARPs
If a difference has not been filed, see Note A on filing of difference
Have a negative impact on safety, regularity & efficiency
See ANC Notes
State develop action plan in consultation with Regional Office with indication of corrective action & completion date
Deficiency lists discussed as part of Sub-Groups, Task Force, Working Grp TORs
State report action(s) taken to Regional Office
Regional Office validates action(s) taken
11th Air Navigation Conf - Rec 4/8
Deficiency database updated
APANPIRG reviews deficiencies
Deficiency removed from database
CLOSED OUT
Listing of Deficiency with respect to a difference filed
ANC Notes:
a) Deficiencies regarding compliance with particular Standards should be listed even if the State would have filed a related difference
b) Even if a State is under obligation to promptly notify ICAO of differences from SARPs, the lack of implementation should not be considered or listed as a deficiency when there is no negative impact on safety, regularity and/or efficiency as assessed by a planning and implementation group (PIRG)
(Excerpts from a paper presented to the Air Navigation Commission AN-WP/7568 dated 9/11/00)

— END —

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

(Changes proposed **after** APANPIRG/17 are shown in strikeout and underlining.) ***(last updated 20 August 2007)***

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
ATS Routes								
Requirements of Part VIII, Table ATS 1 of the Air Navigation Plan	India/Nepal	A473 - Not implemented	16/3/99	A new proposal was submitted in mid 2003 by Nepal. This is being coordinated by AAI with defense authorities.	India/Nepal - implement the route	India/Nepal	Item captured in Chapter 2 of the Route Catalogue. ATM/AIS/SAR/G/16 (June 2006) updated re progress.	B
	China	B591 - Partially implemented	22/7/97		China will consider future imeplementation.	China	Reviewed by ARNR/TF. Item captured in Chapter 2 of the Route Catalogue ATM/AIS/SAR/G/16 (June 2006) updated - route implemented in Shanghai FIR, however implementation is not in accordance with BANP, further implementation TBD	B
	~~Indonesia~~	~~G461 - Implemented with different route specification~~ Implemented	~~24/11/93~~	~~ICAO co-ordinated with Indonesia to amend BANP requirement. APAC00/1 ATS was approved on 15 January 2001.~~	~~Indonesia implement the requirement accordingly.~~	~~Indonesia~~	~~Implemented with different route specification. Amendment Proposal to be submitted. Captured in Chapter 3 of the Route Catalogue.~~	~~B~~
	Cambodia/Philippines/ Thailand/Viet Nam	G473 - Partially implemented	24/11/93	Co-ordination is in progress among States and ICAO.	ICAO - continue implementation co-ordination.	Cambodia /Philippines Thailand/Viet Nam/ICAO	~~Captured in Chapter 2 of the Route Catalogue.~~Superceded by the re-structuring of the South China Sea Route structure in 2001.	B

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
	China/Kazakhstan	R216 - Not implemented	24/11/93	CAAC advises current route B215 KUQA A460 REVKI to Alma Ata meets the requirements for traffic from Urumqi to Alma Ata and requests deletion of R216 from BANP (14 Apr 03).	CAAC will coordinate with Kazakhstan to delete R216 from BANP.	China/Kazakhstan ICAO	Captured in Chapter 2 of the Route Catalogue.	B
	Cambodia/Lao PDR/Thailand	R345 - Not implemented. Under the coordination process.	24/11/93	Cambodia has advised that the requirement is no longer valid and will propose the deletion of requirement in consultation with Lao PDR and Thailand.	Cambodia- coordinate the deletion with IATA as well as Lao PDR and Thailand	Cambodia/Lao PDR/ Thailand	Item captured in Chapter 2 of the Route Catalogue.	B
	Indonesia	R459 - Implemented as W51 and W36	24/11/93	ICAO has requested Indonesia to implement as R459.	Indonesia, Singapore - consider implementation of the route with designator L504.	Indonesia/Singapore	To be implemented as L504. Target implementation date TBD	B

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
WGS-84								
Requirements of Paragraph 3.6.4 of Annex 15	Bhutan	WGS-84 - Not implemented	2/7/1999	Data conversion completed, but not published		Bhutan	TBD	A
	Cambodia	WGS-84 - Partially implemeted	28/6/2001	Cambodia reported ICAO on 22 June 2004 that the WGS-84 coordinates have been implemented in international airports, airspace and international routing.		Cambodia	TBD	A
	China	WGS-84 - Not implemented * implemented in the Sanya FIR as of 1 Nov 2001	2/7/1999	Differences to Annex 15 - *Aeronautical Information Services* are notified		China	~~Planning in progress. China promoting actively, coordination with Regulatory Department in progress.~~ WGS 84 coordinates interim is in progress and planned to be completed ni 2010.	A
	DPR Korea	WGS-84 - Not implemented				DPR Korea	2004	A
	Kiribati	WGS-84 - Not implemented				Kiribati	TBD	A
	Nauru	WGS-84 - Not implemented		Conferring with consultant		Nauru	TBD	A
	Philippines	WGS-84 - Implemented at international airports		on-going		Philippines	~~2006~~. Fully implemented and published in AIP as of January 2006.	A
	Solomon Islands	WGS-84 - Not implemented				Solomon Islands	1999	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
	Vanuatu	WGS-84 - Implemented at main airports	2/7/1999			Vanuatu	1999	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Type of ATS								
Requirements of Part II, Table ATS 3D of the Air Navigation Plan	India	Some ATS route segments in part of Mumbai FIR are subject to Advisory Services	24/11/93	Co-ordination in progress through BBACG. HF radio being modernized and datalink being installed.	India - implement Area Control Services	India	ATM/AIS/SAR/G/16 (June 2006) updated CPDLC trial progressing well, CRA to be established soon, implementation of CPDLC will enable update to control services FL290-FL410. **As of July 2007 CRA still not in place, consequent delay to datalink implementation**	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Airspace Classification								
Requirements of Paragraph 2.6 of Annex 11	China	Airspace Classification - Not implemented	7/7/99		Difference to Annex 11 is published in AIP, China.	China	ATM/AIS/SAR/G/16 (June 2006) updated, planning in progress to divide into 4 classes of airspace, some differences to ICAO airspace classifications	A
	DPR Korea	Airspace Classification - Not implemented	7/7/99			DPR Korea	2005	A
	Kiribati	Airspace Classifcation - Not implemented	7/7/99			Kiribati	TBD	A
	Nauru	Airspace Classification - Not implemented	7/7/99			Nauru	TBD	A
	Papua New Guinea	Airspace Classification - Not implemented	7/7/99			Papua New Guinea	Project in place	A
	Solomon Islands	Airspace Classification - Not implemented	7/7/99			Solomon Islands	TBD	A
	Viet Nam	Airspace Classificatio - Not implemented	7/7/99			Viet Nam	Expected completion 2007 (National Assembly adopted Civil Air Law on 29 June 2006, ATS regulations will be re-issued accordingly.)	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
AIP Format								
Requirements of Chapter 4 of Annex 15	Cook Islands	AIP Format - Not implemented	7/7/99			Cook Islands	ATM/AIS/SAR/G/16 (June 2006) updated - AIP COOK ISLANDS in new format in progress with assistance of New Zealand, effective date TBD	A
	Kiribati	AIP Format - Not implemented	7/7/99			Kiribati		A
	Nauru	AIP Format - Not implemented	7/7/99			Nauru		A
	Papua New Guinea	AIP Format - Not implemented	7/7/99	under development		Papua New Guinea	TBA	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
SAR capability								
Requirements of Annex 12	Cook Islands	Annex 12 requirements not implemented. No agreements with adjacent States.	31/1/95	SAR agreement with New Zealand under development	Cook Islands - implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Cook Islands	2004	U
	Maldives	Annex 12 requirements not implemented. No agreements with adjacent States.	24/4/97	SAR services and facilites provided (details to be confirmed). SAR agreements with neighbouring States under development	Maldives - implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Maldives	2004	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Carriage of ACAS II								
Requirement of Chapter 6 of Annex 6	Bhutan	Annex 6 requirement not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U
	Cook Islands	Annex 6 requirement not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
	Kiribati	Annex 6 requirement not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
	Marshall Islands	Annex 6 requirement not implemented.	26/8/05		Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U
	Micronesia	Annex 6 requirement not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
	Nauru	Annex 6 requirement not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
	Palau	Annex 6 requirement not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U
	Papua New Guinea	Annex 6 requirement not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
	Philippines	Annex 6 requirement not implemented.	26/8/05		Philippines - implement Annex 6 as required.	Philippines	Rules and regulations regarding carriage of ACAS II already incorporated in ATO Administrative Order no 121 series of 2001 under section 12.356(a) and (b)	U
	Solomon Islands	Annex 6 requirement not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U
	Tonga	Annex 6 requirement not implemented.	26/8/05		Tonga - implement Annex 6 as required.	Tonga	TBD	U
	Vnuatu	Annex 6 requirement not implemented.	26/8/05	Pressure altitude reporting transponder required in all airspace since 1/1/00.	Vanuatu - implement Annex 6 as required.	Vanuatu	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Carriage of Pressure Altitude Reporting Transponder								
Requirement of Chapter 6 of Annex 6	~~Bangladesh~~	~~Annex 6 requirement not implemented.~~ Implemented	~~26/8/05~~	~~ACAS II required since 1/1/03.~~	~~Bangladesh - implement Annex 6 as required.~~	~~Bangladesh~~	~~TBD~~	~~U~~
	Bhutan	Annex 6 requirement not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U
	Cambodia	Annex 6 requirement not implemented.	26/8/05	ACAS II required in all airspace within FIR since 1/1/03.	Cambodia - implement Annex 6 as required.	Cambodia	TBD	U
	Cook Islands	Annex 6 requirement not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
	DPR Korea	Annex 6 requirement not implemented.	26/8/05	ACAS II required in all airspace within FIR since 1/1/01.	DPR Korea - implement Annex 6 as required.	DPR Korea	TBD	U
	New Caledonia	Annex 6 requirement not implemented.	26/8/05	ACAS II required in all airspace within FIR since 23/1/03.	New Caledonia - implement Annex 6 as required.	New Caledonia	TBD	U
	Kiribati	Annex 6 requirement not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
	Lao PDR	Annex 6 requirement not implemented.	26/8/05	ACAS II required in all airspace within FIR since 1/1/03.	Lao PDR - implement Annex 6 as required.	Lao PDR	Competed	U
	Marshall Islands	Annex 6 requirement not implemented.	26/8/05	ACAS II required.	Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
	Micronesia	Annex 6 requirement not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
	Nauru	Annex 6 requirement not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
	Palau	Annex 6 requirement not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U
	Papua New Guinea	Annex 6 requirement not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	TBD	U
	Philippines	Annex 6 requirement not implemented. Implemented within TMA only.	26/8/05		Philippines - implement Annex 6 as required.	Philippines	TBD. Rules and regulations regarding carriage of pressure altitude reporting transponder already incorporated in ATO Administrative Order No 91, series of 2002 under section 91.215(a) & (b)	U
	Solomon Islands	Annex 6 requirement not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U
	Tonga	Annex 6 requirement not implemented.	26/8/05		Tonga - implement Annex 6 as required.	Tonga	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action****
Non Provision of Safety-related Data								
Requirement of Paragraph 3.3.4.1 of Annex 11	~~Bangladesh~~	~~Annex 11 requirement not implemented.~~	~~21/8/06~~		~~Bangladesh - provide the safety-related data as required.~~	~~Bangladesh~~	~~TBD~~	~~A~~
	Lao PDR	Annex 11 requirement not implemented.	21/8/06		Lao PDR - provide the safety-related data as required.	Lao PDR	TBD	A
	Myanmar	Annex 11 requirement not implemented.	21/8/06		Myanmar - provide the safety-related data as required.	Mayanmar	TBD	U
	Papua New Guinea	Annex 11 requirement not implemented.	21/8/06		Papua New Guinea - provide the safety-related data as required.	Papua New Guinea	TBD	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**State/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Date of completion**	**Priority for action**
~~**Annex 14 Vol. I § 5.3.1.1**~~	~~**India**~~ ~~Madras/ Chennai~~	~~Runway 25, potential hazard as runway lighting blends with existing road lights and is difficult to differentiate.~~	~~2003~~	~~Action has been reported to disconnect electric supply to markings along highway NOTAM action required.~~	~~The matter is sub-judice, being taken up separately.~~ ~~Lights that were blending with r/w lighting have since been disconnected following the order of High Court, Chennai~~	~~AAI~~	~~On-going~~ ~~Completed October 2006~~	~~"U"~~
Annex 14 Vol. I § 3.1.22	**Myanmar** Yangon/ Mingaladon	New runway surface slippery when wet.	2003	Surface of a paved runway shall be so constructed as to provide good friction characteristics when runway is wet.	RWY surface replaced; no new reports from airlines Final RWY layer still to be completed (update 2005)		On-going	"A"
Annex 14 Vol. I Amendment 6 *§ 10.1* *§ 10.2*				A maintenance programme should be established to maintain facilities in a condition which does not impair safety of air navigation.				"A"
Annex 14 Vol. I § 5.3.4		No approach Lighting RWY 03	1994	PAPI installed in 2002. Approach lights to be installed when funds available.				
Annex 14 Vol. I § 4.2	**Nepal** Kathmandu	~~High ground in the vicinity of aerodrome.~~	2003	Airspace around aerodromes to be free from obstacles as defined by the obstacle	The manoeuvring area is faraway from the obstacles (a small hillock) and a temple being there which is bit	CAAN	Apr. 2005	"U"

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**State/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Date of completion**	**Priority for action**
				limitation surfaces for safe aircraft operation.	sentimental. However, verbal negotiations with the stake holders for dismantling the temple subject to replacement to other place has been made. High ground removed completely. ICAO Mission Report, May 2007			
Annex 14 Vol. I § 3.4	**New Zealand** Wellington	Runway-end safety areas RWY 16/34 inadequate.	2000	RESA shall be provided and shall extend from the end of a runway strip for a distance of at least 90 m.	A 90 m RESA at the southern end of RWY under construction – completion estimated April 2007 A 90 m RESA at the northern end of RWY to start before the end of 2006 – completion estimated December 2007	Civil Aviation Authority	2007	"U"

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**State/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Date of completion**	**Priority for action**
	~~**Pakistan**~~							
~~**RAN/3 Rec. 4/10**~~	~~Karachi~~	~~Runway and Taxiway markings inadequate and are not clearly visible at night.~~	~~2003~~	~~All markings on paved areas should be inspected and a schedule of painting be establish.~~	~~Runway & Taxiway markings schedule has been developed for the period July 04 to June 05. A programme has been forwarded to the Regional Office.~~ ~~Next painting shall be carried out as scheduled.~~	~~CAA Pakistan~~		~~"A"~~
~~**Annex 14 Vol. I** ***§ 5.2.1.7***~~				~~Pavement markings should be made with reflective materials designed to enhance visibility of markings at night.~~	~~Repainting scheduled for July 2005 (update 2005)~~ ~~Repainting runway and taxiway markings completed on 27 Dec 2005~~		~~Completed~~	

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**State/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Date of completion**	**Priority for action**
Annex 14 Vol. 1 Amendment 6 ***§ 9.10.1*** ***§ 9.10.2***	**Philippines** Manila	Airport security lax, allowing livestock to stray on to active runways.	2004	Improved airport perimeter fencing and general security within the perimeter of the airport required.	Currently projects are incessantly being pursued to further minimize wild life related incidents.			"A"

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE CNS FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
Provision of ATIS as specified in FASID Table CNS 2 (Doc 9673)	Bangladesh	To broadcast current, routine terminal information to arriving and departing aircraft to ease congestion on the Tower and Approach channels affecting safety of aircraft operation.	May 2007	Provide aerodrome Terminal Information broadcast system to ease congestion on VHF and to reduce controllers work load	The ATIS equipment installed has been out of service due to maintenance problem and is beyond repair. It is required to provide a new equipment.	Civil Aviation Authority of Bangladesh	December 2007	A
Adequate and reliable VHF COM	Myanmar	Quality and reliability of RCAG VHF inadequate and unavailability of required coverage. Pilot report continued to indicate occasional communication difficulties.	1998 In early 2007	Improvements in the quality of link to RCAG stations and power supply system are required.	Action should be taken to provide reliable links between the RCAG stations and Yangon ACC. High level ICAO mission was conducted. An action plan was developed to upgrade equipment at RCAG stations, provide VSAT link at all RCAG stations, to improve power supply system and to shift ACC to the new location. DCA Myanmar has replaced equipments at all 6 RCAG sites with digital VHF system and has provided VSAT links and solar power supply system at all sites. The facilities were formally implemented effective 9 June 2005 using new frequencies in place of old frequencies affected by interference. New HF transmitters were used to provide service to aircraft flying beyond VHF coverage in a small portion of Yangon FIR	DCA Myanmar	Revised target date is end of 2007. This deficiency will be removed from the list upon receipt of official report providing full details of action taken by Myanmar and confirmation by the users.	A

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
Provision of ATIS as specified in FASID Table CNS 2 (Doc 9673)	Nepal	To broadcast current, routine terminal information to arriving and departing aircraft to ease congestion on the Tower and Approach channels affecting safety of aircraft operation.	April 2005	Provide aerodrome Terminal Information broadcast system to ease congestion on VHF and to reduce controllers work load	ATIS equipment provided in 2001 remained unusable due to technical problem which is still under investigation and rectification.	Civil Aviation Authority of Nepal	December 2007	A
Reliable AFTN circuit for timely exchange of operational safety messages.	Philippines	Total disruption of the AFTN circuit between Manila and Hong Kong after Philippines Long Distance Telephone Company (PLDT) failed to provide communication link between Manila and Hong Kong.	February 2007	It is urgently required to restore the Manila/Hong Kong AFTN circuit to meet the requirement for the exchange of safety messages between Manila and Hong Kong within the established transit time of 5 minutes. The problem is likely to exist until Philippines avails the service of other communication service provider.	Prolonged delay in rectification of problem experienced at Manila has resulted in diversion of message traffic for a long time via Taibei with alternate routing via Hong Kong/Fukuoka/Singapore/Manila causing traffic congestion as well as higher transit time of AFTN message.	Air Transportation Office (AOT) Philippines	By the end of September 2007	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Meteorological observations and reports. (Annex 3, Chapter 4)	Solomon I.	Weather information is inadequate and not provided on a regular basis	1996 Confirmed 2006 SOA	Reported by airlines operating to Solomon I.	Equipment to be upgraded and arrangements to be made for regular observations	Ministry of Transport, Works and Aviation, Solomon I. *Note: OPMET/M TF to carry out survey*	TBD	A
Meteorological observations and reports. (Annex 3, Chapter 4)	Kiribati	METAR from Kiribati not available on regular basis.	1998 Confirmed 2005 SIP	Reported by airlines	State's MET authority to consider urgent action to be taken for providing regular observations and reports	Directorate of Civil Aviation, Kiribati. *Note: OPMET/M TF to carry out survey* ICAO SIP conducted in 2005; ICAO TC Project proposed for South Pacific; supported by WMO	TBD	A

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Indonesia	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Three-party LOA to be signed between the MGA, DGCA and DVGHM	DGCA, MGA Indonesia	TBD *(no action plan submitted to RO)*	A
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Papua New Guinea	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Procedures to be set up for exchange of data between NWS, ATS and Rabaul Observatory and a LOA to be signed	NWS, ATS Papua New Guinea *Note: ICAO Regional Office to monitor*	TBD (no action plan submitted to RO)	A

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Provision of SIGMET for volcanic ash (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Indonesia Philippines Papua New Guinea	Requirements for issuance and proper dissemination of SIGMET, including SIGMET for volcanic ash, have not been fully implemented	ICAO SIP mission Dec 2003	a) Reported by airlines b) Noted by Volcanic Ash Advisory Centres	a) ICAO to carry out a Special Implementation Project (SIP) with the primary objective to improve implementation of SIGMET procedures, especially for VA. b) State to take urgent actions to implement the SIGMET procedures.	a) State's Met authorities b) ICAO to implement the SIP. c) ICAO Regional Office to co-ordinate and monitor. *Note: ICAO SIP carried out in 2003; progress in issuance of SIGMET for VA is noted; the outstanding problems to be resolved within 1-year time* *Progress reported by VAAC Darwin*	To be advised LOA between ATO, PHILVOCS & PAGASA signed in 2004 to make reporting part of information dissemination practice. ATO will arrange regular consultation amongst ATO, PHILVOCS & PAGASA.	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
a) Service for operators and flight crew members. (Annex 3, Chapter 9). b) WAFS products for flight documentation. (ASIA/PAC FASID Table MET 1A).	Cambodia Myanmar	Briefing and flight documentation not provided as required. WAFS products not available	1999	Airlines do not receive the required flight documentation including WAFS forecasts.	States to consider urgent action for installation of SADIS VSAT for receiving WAFS products and OPMET information. Action plan proposed by ICAO MET mission 2003	State's MET authorities *A TC project proposal submitted to SSCA, Cambodia*	TBD	A
MWO for Phnom Penh FIR and SIGMET (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Cambodia	Requirements for meteorological watch office (MWO) to be established at Phnom-Penh international airport have not been met.		MWO not established due to lack of trained personnel and technical facilities. No SIGMET service for Phnom Penh FIR	Establishment of MWO currently not feasible. Urgent need for bi-lateral agreement for SIGMET service by a neighboring State.	SSCA, Cambodia *A TC project proposal submitted to SSCA, Cambodia*	TBD	U

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Provision of SIGMET information (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Lao PDR Myanmar Nepal Cambodia	Requirements for issuance and dissemination of SIGMET have not been fully implemented.	2000	SIGMET frequently not available Reported by airlines	State's MET authority to take urgent actions to implement the SIGMET procedures. ICAO issued new version of ASIA/PAC Regional SIGMET Guide in September 2003 *Note: ICAO Regional Office to enquire action plans with fixed target dates from the listed States*	State's MET authorities *In order to improve SIGMET availability, regional SIGMET tests have been conducted in 2005 and 2006*	*(no action plan submitted to RO)*TBD	U

AGENDA 5: FUTURE WORK PROGRAMME

Agenda Item 5: Future Work Programme

Schedule of Future meetings

5.1 The meeting agreed that the tentative schedule of meetings for the rest of 2007, 2008 and 2009 should be as follows (meetings of non-APANPIRG groups are indicated in italics):

2007 – outstanding meetings

PBN Seminar	*11-14 September*	*Bangkok*
RVSM/TF/32 (China Go/Nogo)	18-21 September	Beijing
WPAC/SCS RSG/3	*30 Oct–2 Nov*	*Bangkok*
ATFM/TF/11	*26–30 Nov*	*Bangkok*
RASMAG/8	10-14 Dec	Bangkok
2008		
PBN/ TF	17-19 Jan	Bangkok
BBACG/19 & FIT-BOB/9	*21-25 Jan*	*Bangkok*
FIT-SEA/7	*30 Jan–1 Feb*	*Fukuoka*
AITF/3	*Feb*	*Bangkok*
AMHS Implementation Seminar	*Feb*	*Chiang Mai*
ATFM/TF/12	*3-7 Mar*	*Bangkok*
PFTF/2	TBD	Bangkok
ATFM Seminar	*TBD*	*Fukuoka, Japan*
TRASAS/2	*18-19 Mar*	*Bangkok*
OPMET/M TF/6	Mar	Bangkok
RNP-SEA/3	Mar	Bangkok
RVSM/TF/ 33 (90 day review)	1-4 Apr	Beijing
ADS-B SITF/7	April	Chengdu, China
ATN IC G/3	May	TBD
SEACG/15 & FIT-SEA/8	*26-30 May*	*Bangkok*
RASMAG/9	2-6 Jun	Bangkok
ATM/AIS/SAR SG/18	23-27 Jun	Bangkok
CNS/MET SG/12	21-25 Jul	Bangkok
APANPIRG/19	1 – 5 Sep	Bangkok
RASMAG/10	Nov/Dec	Bangkok
RVSM/TF/ 34 (1 year review)	Nov/Dec	Beijing
2009		
AITF/3	*Feb/Mar*	*Bangkok*
ADS-B SITF/8	April	TBD
ATN IC G/4	May	TBD
ATM/AIS/SAR SG/19	Jun	Bangkok
CNS/MET SG/13	July	Bangkok
APANPIRG/20	7-11 September	Bangkok

5.2 The meeting noted that the provisional agenda for APANPIRG/18 was prepared in line with Air Navigation Commission's proposal for a uniform approach to formulation of agenda for the PIRGs meetings. The provisional agenda for future APANPIRG meetings will be in this format. The meeting accepted Japan's proposal to have a separate heading for RASMAG activities under Agenda Item 3.

5.3 The meeting expressed appreciation to China and Japan for their kind offers to host the ADS-B SITF/7 meeting and the ATFM Seminar as indicated in table above.

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AGENDA ITEM 6: ANY OTHER BUSINESS

Agenda Item 6: Any Other Business

6.1 The meeting agreed to consider working paper 38 on 'North American Sustainment of Aviation Operations during a pandemic influenza outbreak- A concept of Operations and Agreement' as an information paper. This paper was not presented but the meeting took note of its contents.

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LIST OF INFORMATION AND WORKING PAPERS

Paper No.	Agenda Item	Title	Presented by
Information Papers			
IP/1	-	Meeting Bulletin	Secretariat,
IP/2	2.1	Progress Report on the Implementation of the ICAO Unified Strategy Programme (USP)	Secretariat,
IP/3	2.1	Work Programme of ICAO ANC Panels Related to Global ATM System	Secretariat
IP/4	3.4	Review of ATS Coordination Group Activities	Secretariat
IP/5	4	Regional Database of Air Navigation Deficiencies in Asia/PAC Region	Secretariat
IP/6	3.2	Finalization of Model ATM Contingency Plan	Secretariat
IP/7	3.2	Review of the Asia and Pacific Route Catalogue	Secretariat
IP/8	3.3	FAA Ground Based Augmentation System (GBAS) Program Status	USA
IP/9	3.5	Recent Activities in PBN	USA
IP/10	3.3	Significant ADS-B Decision in Australia	Australia
IP/11	3.2	Update on cooperation between China and the US supporting introduction of the RVSM in sovereign Chinese airspace	USA
IP/12	2.1	U.S. next generation air transportation system.	USA
IP/13	3.3	Status of the Multi-Transport Satellite (MTSAT) aeronautical mobile satellite services (AMSS) and MTSAT satellite-based augmentation system (MSAS) service with two satellite constellation	Japan
IP/14	3.2	Automating operational contingency planning	USA
IP/15	3.3	ATN/AMHS Transition Plan of India	India
IP/16	3.3	Regional Preparatory Activities for WRC-2007 and Outcome of APT APG/5 for WRC-2007	Secretariat

Paper No.	Agenda Item	Title	Presented by
IP/17	3.5	Capacity Enhancement Initiatives and PBN Implementation in India	India
IP/18	3.3	Implementation of AFTN Based AIDC in India	India
IP/19	3.2	An Update on CNS/ATM System Implementation in India	India
IP/20	3.3	An Update on GPS AIDED GEO Augmented Navigation (GAGAN) – India	India
IP/21	3.2	Airspace Safety Assessment for THE RVSM Implementation in Sovereign Chinese Airspace	China
IP/22	3.5	Updates on Air Navigation Activities in Viet Nam	Viet Nam

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Paper No.	Agenda Item	Title	Presented by
Working Papers			
WP/1	-	Provisional Agenda	Secretariat
WP/2	1.1	Review of the Action Taken by the ANC and the Council on the Report of APANPIRG/17	Secretariat
WP/3	1.2	Review of the Status of Implementation of APANPIRG/17 Conclusions and Decisions	Secretariat
WP/4	1.3	Review of the Status of Implementation of APANPIRG Outstanding Conclusions and Decisions	Secretariat
WP/5	3.5	Implementation of the concept of Performance Based Navigation	Secretariat
WP/6	2.1	Continued Evolution of a Performance Based Global ATM System	Secretariat
WP/7	2.2	Progress Report on Implementation of DGCA/06 Recommendations	Secretariat
WP/8	2.3	Global Aviation Safety Plan	Secretariat
WP/9	3.2	Progress Report on Unmanned Aerial Vehicle Work (UAV)	Secretariat
WP/10	2.4	ICAO Business Plan	Secretariat
WP/11	2.1	Environmental Benefits of CNS/ATM Systems	Secretariat
WP/12	3.1	Status on Regional Air Navigation Plan – AOP	Secretariat
WP/13	3.2	Report of the Seventeenth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/17)	Secretariat
WP/14	3.3	CNS/MET SG/11 Report	Secretariat
WP/15	3.2	ATM/AIS/SAR–Review Implementation of Routes in the ICAO Asia/Pacific Route Catalogue	IATA
WP/16	3.2	Language Proficiency Requirements	Secretariat
WP/17	3.1	Aerodrome Certification Requirements	Secretariat
WP/18	3.1	Bird Hazard Management	Secretariat

Paper No.	Agenda Item	Title	Presented by
WP/19	4	DRTF/3 Report on Deficiencies in the Air Navigation Field	Chairman, DRTF/3
WP/20	4	Status of APANPIRG List of Deficiencies	Secretariat
WP/21	3.2	Common Air Traffic Flow Management Terminology	USA/Japan
WP/22	3.2	Report on Activities of the RASMAG	Secretariat
WP/23	3.5	Funding of Regional Airspace Safety Monitoring & Outcomes of the Regional Airspace Safety Monitoring Committees Task Force	Secretariat
WP/24	3.2	AIS Update from the AIS Implementation Task Force and the 17th Meeting of the ATM/AIS/SAR Sub-Group	Secretariat
WP/25	3.2	Non-adherence to AIRAC Provisions	Secretariat
WP/26	3.2	Asia/Pacific RVSM Safety Assessments	Secretariat
WP/27	5	Future Work Programme	Secretariat
WP/28	3.2	Implementation of Air Traffic Flow Management (ATFM) in Bay of Bengal and South Asia	Secretariat
WP/29	3.2	Implementation of Reduced Vertical Separation Minimum (RVSM) in the Asia and Pacific Region	Secretariat
WP/30	3.2	Summary of the First Meeting of the Trans-Regional Airspace and Supporting ATM Systems Steering Group (TRASAS/1)	Secretariat
WP/31	3.2 &3.3	AIDC Task Force & AIDC Interface Control Document Version 3	Secretariat
WP/32	3.2	Long Term Monitoring of RVSM Height Keeping Performance	IATA
WP/33	3.2	Review of the North and Central Pacific Airspace	IATA
WP/34	3	Increasing efficiency and Reducing Greenhouse Emissions in the Oceanic Environment	USA
WP/35	3.3	FAA Automatic Dependent Surveillance-Broadcast (ADS-B) Program Office Roadmap	USA

Paper No.	**Agenda Item**	**Title**	**Presented by**
WP/36	3.5	Regional Implementation Plan of Performance Based Navigation	Secretariat
WP/37	3.5	Implementation of RNAV 5and RNAV1 in Japan.	Japan
WP/38	6	North American Sustainment of Aviation Operations During a Pandemic Influenza Outbreak- A Concept of Operations and Agreement	USA
WP/39	3.2	Issues concerning the establishment of safety monitoring agency for Asia region.	Thailand
WP/40	3.2	Japan RMA capability for the Fukuoka FIR and appointment of JCAB RMA by APANPIRG	Japan
WP/41	3.2	The Preparation of Regional Monitoring Agency(RMA) establishment in China	China
WP/42	3.3	Sub-Regional Cooperation for the Implementation of ADS-B in the South-East Asia Area	Indonesia, Malaysia, Singapore and Thailand
WP/43	3.2	Implementation Progress of the Reduced Vertical Separation Minimum (RVSM) in China Airspace	China
WP/44	3.2	Establishment and Revision of ATS/RNAV Routes within Ha Noi and Ho Chi Minh FIRs	Viet Nam
WP/45	3.5	Report of the First Meeting of Regional Performance Framework Task Force of APANPIRG/18 for	Chairman RPFTF

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Flimsy No.	Agenda Item	Title	Presented by
Flimsies			
No. 1	3.3	ADS-B Mandate	Rapparteur of Ad-hoc group
No. 2	3.1	WP/18- Bird Hazard Control and Management	Secretariat
No. 3	3.5	Performance Based Navigation	Secretariat

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