ICAO MHS Networks

ICAO has established Standards and Recommended Practices that require all contracting states to provide and support the Aeronautical Fixed Service (AFS). For decades the Aeronautical Fixed Telecommunication Network (AFTN) and, in the EUR/NAT and the MID Regions, the X.25 based Common ICAO Data Interchange Network (CIDIN) have been used for the exchange of aeronautical messages. Due to certain limitations concerning the message format and the need to transport binary encoded data ICAO has strongly encouraged the introduction of ATS Message Handling Systems (AMHS).

AviSuite MHS Overview

Avitech's AviSuite MHS Overview product family supports AMHS, AFTN and CIDIN and provides an AFTN/AMHS gateway, thus ensuring interoperability between the AFTN/CIDIN and the AMHS networks.

AviSuite’s modular design is scalable to build small to large and high-availability COM Centres. Single and multi switch systems including network solutions are configurable.

The following switch variants are available:

- AFTN switch
- AFTN/CIDIN switch
- Integrated AFTN/AMHS switch with gateway functionality
- Integrated AFTN/CIDIN/AMHS switch with gateway functionality

All variants include a Store and Forward Module (SFM) supporting message retrieval and repetition functions and ensuring zero message loss in case of system restart.

In addition to these server switching components AviSuite also offers end-user client applications:

- AFTN User Agent
- AMHS User Agent

AFTN Component

The AviSuite AFTN Component provides the functionality of an AFTN COM Centre strictly conformant to ICAO Annex 10, Vol. II, Amendment 85. It facilitates routing and relaying of messages with multiple addressee indicators, including Predetermined Distribution Addressee Indicators (PDAI) and Multi Circuit Distribution. It supports asynchronous lines, TCP/IP, X.25, X29, TCP/IP, dial-in/dial-out connections via PSTN and FAX connections. Both IA5 and ITA-2 message formats can be used. The maximum message text length can be configured up to 64,000 characters. AFTN service messages are configurable to be processed and generated automatically or upon operator action.
CIDIN Component

The AviSuite CIDIN component comprises a CIDIN/AFTN application and a CIDIN protocol stack. The application converts AFTN messages into CIDIN format and vice-versa and maps the AFTN Destination Addresses (AD) onto CIDIN Exit Centre Addresses (AX). The protocol stack handles the Entry/Exit Centre transport protocol and the network layer protocol with the routing and relaying of CIDIN packets by their AX addresses. Both PVCs and SVCs are supported. The CIDIN functionality fully meets ICAO EUR Doc 005 – EUR CIDIN Manual, 6th edition.

AMHS Component

The AviSuite AMHS component consists as a minimum of an X.400 Message Transfer Agent (MTA) and an X.500 Directory Server. The MTA exchanges AMHS messages with other MTAs via the P1 message transfer protocol, with AMHS User Agents via the P3 MTS access protocol and with the AFTN component via the Message Transfer and Control Unit (MTCU). The MTA uses a built-in Directory User Agent (DUA) to obtain routing information and other configuration data from the X.500 directory. Optionally a Message Store (MS) can be employed which provides the P7 MS access protocol to AMHS User Agents.

The MTA communicates via RFC1006/TCP/IP and/or via ATN Internet Protocol, thus being configurable as a dual stack AMHS switch.

Basic and Extended ATS Message Handling Services as specified in ICAO Doc 9880, Part II are supported.

AFTN/AMHS Gateway

Together with the AMHS and the AFTN component and the Monitoring and Control Position the Message Transfer and Control Unit (MTCU) provides the functionality of an AFTN/AMHS gateway within an integrated AFTN/AMHS or AFTN/CIDIN/AMHS switch. It converts AFTN messages into AMHS messages and vice-versa, strictly following the rules specified in ICAO Doc. 9880 – AN/466, Part II. It supports the XF and the CAAS addressing scheme as well as individual address mapping.

Monitoring and Control

The integrated Monitoring and Control Position (iMCP) provides a user-friendly graphical interface to manage all components of an AFTN/CIDIN/AMHS message switch. It indicates all system events to administrators and operators. Different types of system events can be configured as audible/visible alarms which have to be acknowledged. A large variety of commands allows channel control, circuit and address diversion, etc.

Multiple versions of configuration tables can be maintained for all applications; specific checks ensure that only mutually consistent table sets can be activated.

AFTN messages received with format errors and/or non-routable addresses are forwarded to an intelligent correction position.

The operator can retrieve and repeat messages using a variety of search criteria. Trace and journal data contain additional statistical information about messages and their processing in the switch.

A statistics module provides meaningful statistical data which can also be exported into CSV files for further analysis with office tools.

The iMCP also includes user permissions management.

The status of hardware components and connections are collected by use of SNMP and displayed graphically.

AMC Interface

The conversion of AFTN addresses into AMHS and vice-versa is controlled by address look-up tables which must have the same content in each gateway worldwide in order to ensure that all messages passing gateways are switched correctly. The amount of addressing data and the criticality of faulty assignment make an automatic support of COM Centre operators at the configuration of their AFTN/AMHS gateways indispensable. EUROCONTROL’s ATS Messaging Management Centre (AMC) provides coordinated MD-, CAAS and User Address look-up tables in CSV format to the COM Centres for download. A comfortable user interface allows import of these data into the directory, thus making them available not only to the MTCU, but also to the User Agents.

Furthermore, the AviSuite switch provides statistics data as specified in ICAO EUR Doc 021 – ATS Messaging Management Manual, Version 7.0 for upload into the AMC.
AFTN/AMHS User Agents

Both the AFTN and the AMHS User Agent are advanced messaging clients meeting the needs of ATS users. The applications combine the convenience of a highly sophisticated ATS terminal application with the message handling capabilities of AFTN or AMHS depending on the customers’ requirements.

The entry point for all messaging related data in AviTerm is the Message Office. It is used to collect all messages submitted and received by the messaging AviUnit. Its HMI is split into three sub windows, a tree view, a table view and message preview – similar to the view presented by most of the popular email clients.

A message can be previewed by selecting it in the table view.

In order to see all details of the message, it can be opened in the specialized AviUnit.

If a received message contains information elements that require the immediate attention of the user, an audible and visible alarm is generated notifying the user of the relevant event.

A new message can be created using different methods. The simplest method is filling in all necessary data into the input fields of the according application window. To compile new messages, the user may also load an existing message for modification. All AviUnits implement a common template handling mechanism allowing the creation, storage and administration of message templates. In centralised installations, templates may even be shared amongst the user community.

The software comprises comprehensive syntactical and, wherever possible semantic checks of the data entered by the user. This ensures a high quality of all messages submitted.

A specialized frame for AFTN messages supports all necessary AFTN specific features according to ICAO Annex 10, Vol. II.

In order to ease the migration from AFTN to AMHS, the AMHS frame is structured in such a way that users accustomed to AFTN quickly feel at home.

The integrated functionality of a Directory User Agent (DUA) automatically handles the conversion of AFTN addresses into AMHS addresses and vice versa. This ensures that addresses are always consistent and reduces the risk of delivery failure due to mistyped AMHS addresses.

The AMHS User Agent can be connected to an ATS Message Server either by means of the MTS Access Protocol P3 or the MS Access Protocol P7.

In addition to the Basic ATS Message Handling Service the AMHS User Agent supports the following Extended Services:

- ATN/AMHS Directory Services
- Support of Unstructured Binary Data (File Transfer Body Part)
- Use of IPM Heading Extensions
- Security Services
Options
Avitech also furnishes AFTN and/or AMHS P3 or P7 protocol interfaces to legacy systems in order to connect them to an AFTN or AMHS switch.
An AFTN/IATA-Type B gateway can be integrated into the AviSuite switch.
An ATN Router can be provided, if AMHS communication via the ATN Internet is required.

Conformance
AviSuite fully conforms to the recommendations and requirements of
- EUROCONTROL Specification on the Air Traffic Services Message Handling System (AMHS), Edition 2.0
- AMHS Conformance Tests as specified in Appendix D of the EUR AMHS Manual have been successfully performed with several customer systems supplied by Avitech.

Experience, Technology Leadership, References
Avitech’s experience in aeronautical data and message switching traces back to the 1970’s when the first Message Handling System went into operation. Avitech’s technology leadership was established in 1992 with the start of operational use of the world’s first CIDIN link. In 1996 Avitech implemented an integrated AFTN/CIDIN/AMHS system with the first nationwide AMHS network for the combined German Armed Forces. This system comprises 31 MTAs in different locations in Germany. After several upgrades it is fully compliant to ICAO Doc 9880, Part II. Having successfully passed all conformance, interoperability and pre-operational tests defined in ICAO EUR Doc 020 – EUR AMHS Manual, Appendices D, E, F, the system exchanges operational AMHS traffic with the German Civil COM Centre since February 2011.

The integrated AviSuite AFTN/AMHS system in Jordan was among the first to establish international AMHS links for operational use. Since 2010 three operational AMHS links between Amman and other COM Centres in the MID Region have proven their reliability and stability.

Further AviSuite AFTN/AMHS switches are in operation in South Korea, Tunisia, Turkey, Hungary and Poland.

Avitech actively participated in the FIRST (First Multipartite International Realisation of ICAO SARPs AMHS Trials) group in which 3 independent ANSPs and their suppliers defined and validated interoperability tests which were later appended to the EUR AMHS Manual.