INTERNATIONAL CIVIL AVIATION ORGANIZATIONA
ASIA AND PACIFIC OFFICE

ASIA/PACIFIC REGIONAL
AERONAUTICAL TELECOMMUNICATION NETWORK (ATN)
AIR TRAFFIC SERVICE (ATS)
MESSAGE HANDLING SYSTEM (AMHS) DESCRIPTION

First Edition – April 2005

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1.0 Introduction

The Aeronautical Telecommunication Network (ATN) is a global inter-network that provides digital communications necessary to the automated systems that include; air traffic service communication (ATSC), aeronautical operational control (AOC), aeronautical administrative communication (AAC), and aeronautical passenger communication (APC).

The ATN is composed of a network infrastructure and applications, and provides the global communication for ground-ground (G/G) and air-ground (A/G) services. The major components of ATN network are routers (Intermediate Systems: IS) including G/G routers and A/G routers, and communication sub-networks including air-ground and ground-ground sub-networks. The ATN applications include, among others, context management (CM), controller-pilot data link communication (CPDLC), air traffic service message handling services (AMHS). The applications are hosted by the End Systems (ES).

The Aeronautical Fixed Telecommunication Network (AFTN) and the Message Switching System are being incrementally replaced by a regional ATN ground network and AMHS. This document describes AMHS system in the Asia/Pacific region.

1.1 Scope

This document describes the functionality, system, performance, information security, and system management requirements of the AMHS system in the Asia/Pacific region. The AMHS system includes ATS Message Server, ATS Message User Agent, and AFTN/AMHS Gateway. The AFTN/AMHS Gateway is only needed during the early stage of ATN/AMHS implementation to operate AMHS and AFTN concurrently. This document provides essential procurement guidance for the AMHS system to assure the interoperability of the AMHS within the Asia/Pacific Region. This document includes:

1. AMHS functionalities including basic and extended AMHS service;
2. AMHS system requirements;
3. AMHS performance requirements to ensure the performance of Asia/Pacific AMHS;
4. Information security requirements; and
5. System management requirements.

This document should be used in conjunction with ICAO Doc. 9705 “Manual of Technical Provisions for the Aeronautical Telecommunication Network”[1,2], the Interface Control Document (ICD) for Asia/Pacific Regional AMHS, and other applicable documents as highlighted in this document.

1.2 Standard Compliance

1.2.1 ICAO Doc 9705 Edition 2 and Edition 3

This document is applicable to ATN AMHS that is defined in sub-volume III of the ICAO Doc 9705.

While the current version of ICAO Doc 9705 is Edition 3, there are two major differences between the AMHS requirements specified in Edition 2 and Edition 3:

1) ICAO Doc 9705 Edition 3 includes extended service; and
2) ICAO Doc 9705 Edition 3 does not include pass-through service.

It is further noted that the technical provisions are generally backwards compatible between successive editions. While Doc 9705 Edition 3 incorporates technical provisions for AMHS enhancements such as extended service, these enhancements are not mandatory for AMHS, and the use of these enhancements for AMHS is not currently planned in the Asia/Pacific region on a regional basis. Both ICAO Doc 9705 Editions 2 and 3 satisfy the system level requirements specified in this document.

The AMHS specified in ICAO Doc 9705 is implemented over the ATN protocol stack, which is based on the ISO Open Systems Interconnect (OSI) protocols. This uses the Connectionless Network Protocol (CLNP) as the network protocol and the Connection Oriented Transport Class 4 Protocol (COTP4) as the transport protocol.

1.3 Introduction to the ATS Message Handling System (AMHS)

1.3.1 Aeronautical Fixed Telecommunications Network (AFTN)

The *ATS Message Handling System (AMHS)*, which has been defined in the ICAO Aeronautical Telecommunication Network (ATN) standards, is intended to be a replacement for the current *Aeronautical Fixed Telecommunications Network (AFTN*). AFTN is a store-and-forward messaging service for conveyance of text messages using character-oriented procedures. AFTN messages are forwarded on a hop-by-hop basis using pre-configured routes that are the most expeditious to affect delivery to the addressee. AFTN has diversion routing lists agreed to by the Administrations operating the communication centres where the AFTN switches reside. These lists are statically configured and used to immediately reroute traffic in the event of a circuit outage in a fully automatic communication centre and to manually reroute traffic within 10 minutes in a non-fully automatic communication centre. Under AFTN procedures the sending station will hold messages transmitted, and in the event that continuity of message traffic is not maintained, they are re-transmitted. Continuity of message traffic is supervised using sequence numbers applied to all traffic over a particular channel. The AFTN system is depicted in Figure 1.

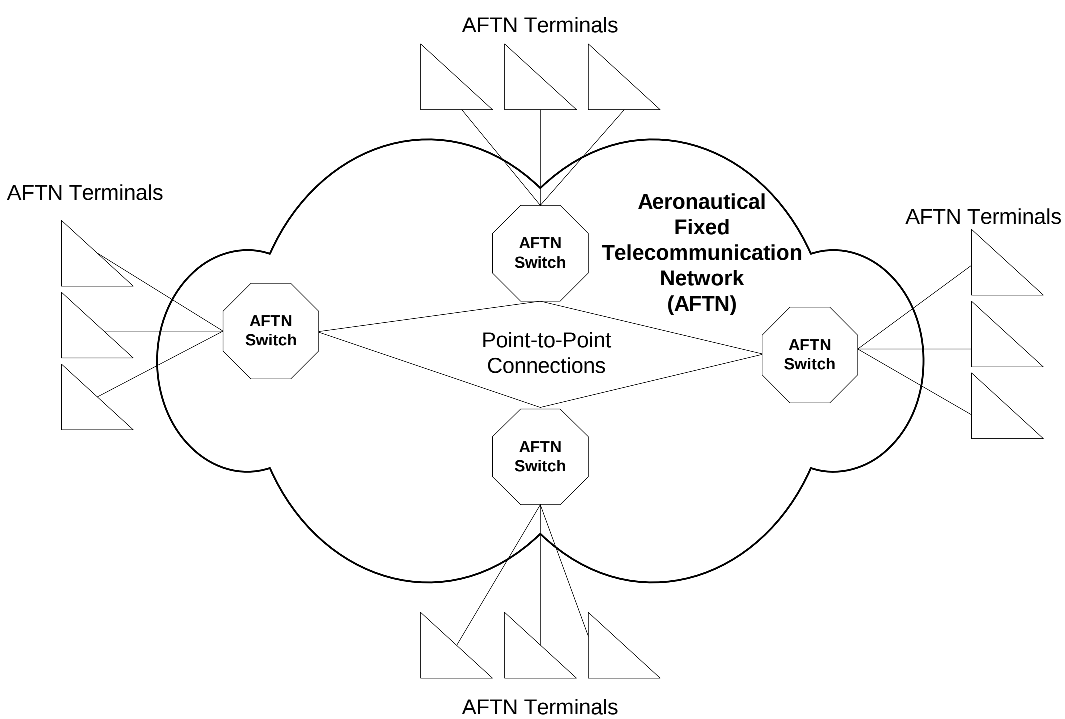

Figure 1 – AFTN System

1.3.2 OSI X.400 Message Handling System

The ATS Message Handling System is based on the OSI X.400 Message Handling System. It is important to note that the X.400 Message Handling System is not a physical system with actual physical entities but rather is an architectural model for specifying functions or services provided by logical entities and the protocols between these logical entities. Figure 2 depicts the OSI X.400 architecture in the overall *Message Handling Environment (MHE)*. As is depicted there is an outer infrastructure and inner infrastructure. The outer infrastructure is the *Message Handling System (MHS)*, which is a generic messaging system from the perspective of MHS Users.

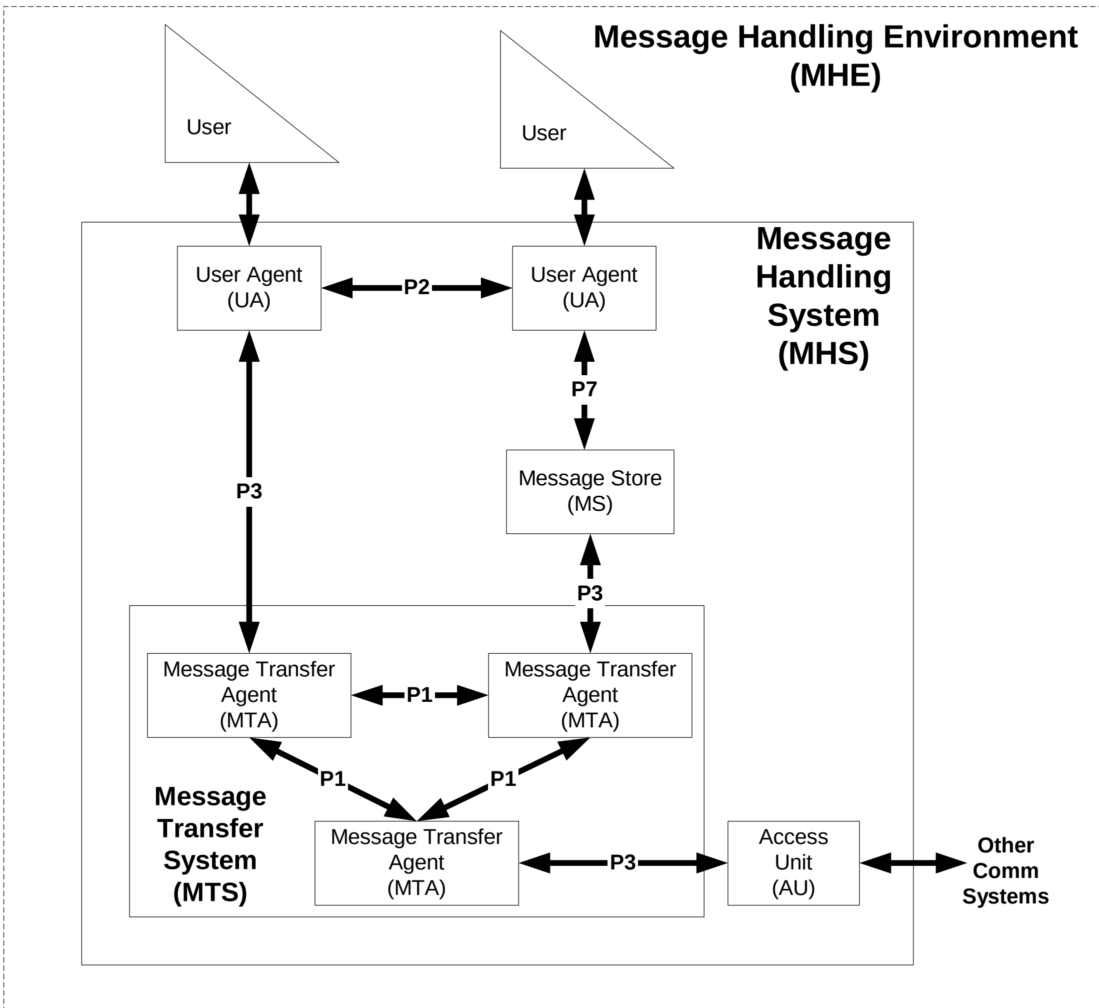

Figure 2 – X.400 Architecture and Protocols

The inner infrastructure is the *Message Transfer System (MTS)*, which provides the store and forward capability of the MHS. The MTS consists of a network of *Message Transfer Agents (MTA)*. Informally, MTAs are "message routers", that is, they function as routers at the message level to forward messages across the MHS. MTAs forward messages using the Recipient Address in the message (as opposed to the network address of a network level packet which a "network router" uses). MTAS MTAs communicate with one another using the P1 protocol. The P1 protocol defines a message envelope (which would be called a header at the network level). The P1 envelopes contain routing and control information and thus determine how message exchange occurs among MTAs.

MTS users within the MHS are either *User Agents (UA)* or *Message Stores (MS)*. A UA is essentially a unit (of software) that interacts with the MTS on behalf of a user. A UA functions to permit the user to send and receive mail, for example, like the Microsoft Outlook Express software that may be resident on a PC. UAs communicate with one another using the P2 protocol. The P2 protocol defines the content and format of an interpersonal message. The P2 protocol defines a P2 heading, which is equivalent to the address on a personal letter and a P2 body which is made up of one or more P2 body parts, each containing information in different formats. As described above the P1 protocol between MTAs will encapsulate a P2 interpersonal message with control information during MTA to MTA communication

A MS is, as the name suggests, a unit that stores messages on behalf of a UA. When a MTA has a message to deliver to a UA it delivers it to the MS instead of the UA. The UA can then retrieve the message from the MS at its convenience. Access to a MS by a UA in the X.400 MHS is similar to Outlook Express accessing a mail server using the Internet's POP3 protocol. A UA communicates with a MS using the P7 protocol. The P7 protocol defines procedures for message submittal, message retrieval, and message administration.

MTS users communicate with MTAs using the P3 protocol. The P3 protocol defines procedures for message message delivery and as in the case for the P7 protocol defines procedures for message submittal and message administration.

The final entity in the diagram is an *Access Unit (AU)*. The AU is simply a gateway to another communications system. In the original X.400 specifications, AUs were expected to provide an interface to pre-X.400 technologies such as telex, and teletex. As will be described below, ICAO defines two AUs. One is the AFTN/AMHS Gateway and the other is the CDIN/AMHS Gateway. Note that many X.400 vendors offer AUs that provide gateway service to TCP/IP mail service in the form of an X.400 to SMTP gateway.

1.3.3 ATS Message Handling Service (ATSMHS)

The message handling service provided in the ATN is called the *ATS Message Handling Service (ATSMHS)*. This service is specified using X.400 standards following the X.400 architecture described above. There are two levels of ATSMHS service: Basic ATS Message Service and Extended ATS Message Service.

- **Basic ATS Message Service** provides a nominal capability equivalent from a user perspective to those provided by AFTN.

- **Extended ATS Message Service** provides enhanced features such as supporting transfer of more complex message structures (body parts), use of the directory service, and support for security.

1.3.4 ATS Message Handling System (AMHS)

ICAO Doc 9705 distinguishes the service from the set of computing and communication resources implemented by ATS organizations to provide the ATS message handling service. The set of computing and communication resources is called the *ATS Message Handling System (AMHS)*. For Basic ATS Message Service, the following AMHS entities are defined:

- **ATS Message Server -** An X.400 MTA and optionally one or more MSs

- **ATS Message User Agent** – An X.400 UA

- **AFTN/AMHS Gateway** – An MTA and an AFTN specific AU, called a Message Transfer and Control Unit (MTCU) and a Control Position.

- **CDIN/AMHS Gateway** – An MTA and a CDIN specific AU, called a Message Transfer and Control Unit (MTCU) and a Control Position.

1.4 Initial AMHS Configuration

Figure 3 depicts the initial AMHS configuration. In this configuration the AFTN system is still in place, a supporting network of ATN Ground-Ground Routers is introduced, and AFTN/AMHS Gateways are introduced to begin the transition to ATN-based ATSMHS. In this configuration, basic ATS message service is provided. From a users perspective at an AFTN terminal there should be no difference from the AFTN only environment. The advantage of the ATN is that the Ground-Ground routers of the ATN perform re-routing automatically without the need for pre-configured diversion routing list and they permit direct MTA-to-MTA routing rather than having messages relayed through intervening MTA.

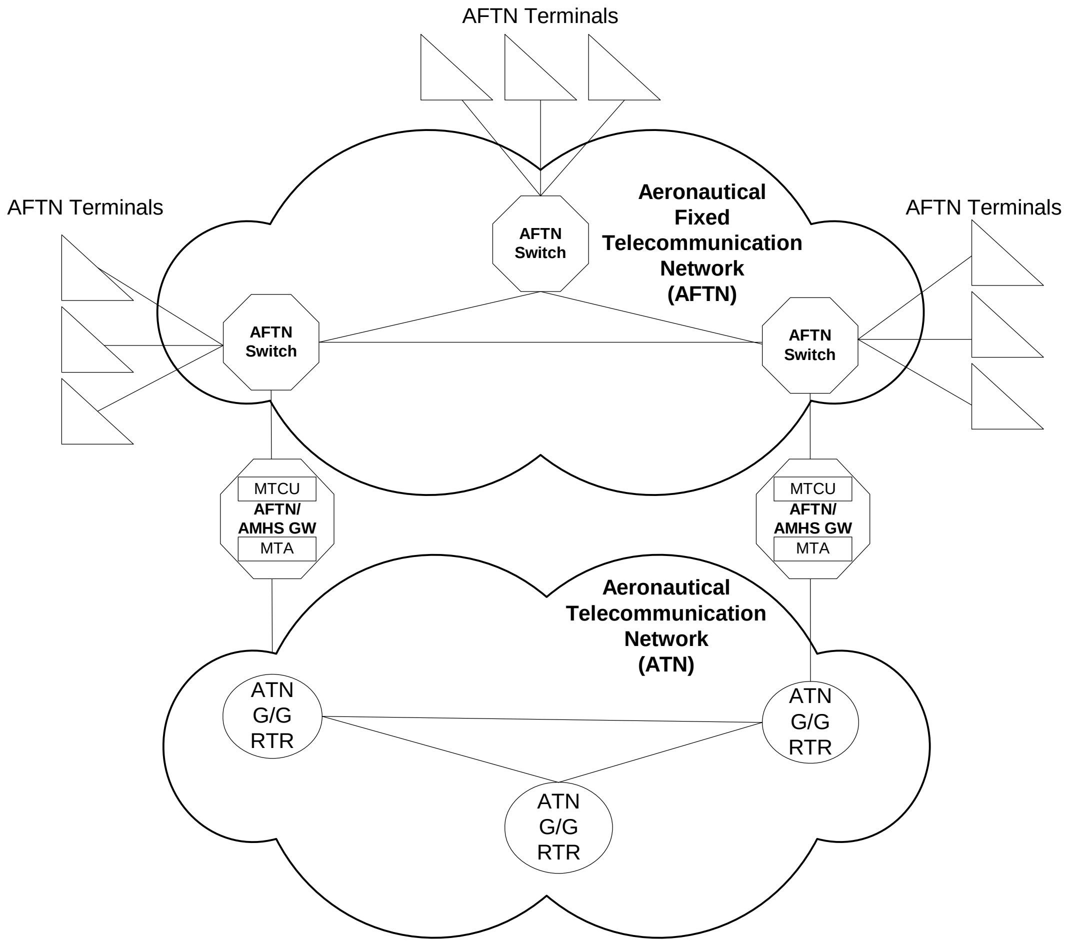

Figure 3 – Initial AFTN – AMHS Gateway System

1.5 Evolving AMHS Configuration

Figure 4 depicts the evolving AMHS configuration. In this configuration AFTN terminals and associated AFTN switches are still in place to accommodate administrations that have not yet switched to AMHS. The evolving system now has AMHS terminals. These terminals have ATS message user agents embedded in them. The AMHS user terminals interface to ATS Message Servers, which as described above, will have an MTA to interface the ATN MTS and most likely an embedded MS capability to permit storage of messages which terminals are not in-use. Administrations may introduce AMHS terminals while at the same time maintaining AFTN terminals. In this case, it is likely that a combination AFTN/AMHS Gateway and ATS Message Server will be employed. It is anticipated that gateway vendors will provide this upgrade path.

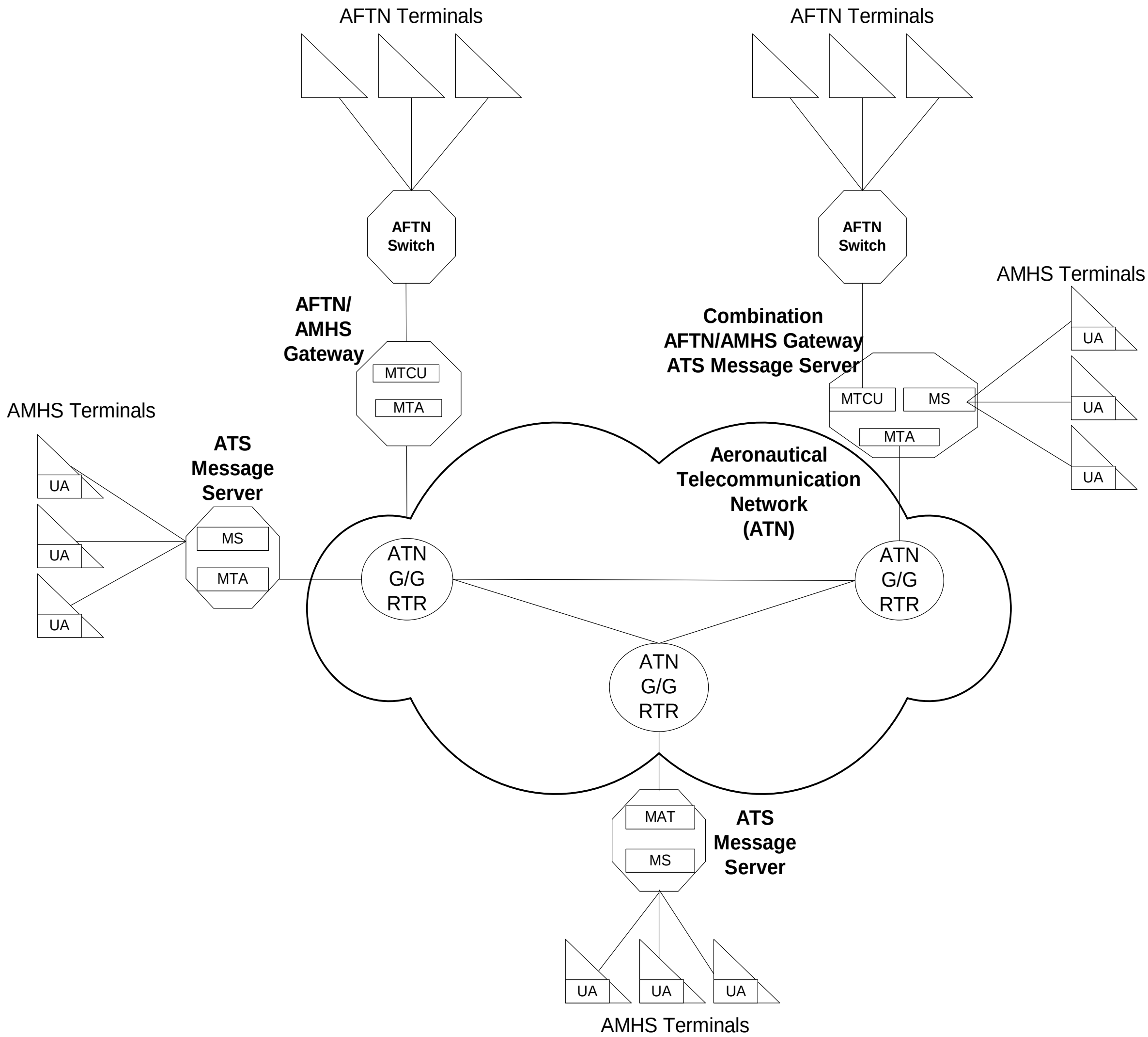

Figure 4 – Evolving AMHS System

1.6 AMHS with Extended Services

Figure 5 depicts an AMHS configuration with extended services. Extended services will generally involve support from an X.500 directory service. The directory may be used to enhance the AMHS system. For example, the directory may be accessed by UA to obtain the O/R address and capabilities of potential message recipients. The directory may be accessed by MTAs to look up the MTA serving a recipient and to look up the NSAP address of the serving MTA. Access is via a Directory User Agents (DUA) in the UA or MTA.

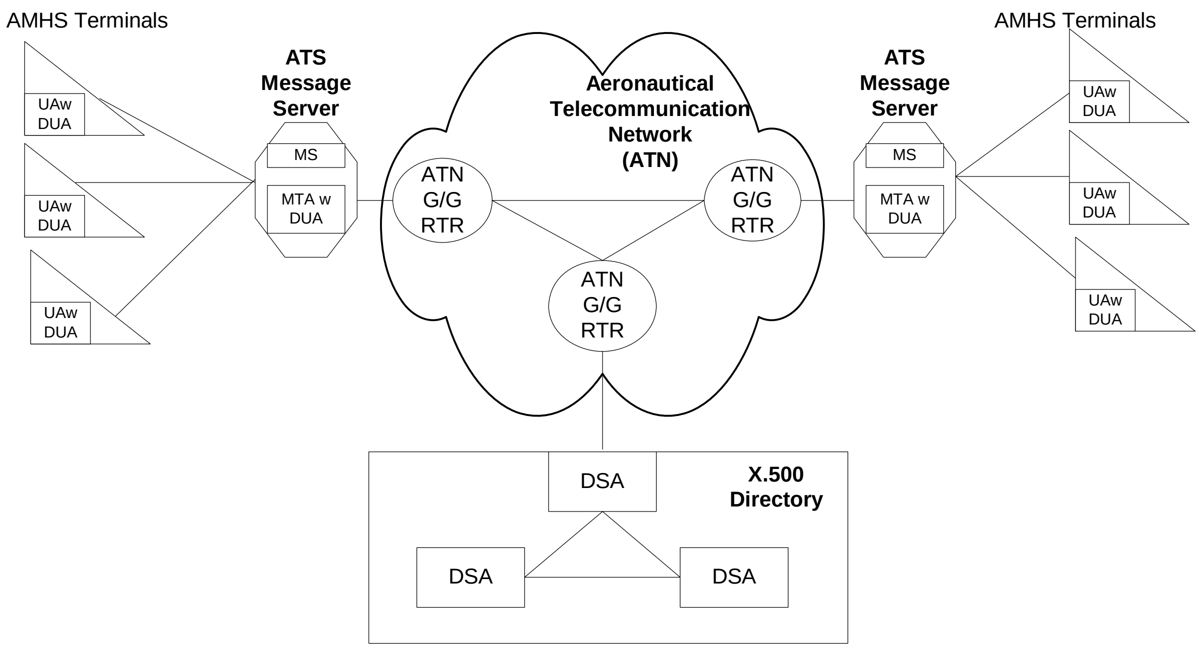

Figure 5 – AMHS with Extended Services

The directory will also enable enhanced security services. In this case a UA may access the directory to obtain X.509 public key certificates. X.509 certificates enable messages to be transmitted with the authentication security service. Authentication ensures that the identity of a peer is a claimed and that a particular message came from an authentic peer.

Other extended services include support for body parts in other than text format. For example, AMHS will be able to transmit meteorological data in Binary Universal Form Representation (BUFR) defined by the World Meteorological Organization (WMO).

2.0 Documents

2.1 Applicable Documents

The following documents, with specific editions and/or versions, contain requirements which, through reference in this text, constitute requirements of this document. The requirements for the AMHS system descriptions are specified in the following documents:

1) *ICAO Doc. 9705-AN/956*. Manual of Technical Provisions for the Aeronautical Telecommunication Network, Second Edition– 1999.

2) *ICAO Doc. 9705-AN/956*. Manual of Technical Provisions for the Aeronautical Telecommunication Network, Third Edition– 2002.

3) *ISO/IEC 10021_1:1990.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 1: System and Service Overview.

4) *ISO/IEC 10021_1/Amd.2:1994.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 1: System and Service Overview.

5) *ISO/IEC 10021_1:1999.* Information Technology — Message Handling Systems (MHS) — Part 1: System and Service Overview.

6) *ISO/IEC 10021_2:1990.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 2: Overall Architecture.

7) *ISO/IEC 10021_2/Amd.1:1993.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 2: Overall Architecture.

8) *ISO/IEC 10021_2/Amd.2:1994.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 2: Overall Architecture.

9) *ISO/IEC 10021_2:1999.* Information Technology — Message Handling Systems (MHS) — Part 2: Overall Architecture.

10) *ISO/IEC 10021_3:1990.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 3: Abstract Service Definition Conventions.

11) *ISO/IEC 10021_4:1990.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 4: Message Transfer System: Abstract Service Definition and Procedures.

12) *ISO/IEC 10021_4/Amd. 1:1994.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 4: Message Transfer System: Abstract Service Definition and Procedures.

13) *ISO/IEC 10021_4:1999.* Information Technology — Message Handling Systems (MHS) — Part 4: Message Transfer System: Abstract Service Definition and Procedures.

14) *ISO/IEC 10021_5:1990.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 5: Message Store: Abstract Service Definition.

15) *ISO/IEC 10021_5/Amd. 1:Date.* Message Store Extensions and Message Store Logs.

16) *ISO/IEC 10021_5:1999.* Information Technology — Message Handling Systems (MHS) — Part 5: Message Store: Abstract Service Definition.

17) *ISO/IEC 10021_6:1990.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 6: Protocol Specifications.

18) *ISO/IEC 10021_6:1999.* Information Technology — Message Handling Systems (MHS) — Part 6: Protocol Specifications.

19) *ISO/IEC 10021_7:1990.* Information Technology — Text Communication — Message_Oriented Text Interchange System (MOTIS) — Part 7: Interpersonal Messaging System.

20) *ISO/IEC 10021_7:1999.* Information Technology — Message Handling Systems (MHS) — Part 7: Interpersonal Messaging System.

21) *ISO/IEC ISP 12062_1:1995.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 1: IPM MHS Service Support.

22) *ISO/IEC ISP 12062_1:1999.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 1: IPM MHS Service Support. (Edition 3)

23) *ISO/IEC ISP 12062_2:1995.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 2: AMH21 — IPM Content.

24) *ISO/IEC ISP 12062_2:1999.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 2: AMH21 — IPM Content. (Edition 3)

25) *ISO/IEC ISP 12062_3:1995.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 3: AMH22 — IPM Requirements for Message Transfer (P1).

26) *ISO/IEC ISP 12062_3:1999.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 3: AMH22 — IPM Requirements for Message Transfer (P1). (Edition 3)

27) *ISO/IEC ISP 12062_4:1995.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 4: AMH23 — IPM Requirements for MTS Access (P3).

28) *ISO/IEC ISP 12062_4:1999.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 4: AMH23 and AMH25 — IPM Requirements for MTS Access (P3) and MTS 94 Access (P3). (Edition 3)

29) *ISO/IEC ISP 12062_5:1995.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 5: AMH24 — IPM

30) Requirements for Enhanced MS Access (P7).

31) *ISO/IEC ISP 12062_5:1999.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 5: AMH24 — IPM

32) Requirements for Enhanced MS Access (P7). (Edition 3)

33) *ISO/IEC ISP 12062_6:1999.* Information technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 6: AMH26 — IPM Requirements for Enhanced MS 94 Access (P7). (Edition 2)

34) Asia/Pacific Region Interface Control Document (ICD) for ATS Message Handling System (AMHS), Version 1.0, September 2002.

2.2 Reference Documents

The following documents are reference documents applicable to the AMHS descriptions. These documents do not form a part of this document and are not referenced within the document.

1) *ICAO Doc. 9739-AN/961*. The Comprehensive Aeronautical Telecommunication Network (ATN) Manual (CAMAL) First Edition, January 1999.

2) *ISO/IEC 8348:1993*. Information technology - Open Systems Interconnection - Network Service Definition.

3.0 AMHS Functionality

The AMHS provides the ATS message exchange between service users. Implemented over ATN network, the ATS message service is an implementation of message handling system based on ISO/IEC 10021 or ITU-T X.400.

The ATS message service may have two levels of services: the Basic ATS Message Service and the Extended ATS Message Service.

3.1 Basic ATS Message Service

The Basic Service is based on the first version of the ISO/IEC International Standardized Profiles (ISP), published in 1994 and based on the ISO/IEC 10021:1990 set of standards.

3.2 Extended ATS Message Service

The Extended Service is based on the third version of the ISO/IEC ISP, published in 1999 and based on the ISO/IEC 10021:1999 set of standards. The Extended Service is a superset of Basic Service, and is backward compatible with the Basic Service.

3.3 Asia/Pacific ATS Message Handling Service (ATSMHS)

In the initial stage, the Asia/Pacific ATSMHS will only provide the Basic Service. Eventually, the Extended Service will be supported by all AMHS.

4.0 AMHS System Requirements

The Asia/Pacific AMHS includes three types of end systems:

1) ATS message server;

2) ATS Message User Agent; and

3) AFTN/AMHS gateway.

The AMHS end systems should comply with the requirements in accordance with the Protocol Implementation Conformance Statement (PICS) specified in Asia/Pacific Regional AMHS ICD [32].

4.1 ATS Message Server

An ATS message server includes a Message Transfer Agent (MTA) and optionally one or several Message Stores (MSs). The MTA transfers messages and delivers them to the intended recipients. The MS is a functional entity whose primary purpose is to store and permit retrieval of delivered messages.

The Asia/Pacific ATS message server should comply with the following requirements in accordance with the Asia/Pacific AMHS ICD[32].

1. the profile specification expressed in ICAO Doc 9705 section 3.1.2.2.2.1; and

2. the provisions related to traffic logging as specified in ICAO Doc 9705 section 3.1.2.2.2.2.

The Extended ATS Message Service is out of the scope in this document.

4.2 ATS Message User Agent

An ATS Message User Agent includes a User Agent (UA) functional object as defined in ISO/IEC 10021-2. UA is an application process that interacts with the Message Transfer Agent (MTA) or a Message Store (MS), to submit messages on behalf of a single user. Both MTA and MS functional object are defined in ISO/IEC 10021-2.

For the support of the Basic ATS Message Service, an ATS message user agent should comply with the following requirements in accordance with Asia/Pacific AMHS ICD.

1. the UA profile specified in ICAO Doc 9705 section 3.1.2.2.1.1, based on AMH21 as specified in ISO/IEC ISP 12062-2:1995 (1st or later Edition) and for messages including a body part whose type is an Extended Body Part Type of general-text-body-part type; and

2. the provisions related to traffic logging as specified in ICAO Doc 9705 section 3.1.2.2.1.2.

The Extended ATS Message User Agent is out of the scope in this document.

4.3 AFTN to AMHS Gateway

An AFTN /AMHS gateway provides an inter-connection between the AFTN and the ATN AMHS. The AFTN/AMHS gateway consists of the following four logical components:

1. AFTN component;
2. ATN component;
3. Message transfer and control unit; and
4. Control position.

The ATN component includes a MTA and an Access Unit (AU) defined in ISO/IEC10021-2. The AU delivers the indirect users' messages, such as AFTN messages, to AMHS.

The AFTN/AMHS gateway requirements are defined in ICAO Doc 9705 section 3.1.2.3 and Asia/Pacific AMHS ICD.

4.4 AMHS Addressing Scheme

The AMHS address includes Common AMHS Addressing Scheme (CAAS) Address and translated-form (XF) Address.

Both CAAS and XF address are used in Asia/Pacific Region. The AMHS addressing in Asia/Pacific region should comply with the requirements provided in ICAO Doc 9705 section 3.1.2.1.5.

5.0 Upper Layer Requirements

5.1 ATN AMHS

According to ICAO Doc 9705, ATN AMHS is over a Connectionless Network Protocol (CLNP) based ATN network. In order to implement ATN AMHS in Asia/Pacific Region, upper layers including presentation and session layer should comply with the upper layer requirements defined in Asia/Pacific AMHS ICD.

6.0 Performance Recommendations

The ATN AMHS performance requirements depend on the ATN network, AMHS service requirements, and bilateral agreements.

The follows are the baseline AMHS performance requirements.

6.1 Communications Performance and Capacity

The required communication performance of the AMHS (circuit speeds, number of circuits, message conveyance capability, maximum message transit time etc.) should be first determined. This may be achieved by analysis of existing communications traffic levels and the bandwidth and latency requirements of current and future applications. The following are general minimum guidelines for AMHS.

1. The minimum WAN speed should be 64 Kbps.

2. The minimum LAN speed should be 10 Mbps.

The AMHS message conveyance capability should be calculated based on existing and projected traffic.

3. The ATN AMHS maximum message transit time should be determined bilaterally to meet the end-to-end performance requirement.

6.2 Availability and Reliability

The availability of message service is determined based on Mean Time Between Failures (MTBF) of the AMHS and downtime, which are in turn determined bilaterally to meet the end-to-end performance requirements. In the network design, availability requirements should first be determined and the network should then be designed to achieve this with given equipment reliability. Availability requirements are normally higher for ATS Message server and AMHS/AFTN gateway than ATS Message User Agent.

1. For ATS Message server and AMHS/AFTN gateway, a high level of availability of the message service is required. This may be achieved either by using ATS Message Server and AMHS/AFTN gateway that have internal redundancy (e.g. dual-redundant systems) or by the use of multiple non-redundant AMHS, with automatic switchover capability in the event of failure.

Where such high levels of availability are not required, use of multiple AMHS with manual switchover in the event of failure within a certain time period, or identification of faults and replacement of malfunctioning units within a certain time period, may be acceptable methods of meeting availability requirements.

2. The maximum allowed message service downtime is determined based on maintenance contract. Use of multiple or redundant AMHS may help to maintain message service availability during scheduled maintenance downtime.

7.0 Information Security

7.1 Message Exchange Security

According to ICAO Doc 9705 section 3.1.2.1.2.3, in the Basic Service, security should be obtained by procedural means rather than by technical features inherent to the AMHS.

Security of Extended Service is out the scope in this document.

7.2 AMHS Security

The security of each AMHS is considered a local issue.

8.0 AMHS with Extended Services

Network Management Recommendations

The AMHS should provide a network management agent capable of supporting local management provisions.

The Common Management Information Protocol (CMIP) is the network management protocol specified for ATN according to ICAO Doc 9705. ATN network management sees the use of CMIP to allow direct access to network management information across domains in real-time. However, there are currently no requirements for such real-time inter-domain management information sharing within the Asia/Pacific region. Further, there are very few commercially available CMIP products at present. Implementation of ATN SARPs compliant CMIP agent is therefore optional for Asia/Pacific region AMHS at present.

For local management of AMHS within a domain, use of the Simple Network Management Protocol (SNMP) is recommended, given the widespread availability of commercial-off-the-shelf (COTS) SNMP server (network management) products.

APPENDIX A ACRONYMS

AAC	Aeronautical administrative communication
A/G	Air-Ground
AMH2n	Application Message Handling profile #2n, n=1,2,3…
AMHS	ATS Message Handling System
AOC	Aeronautical Operational Control
APC	Aeronautical Passenger Communication
ATC	Air Traffic Control
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Service
ATSC	ATS Communication
ATSMHS	ATS Message Handling Service
AU	Access Unit
CLNP	Connectionless Network Protocol
CAAS	Common AMHS Addressing Scheme
DUA	Directory User Agent
ES	End system
G/G	Ground-Ground
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IPM	Interpersonal Messaging
IS	Intermediate System
ISO	International Standardization Organization
ISP	International Standardized Profiles
MS	Message Store
MTA	Message Transfer Agent
MTS	Message Transfer System
MTBF	Mean Time Between Failures
P1	MTS Transfer Protocol
P3	MTS Access Protocol
P7	MS Access Protocol
PICS	Protocol Implementation Conformance Statement
SARPs	ICAO Standard and Recommended Practices
UA	User Agent
XF	Translated-form