INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ASIA/PAC AMHS/ATN NETWORK MANAGEMENT OPERATIONAL PROCEDURE GUIDELINES

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SECTION 1 GENERAL

1.0 Introduction

The **Aeronautical Message Handling System (AMHS)** is a global telecommunications message handling service that requires support and cooperation from multiple organizations and states regionally and around the globe. Personnel from the states, industry, and various private commercial organizations have met for many years to define a structure and guidance for the service.

Because of the basic principle of equal status among all States operating Communications Centers, no provision has been made for unique or special functions, including network management to be performed at any single specific place in the network: any function which is performed at one Center would or should be performed at all Centers. The existing and former situation Aeronautical Fixed Telecommunications Network (AFTN) does not contain or even allow the presence of a non-distributed, i.e. centralized network management function. It must, however, be recognized that one of the reasons for the permanence and robustness of the AFTN is the distribution of operational responsibility. Any introduction of non-distributed functions has to consider carefully the possibility of keeping distributed operational functions for stability reasons.

The current setting of AFTN operation is based on equal distributed function with the fixed centers with dedicated circuit network to support adjacent Flight Information Regions (IFRs) flight exchange. If any disruptions of service occur, the impacted center will coordinate with its adjacent center for backup and traffic diversion.

In the AMHS environment, either using ATN over X.25 subnet or TCP/IP network, the traffic is expected to be diverted automatically. This means, some centers will receive direct traffic that they never encountered in AFTN environment.

Furthermore, the introduction of AMHS with two addressing schemes along with many different network protocols such as ATN over X.25subnet, ATN over IP Subnet, and IPv4 and IPv6 over a TCP/IP network will significantly increase the possibility of the rejection of messages.

Sustaining service is critical during operations and implementation and is required to ensure that AFTN and AMHS will co-exist operationally for a long period of transition. This will make Communication Centers a very important part of transitional and operational activities to quickly resolve any message rejection or processing of unknown delivery problems.

In most all cases the maintenance and operation of Communication Centers is a local matter. However, to maintain a high level of operational reliability and performance there are critical items, procedures, and methods that must be coordinated and shared between and among network centers. Communications Centers must assure conformance to message delivery and format standards as well as accepted telecommunications and network protocols identified for use by the AMHS in ICAO documentation.

Therefore, the introduction of centralized processes and procedures into the Communication Centers will provide for a logical centralized network operation in a decentralized physical network structure.

1.1 Purpose

The AMHS will serve to replace the existing AFTN system. This document provides guidance in the regional, global, and local operation of the AMHS systems located in and associated with Communication's Centers operating AMHS systems or user agents.

1.2 Scope

This document covers areas deemed necessary for the efficient and effective operation of regional and global AMHS message handling systems distributing critical and necessary information used to facilitate the efficient movement of aircraft in the global environment.

1.3 Application

Policies and processes applied by this document are published and available in ICAO regional or global documentation relating to ATN, AMHS, Standards and Recommended Practices as well as relative technical guidance.

SECTION 2 AMHS OVERVIEW

2.0 Introduction

The AMHS is a message handling system that is owned and operated by ICAO member States or their agents and provides high-speed data communication and message exchange between other AMHS locations in a global or regional network environment.

2.1 AMHS

The AMHS is comprised of Message Transfer Agents (MTAs), Message Stores (MSs), User Agents (UAs), Access Units (AUs) and Directory User Agents (DUAs). Routers and telecommunication backbones connect AMHS communication center locations and User Agents to facilitate data exchange and transmission between users and suppliers. The AMHS employs the X.400 suite of recommendations for message handling and delivery.

2.2 AMHS Message Communication Standard

The AMHS, employed by or contracted by member states or their agents, will conform to ICAO standards for message format and message types. Any deviation from the standards must be approved by ICAO and coordinated with member States.

2.3 AMHS Data Telecommunication Standard

AMHS network center participants and providers will utilize the most efficient telecommunications circuits that comprise the backbone circuits between AMHS routing and message transfer agent locations. AMHS participants will conform to and utilize data telecommunications protocols and methods identified and approved in applicable ICAO documentation.

SECTION 3 ORGANIZATIONAL RESPONSIBILITIES

3.0 Introduction

This section provides information on the management approach that will be used for AMHS and the responsibilities of organizations that own, operate, and support AMHS systems.

3.1 AMHS Management Approach

The AMHS will employ a matrix management approach to provide technical systems and services under the guidance of network management policies.

3.2 Management Functions

AMHS network management will be comprised of 5 basic functions and modeled after the OSI network management standard. The 5 functions are:

1. Configuration Management
2. Fault Management
3. Performance Management
4. Security Management
5. User Access Management

3.3 Organizations and Roles

It is the basic responsibility of all AMHS providers and users to supply the following basic information to other providers and users that they normally coordinate and communicate with in the daily operation of the AMHS.

1. Points of contact and telephone numbers for:

   a. Network operations desk.
   b. Communication Center Management, first and second levels
   c. Engineering and planning

2. Maintenance and restoration activities

3. System changes and configuration changes

4. Modifications

All network activities modifications and corrective actions will be coordinated through these points of contact, beginning at the lowest and most practical level.

SECTION 4 CONFIGURATION MANAGEMENT

4.0 Introduction

It will be the responsibility of AMHS managers to provide an initial operational baseline configuration of the functional and physical configuration of their systems. This information will be shared and accessible to other AMHS participants. Changes to this baseline will be shared, tested, and, coordinated for implementation before they become operational.
The importance of strict configuration management is a paramount element of a global network such as the AMHS. Modifications can have far reaching global effects greater than those encountered today when implementation and change failures occur in the current AFTN network.

4.1 Operational Baseline

The initial operational baseline will not be modified without proper regional and global coordination. This is to assure that the addition or modifications of elements in the AMHS have passed proper conformance and implementation testing before being deployed. This activity will provide a foundation to limit and mitigate the risks associated with changes.

4.2 Configuration Control

While the procurement and operation of AMHS is mostly a local matter it is important that elements of software and hardware used in these systems conform to the standards identified by ICAO.

Additionally participants cannot act unilaterally with modifications and changes to their AMHS without the assurance to other participants that their changes with not adversely impact the system locally, regionally, or globally.

Any changes will be coordinated and advertised globally and shall not be implemented until a reasonable comment period has expired. This comment period will be 30 days from the initial announcement of the proposed change. The change will be considered approved, without further comment, and be implemented within 7 days of the comment period expiration.

It is recommended that configuration control measures be initiated in all regions with global coordination between the regions managed by ICAO.

4.3 Routine Modifications and Configuration Changes

Any modifications that occur as a result of software, hardware, informational updates, and the implementation and installation of modified or new hardware, shall be fully coordinated for fault and risk mitigation.

4.3.1 Address changes

Address changes will be closely coordinated among Communication Centers to avoid the problems associated with Non Deliverable Reports (NDR.) The changes can then be applied and propagated during a predetermined and scheduled Aeronautical Information and Regulation Cycle (AIRAC) period

4.3.2. Routing, software, and hardware modifications

Routing, software, and hardware modifications not associated with restoration will only be initiated when regional and global databases have been modified, and comment and notification periods have been observed. The changes can then be applied and propagated during a predetermined and scheduled Aeronautical Information and Regulation Cycle (AIRAC) period

SECTION 5 FAULT MANAGEMENT

5.0 Introduction

System component failures and degradations in network service are usually noted first by operations personnel via alarms, reports and monitoring systems or by individual network users who notify the Communication Center. Therefore fault management functions start at the Communication Centers.

- Elements of Fault Management
- Monitoring
- Detection
- Notification
- Restoration
- Tracking

5.1 Organizational Functions for Fault management

5.1.1 Communication Center

The primary focus for fault management of the AMHS rests with the Communication Center personnel who perform the five basic elements of fault management as an integral function of their daily activities. The Communication Center maintains the latest versions of software and configurations for reloading elements in the event of a failure.

5.1.2 Engineering and second level support

These organizations assist in the resolution of system faults that require engineering expertise. These organizations will normally be alerted by the Communication Center who will provide a detailed description of the fault.

5.1.3 Telecommunications

It is the responsibility of all Communications centers to contact telecommunications vendors and providers in the event of reduced service or circuit failures.

5.1.3.1 Bi-lateral circuits

It is recommended that in the case of bi-laterally provisioned circuits between states or Communication Centers, the Center with the Eastern most geographic location be the primary point-of-contact for testing and restoration coordination activities. This does not reduce the responsibility of the associated facility to monitor and participate in fault location and restoration.

SECTION 6 SAFETY MANAGEMENT

6.0. Introduction

In order to provide continual and safe services when changes, modifications, policy amendments, and routine maintenance activities are conducted AMHS users and providers must practice Safety Management System (SMS) activities. AMHS participants practice safety management by conducting and performing risk assessment and analysis and using the results to make decisions. The risk assessment and analysis must be predetermined, documented in a plan which must include the criteria for acceptable risk The plan must be published and approved internally and with other affected AMHS Communication Centers and users. Guidance related to Safety Management can be found in ICAO Doc.9859 Safety Management System (SMS) Manual.

6.1. Risk Management Plan

Risk assessment and analysis must be predetermined, documented in a plan which must include the criteria for acceptable risk

6.2. Hazard Identification

The hazard analyses and assessments required in the plan must identify the safety risks associated with the system or operations under evaluation, modification or maintenance.

6.3. Risk Assessment

The risk assessment of the hazards examined must be compared to the acceptability criteria specified in the plan and the results provided in a manner and method easily adapted for decision making

6.4. Risk Mitigation

The risk management decision must include the safety risk assessment and the risk assessments may be used to compare and contrast options. The implementation of the plan will facilitate the mitigation of failures and incidents incurred as a result of system modifications, replacement and improvements.

SECTION 7 PERFORMANCE MANAGEMENT

7.0 Introduction

Performance management is the function that keeps the network and services operating efficiently when unexpected patterns or failures would otherwise cause network congestion and failed or delayed message delivery. Performance management uses control processes to anticipate network delivery problems and respond to them. This involves collecting and accessing network data, and determining whether changes, repair or corrective action is necessary. Performance management is akin to a long term monitoring function as opposed to "real time" fault and operational management functions.

7.1 Performance Management Concept

The concept used by Communication Center's is a simple 4 step approach to performance management:

1. Identify performance parameters
2. Set performance objectives
3. Access conformance
4. Take control action to insure performance objectives are obtained

7.2 Performance parameters

Basic performance parameters and application of performance parameters are identified in ASIA/PACIFIC ATN/AMHS regional transition and planning documentation in the system management sections.

SECTION 8 SECURITY MANAGEMENT

8.0 Introduction

The implementation of security policy will be applied to all network resources and users to prevent unauthorized access to AMHS and computers connected to the AMHS and the applications running on those computers.

8.1. Policy

Users and providers will adhere to published regional and global ICAO security guidelines.

SECTION 9 USER ACCESS MANAGEMENT

9.0 Introduction

User access management compliments security and network performance and is fundamental to the efficient operation of the network.

9.1 User conformance and interface testing

All new users and user modifications will be tested to assure compliance with ICAO prescribed standards, tolerances and interface control documentation. Testing performed and documented shall be in compliance with ICAO prescribed Conformance documents and Interface Control documents.

No system shall be considered operational until formal operational testing has been performed in a live environment.

SECTION 10 VALIDATION TESTING

10.0 Introduction

Testing is essential to the operation of the network and provides verification that the introduction of new hardware, software or the modifications of hardware or software are accomplished with minimal impact on the operational network.

10.1 System changes, modifications and new hardware or software

All changes whether hardware or software will be thoroughly tested in off-line systems prior to implementation in the operational environment. Testing will strictly adhere to good fault mitigation practices and safety management guidelines as outline in related ICAO documentation.

10.1 Security testing

Testing will include tests associated with security vulnerabilities and the possible introduction of weaknesses into the operational network with the introduction of new or modified hardware or software.

SECTION 11 RECOMMENDED BEST PRACTICES

11.0 Introduction

Best Practices consolidate the elements of network and communication center management and focus on the procedures that are most productive and effective in a real time environment. In the AMHS environment Communications Centers will be more dependent on networks they do not own or control. In order to be effective they will need to be able to look through these networks to End Users and on to other Communication Centers, and ascertain the viability of the network and user elements. This ability will enable the Communication Center to make sound and swift decisions to increase the availability times of the entire AMHS infrastructure.

11.1. Availability

First and foremost base most monitoring on availability, and second monitor performance. While availability and performance go hand-in-hand they primary real time responsibility of the communication center is to assure the delivery of messages in an efficient manner and the availability of systems and networks is the most important operational element in when serving users. Rapid identification and replacement of failed elements of the AMHS or its supporting network are the primary concern.

11.2. Early detection

Strive for early detection of problems. Use monitoring tools that identify availability issues first. Rely more on real-time measurements and assessments rather than trend analysis. Use measurements that screen problems to determine priority and establish priorities that reflect the return to availability as the highest priority.

11.3. Performance

Measuring performance is important but not key to operational management availability in operational management is primary. However performance statistics and measurements must be made to accomplish important trend analysis and data gathering. Ensure that monitoring tools used make these measurements and gather this information during periods of relatively low network activity.

11.4 Focus

Operational management should be focused on the availability of the AMHS to the users and communication centers. Centers should respond rapidly to failures and deploy swift measures to resume system and network availability. While trend analysis is import, in the operational environment it is more important to use tools, equipment, methods, and practices that facilitate a return-to-service at the earliest possible time.

11.5 Availability Keys

a. End-User response times
b. Message Queue size
c. Transmission times (latency)
d. Non-deliverable reports.
e. Application Response times

SECTION 11 DOCUMENT REFERENCES

(1) ICAO doc9739 ATN Manual
(2) ICAO doc9896 Manual for the ATN using IPS Standards and Protocols
(3) ICAO doc9880 ATN Technical provisions
(4) ICAO doc9705 ATN Technical provisions
(5) ICAO ATN SARP Annex 10 Volume III amendment 83
(6) ICAO ASIA/PACIFIC ATN Regional Transition Documentation
(7) ITU-T, ISO, IETF X.400
(8) IETF RFC 1649
(9) IETF RFC 2126
(10) IETF RFC 1006
(11) ICAO Doc 9859 Safety Management System (SMS) Manual
(12) AMC Users Manual EuroControl, OneSky
(13) ICAO Europe AMHS Manual version 3.1
(14) ICAO Asia Pacific AMHS Regional Transition Documentation Guidelines Performance
(15) ICAO Asia Pacific AMHS Regional Transition Documentation Guidelines Management