



International Civil Aviation Organization

**THE TWELFTH WORKING GROUP MEETING OF
AERONAUTICAL TELECOMMUNICATION NETWORK
(ATN) IMPLEMENTATION CO-ORDINATION GROUP OF
APANPIRG (ATNICG WG/12)**



5 – 8 August, Renton, WA, USA

Agenda Item 6: AMHS and IP Implementation Status in Asia/Pacific and other Regions

BRIEF REVIEW OF ATN/AMHS IMPLEMENTATION IN OTHER REGIONS

(Presented by the Secretariat)

SUMMARY

This paper presents a brief review of ATN/AMHS related works that is going on in the other regions.

1. INTRODUCTION

1.1 AMHS has been identified as next generation of AFTN for data communication to support ATS messaging related exchange between ICAO member States as part of the Aeronautical Fixed Service – AFS. This paper reviews current status and recent development of AMHS related planning and implementation taking place in other ICAO Regions.

2. DISCUSSION

SAM/CAR/NAM Regions

2.1 An AMHS Workshop and a meeting (SAM/IG/10) to review the ATS Message Handling System (AMHS) implementation were held in Miami from 10 to 13 April, 2012. The Eleventh workshop/meeting of the SAM Implementation Group (SAM/IG/11) was held in Lima, Peru from 13 to 17 May 2013.

The SAMIG addressed, *inter alia*, aspects related to Project D2 – ATN ground-ground and air-ground applications in the SAM Region. The goals taken under consideration are:

- a) Complete all AMHS interconnections by December 2015;
- b) Complete the drafting of MoUs for the interconnection of AMHS systems by mid 2013; and

- c) Complete the migration to AMHS interconnections using the IP protocol by December 2015.

2.2 The meeting also addressed the *Operational integration of AMHS connections*. The meeting took note that the AMHS interconnection between Ecuador and Peru had been implemented in July 2012, the first interconnection between two AMHS systems from different manufacturers. Peru is the State in the Region with the largest number of implemented AMHS interconnections, and this provided the experience required to complete other interconnections. In this regard, the meeting felt that Peru could provide technical advice (consultancy) to those States that might require it.

2.3 In order to support the States of the Region in the implementation of AMHS interconnections, the following events were carried out in 2012 through technical cooperation projects RLA/06/901 and RLA/03/901: the *Course on the ATS (COM-AMHS) message handling system and interconnection aspects* (Lima, Peru, July 2012) was conducted by the Instilux-Eurocontrol institute, with an expert with broad experience in AMHS systems and communication networks; and the *ICAO Seminar/workshop on the implementation of ground-ground and ground-air data links in the SAM Region* (Lima, Peru, September 2012).

2.4 The current situation of the AMHS Interconnection Action Plan in the SAM Region:

2.4.1 The signing of *Memoranda of Understanding* (MoU) for the interconnection of AMHS systems between States that already have such systems in place is still pending:

- a) Chile-Peru
- b) Colombia-Panama
- c) Colombia-Venezuela
- d) Brazil-Suriname
- e) Guyana-Venezuela
- f) Suriname-Venezuela
- g) Brazil-Guyana
- h) Brazil-Venezuela
- i) Bolivia-Peru
- j) Bolivia-Brazil
- k) Bolivia-Argentina
- l) Ecuador-Colombia
- m) Ecuador-Venezuela
- n) Bolivia Paraguay

It should be noted that, to date, Uruguay has not yet implemented its AMHS system.

2.4.2 The following MTAs are undergoing operational implementation of the interconnection:

- a) Argentina-Brazil
- b) Argentina-Chile
- c) Argentina-Peru
- d) Brazil-Paraguay
- e) Brazil-Peru
- f) Brazil-Colombia
- g) Peru-Venezuela

2.4.3 To date, the following operational interconnections between MTAs have been implemented using the P1 protocol:

- a) Argentina-Paraguay, in March 2012
- b) Colombia-Peru, in November 2010
- c) Guyana-Suriname, in July 2011
- d) Ecuador-Peru, in July 2012

It should be noted that only AMHS system interconnections between States that have implemented and signed the MoU have been included.

2.4.4 Three (3) interconnections between AMHS systems of the same manufacturer--Argentina-Paraguay (Radiocom), Colombia-Peru (Comsoft), Guyana-Suriname (Skycom)—and one (1) interconnection between systems of different manufacturers--Ecuador (Thales)-Peru (Comsoft)—have been completed, based on document “Guide for the Operational Interconnection of AMHS Systems in the SAM Region”.

2.4.5 In this regard, according to RFC standard 1006: "ISO transport service in the upper part of the TCP", the OSI/TCP adaptation in the transport layer must be done using the TP0 protocol. It was concluded:

MTAs (AMHS systems) in the SAM Region must support and be compatible with the TP0 protocol and operate using TCP / IP as transport layer, with TPDU sizes during the connection request (CR): 2048, 1024, 512, 256, 128 bytes. It should be noted that, according to Chapter 13.3.4 of ISO 8073/ITU X.224, TPDU mesh sizes of 8192 and 4096 are not permitted for the TP0 protocol but they are permitted for the TP4/CLNP protocol, which is typically used in the ASIAPAC Region.

2.4.6 Together with its counterparts of Colombia and Ecuador, Peru has used the 2048-byte TP0 protocol to operationally interconnect AMHS systems. Similarly, with the Administrations of Argentina, Brazil and Venezuela (whose AMHS systems use the TP4 protocol), progress has been made with the interconnection; however, to date, it has not been possible to achieve the operational interconnection between our AMHS systems due to the incompatibility of TP0 and TP4 protocols (transport layer). In this order of ideas, it may be further concluded that:

- a) For purposes of interconnection, the OSI or TCP/IP model may be used, but NOT both;
- b) Based this assumption, AMHS systems should be able to operate in a mixed environment, that is, some links (P1 LA) using TCP/IP and other links (P1 LA) using the OSI model. The Peruvian system can operate in a mixed environment to be configured as TP0 or TP4;
- c) ICAO recommends TCP/IP as the transport layer for the SAM Region rather than the TP4/CLNP protocol, which uses NSAP addresses instead of IP addresses as indicated in the AMHS Guide;
- d) When TP4 is used, CLNP must be used as the protocol in layer 3. In this case, AMHS systems require a link that supports OSI protocols, and an ATN router that permits TP4-TP0 conversion would be needed to interconnect two networks. This should be possible through the REDDIG; and

- e) It is suggested that, if possible, a working group be established in coordination with the manufacturers for the implementation of the interconnections still pending and to meet the goals of Project D2.

2.4.7 CAR and SAM has a common strategy for ATN/AMHS implementation and the ATN TF is a common group for both regions. Other data is that the AMHS circuits are being carried out through the MEVA Network.

2.4.8 Regarding AMHS implementation in CAR/NAM regions, it is being carried out through AMHS implementation follow-up workshop/meeting in conjunction with the United States (FAA). The webpage of ICAO Mexico Office:

<http://www.mexico.icao.int/CNS.html#Communications> provides the latest information on AMHS planning and implementation:

AMHS		
CAR-AMHS ImplementationPlan	English	
CAR Regions AMHS Implementation Matrix	English	
AMHS Interoperability Test Plan v1.0	English	
AMHS Implementation Workshop Web Page	Web Link	
List of participants Web	English	
Draft Technical Letter of Agreement for AMHS	English	
1st Teleconf Meeting for AMHS Implementation	English	
FAA Transition Process	English	
ATS Messaging Management Centre (AMC) Users Training Including AMC Phase 2 functions	English	

ICAO MID Region

2.5 The Fourth Meeting of Aeronautical Telecommunication Network/Internet Protocol Suite Working Group (ATN/IPS WG/4) of ICAO MID Region was convened in the ICAO MID Regional Office, Cairo, Egypt from 21 to 23 May, 2012. The main outcome was as follows:

- i) PAN European Network Service (PENS) implemented in Europe allows ANSPs two different IP interconnection possibilities. In case where ANSPs have their own IP networks, they can connect their national IP network to PENS. In other case, where the ANSPs do not have their own IP Network, PENS can install an access point consisting of PENS router, at each location where an IP connection needs to be implemented;

- ii) ICAO MID Region recognized increasing important role of public internet and identified the need for a study to support SWIM including the possibility of using public internet and/or using common service provider; and
- iii) ICAO MID Region also recognized that SWIM is listed in Block 1 in ASBU but has close relation with module B0-FICE which is due from 2013. It was considered appropriate for the States to develop a regional approach in planning for the implementation of SWIM. MID Region is of the opinion that initial activity should be performed to incorporate SWIM into the ATN/AMHS infrastructure.

ICAO EUR Region

2.6 The outcome of the Seventeenth Meeting of the EANPG Aeronautical Fixed Service Group (AFSG) held in April 2013 related to AMHS are as follows:

- The EANPG had endorsed the AFSG proposed amendments to the EUR AMHS Manual (Doc 020), EUR ATS Messaging Management Manual (Doc 021), EUR AFS Security Guidelines (Doc 022R) and the EUR NSAP Address Registry which had become EUR Doc 028;
- The EUR AMHS COM Centre Training guidelines were approved as EUR Doc 026 and the provisional edition of the IP Infrastructure Test Guidelines for EUR AMHS was approved as EUR Doc 027;
- New versions of Supplement Tables AFS-1, 2 and 3 of the EUR ANP FASID including information on IPv6 implementation planning were published on the ICAO website;
- Noted the outcomes of the 12th Air Navigation Conference particularly the elements of the Aviation System Block Upgrade (ASBU) approach and Communication Roadmap including SWIM, IPv4 to IPv6 migration, AMHS plans and AFS security considerations. The Group also noted that the ASBU developments would require a closer coordination of the MET, AIM, ATM, and COM communities at the global as well as the regional level;
- Furthermore, the Group noted that the term “cyber security” encompasses the protection of electronic systems from malicious electronic attack and the means of dealing with the consequences of such attacks. Although, numerous industry groups are making standards in their own areas of expertise, it was noted that there was no overall oversight thus resulting in potential for gaps, overlaps and inconsistencies and no global framework that addresses cyber security issues with a clear view of air traffic management (ATM) efficiency and based as far as possible on existing ICAO structures and bodies but with proper involvement of the necessary cyber security expertise. Consequently, the Conference called upon ICAO, while continuing its work on air traffic management (ATM) security, to establish a mechanism for addressing cyber security issues. In this connection, the Group noted that the *ICAO Air Traffic Management Security Manual* (Doc 9985), was published; and

- AN Conf/12 **Recommendation 2/3** (Security of air navigation systems) called upon ICAO to seek the support of States and stakeholders to complete its work in developing a robust, secure aeronautical telecommunication network and establish, as a matter of urgency, an appropriate mechanism including States and industry to evaluate the extent of the cyber security issues and develop a global air traffic management architecture taking care of cyber security issues.
- **Recommendation 3/3** (Development of ICAO provisions relating to system-wide information management) invited that detailed technical specifications for system-wide information management be developed by the aviation community in close collaboration with ICAO, detailed technical specifications for system-wide information management be open and rely on generic international standards to the extent possible; and ICAO undertake work to identify the security standards and bandwidth requirements for system-wide information management.

XML/WXXM issues

- The Group noted that Amendment 76 to Annex 3 applicable November 2013 enabled the exchange, under bilateral agreements between States in a position to do so, of METAR and SPECI, TAF and SIGMET in digital form. These MET elements in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible markup language (XML)/geography markup language (GML). These MET elements in digital form shall be accompanied by the appropriate metadata. Guidance on the information exchange model, XML/GML and the metadata profile is provided in the Manual on Digital Exchange of Aeronautical Meteorological Information which is being developed. It was expected that the use of digital exchange of Aeronautical Meteorological Information will be mandatory by 2019;
- this amendment was the first step of the full migration which will occur in subsequent amendments to Annex 3 as new requirements are developed and is fully in line with the planned migration of aeronautical information management (AIM) as will be reflected in Annex 15 – Aeronautical Information Services;
- a coordination meeting of the RODBs was held at Eurocontrol from 4 to 5 March 2013. The meeting developed several actions which included the development of the Concept of Operations for ICAO Meteorological Exchange Model (IWXXM). The Concept of Operations would be developed by the EUR Data Management Group (DMG) in coordination with Eurocontrol, World Meteorological Organization (Ad Hoc Task Team on Aviation XML (TT-AvXML)) and reviewed by the Meteorological Aeronautical Requirements and Information Exchange Project Team (MARIE-PT);
- a list of topics considered by the coordination meeting which the concept of operations should address. The list also included items which were of interest to the AFSG, e.g. transmission of AvXML and WXXM by AMHS, inter-regional exchange, concerns regarding the significant increases in data volume due to the extended scope and relative verbosity of observations in IWXXM; and

- traditional AFTN would not be able to support the digital exchange of OPMET data and that AMHS would be required for this purpose. To this end appropriate UAs could be used in the MET systems concerned. The group confirmed that a close co-operation between the DMG and the AFSG working groups would be required so that from the Concept of Operations, which is currently being developed, end-to-end communication requirements (data formats, traffic flows and volumes, etc) may be derived. Then, through the use of appropriate AMHS protocol capabilities, AMHS switch performance and network bandwidth, smooth implementation could be supported.

WG-I and WG-M work

- The Group was provided with the reports of the recent ACP WG-M and WG-I meetings. The Group recalled that there was also a proposal for an Annex 10 amendment related to the 69 characters per line limitation of AFTN. This proposal originated from the AFSG was later agreed to by the WG-M. Information on the progress of this proposal for Amendment of Annex 10, Volume 2 is expected.

Amendment to Annex 10

- The Group noted the adoption of Amendment 88 to Annex 10, through which, among other things, the use of ATN/IPS is encouraged while ATN/OSI remains a supported standard.

Developments in other ICAO Regions

- The Group was presented with the report of the APAC ATNICG/8 meeting. The Group thanked for this information and emphasised the importance of the continuous exchange of this type of information between the various ICAO Regions.

Operational Network matters (*Operations Group (OG) report*)

- the OG concluded that the H24 AMC system availability would be required due to the operational use of the AMC data by the operational COM Centre staff and the use of the AMHS Address Management function worldwide. For the EDS system, H24 availability is required generally due to the online character of the directory service. It was agreed that Eurocontrol would conduct a cost/benefit analysis for availability of the AMC operator service on H24; and
- in accordance with the Global AMHS Coordination procedure the export files for the AMHS MD Register, the CAAS tables and the User Address Look-up Tables were distributed regularly to ICAO HQ. Unfortunately, no acknowledgement or feedback has ever been received. However, it was understood that these AMC AMHS Address Management Tables were used operationally in the AMHS COM Centres of all ICAO Regions. Therefore the Group agreed to the following:

Conclusion AFSG17/01 - Maintenance of the preliminary global AMHS Registry

That ICAO is urged to ensure that the preliminary global AMHS Registry on the ICAO ACP website is maintained in accordance with the globally agreed procedure as circulated by ICAO.

COM Centre contingency procedures

- The Group noted the contingency arrangements made between Belgium and the Netherlands and agreed that the OG would coordinate the development of contingency procedures in coordination with the COM centres. The Group encourages the development of COM Centre contingency plans and emphasized that in case such plans involve or seriously affect external partners they should be coordinated accordingly.

Use of UAs in States without MTA

- The Group noted the intention of some States in APAC to implement a single User Agent (UA) served by an MTA of a PRMD different to the PRMD of the UA. This was not in line with Doc 9880. It was agreed that the issue would be investigated in APAC and CAR/SAM, actions would be undertaken to clarify the issue.

AMC report

- The Group noted the activities undertaken by the AMC throughout the previous year and recognized the excellent and flexible cooperation from CCC Operators and external COM Operators working actively in AMC Operations. This was demonstrated in the high proportion of ACKs received at around 60% each cycle. The Group recognized the work performed by the AMC to manage the extraordinary situations that have been reported within and outside the Region.

Incorrect originator addresses

- The Group was provided with the findings of the OG concerning task 25 “Collect and analyse reports related to incorrect originator addresses and propose potential solutions.” and the proposed measures. The data collected could be grouped into following types of failures:
 - a) The location indicator of the originator address is not present in the Doc 7910;
 - b) The three-letter designator of the originator address is not present in the Doc 8585;
 - c) Both, the location indicator and the three-letter designator of the originator address are not present in the respective ICAO Docs;
 - d) The input direction of messages does not correspond with originator addresses (unexpected input direction);

- e) Messages were detected with non-compliant characters (according to Annex 10, Volume II); and
- f) The habit of using the same address in both Destination and Origin line (self-addressing) of a message was identified.

Planning Group Report

- the current AMC arrangement with Eurocontrol expires in 2014. The Group highlighted that that AMC is of utmost importance for the migration from AFTN/CIDIN to AMHS. In view of the intense AMHS deployment activities worldwide, which require AMC operation and support, the Group urged to ensure an appropriate extension of the AMC service availability. Furthermore, the formal approval for the AMC service provision after 2014 should be pursued in a timely manner.

On-going AMHS implementation activities

- The Group noted the summary of the AMHS implementation planning in the ICAO EUR Region and a good progress in the direction of AMHS implementation and invited States to continue providing information on their implementation status and lessons learned;
- In summary, the following overview of the status of implementation can be derived:
 - a) 5 States have implanted AMHS interstate connections
 - b) 1 State has implanted AMHS nationally
 - c) 3 States are in the process of testing
 - d) 13 States are now ready to start testing
 - e) 12 States are either acquiring a compliant system or have not declared a change.
- The Group noted that around 19 States have an intention to deploy User Agents which re-enforces how important the EDS project will be for the Region. It was also noted that a number of States were intending to make use of the PENS test VPN and ANSP VPN for the implementation of AMHS;
- It was highlighted at the meeting that impending extensive AMHS deployment will result in major changes for all COM Centers in Europe with or without AMHS capabilities. In 2014 it is anticipated that more than 50% of the AFS messaging exchange links in Europe will be AMHS links;
- The Group noted that Canada has started the discussions with the FAA for AMHS Interoperability testing. These tests will be coordinated in 2013. Implementation of an operational AMHS link with the FAA will be delayed, waiting for the Salt Lake City AMHS to be upgraded. Canada has started the discussions with UK NATS for AMHS Interoperability testing, but no plan has

been developed yet. It should be noted that the 2 states need to implement new Telecommunication Infrastructures that can support AMHS IP requirements. Plans for this upgrade will be completed in 2013. Finally, Canada will be looking at its other international circuits, and start planning for the upgrade of the 2 CIDIN circuits to Iceland and Greenland; and

- The Group was informed about the development of the communication infrastructure within Germany which is influenced by the decommissioning of the X.25 services by the end of 2014. Consequently, the CIDIN connections of the Frankfurt COM Centre have to migrate to AMHS, impacting the whole messaging network in Europe.

AFTN/CIDIN/AMHS to PENS.

- The COM Centre Switzerland was in contact with Belgium, France and Italy for AMHS Interoperability Tests. The Group noted the extensive ongoing AMHS activities and invited States to provide feedback on the progress of testing, difficulties encountered and their proposed solutions. Reported experiences result in the refinement of testing and operational procedures.

AMHS / SITA Type X Interconnection Architecture

- The Group was presented with the AMHS / SITA Type X Interconnection Architecture document that stem from the study of operational issues and potential solutions for the operation of a SITA Type-X gateway in a mixed AFTN/AMHS environment;
- In discussing this subject, the Group noted that it was recommended that SITA changes to the XF schema, as the CAAS addressing scheme more prone to potential error either in routing or in the User address lookup table, simply because CAAS addresses have an extra field. The XF schema supports the routing to be done at PRMD level and makes the address entry easy to create;
- The Group noted that the document was intended for the EUR but also might be used as the basis for a global SITA/AFS interconnection approach, if considered acceptable by other Regions. The Group agreed that the document should be used as a basis for discussion with other Regions to derive respective solutions. SITA will undertake coordination with other Regions as needed and the Secretary will assist in the establishment of the appropriate contact. In conclusion, the Group adopted the proposed approach and agreed to the following:

Decision AFSG17/04 - AMHS / SITA Type X Interconnection Architecture

- a) That, the AMC undertake appropriate actions for publication of the AMHS / SITA Type X Interconnection Architecture document, version 1.0, (Appendix E refers);
- b) That the OG is tasked with further refinement and maintenance of the AMHS / SITA Type X Interconnection Architecture document; and
- c) That the ICAO EUR/NAT undertake appropriate actions for distribution of the approved document to other ICAO Regions.

- the United Kingdom informed that due to the amount of message traffic they did not consider it appropriate to ‘gateway’ traffic to another State which has a direct connection with the Type X gateway and they would like to have a direct AMHS/SITA Type X connection.

System Wide Information Management (SWIM) Operational Concept

- The Group was presented with a working paper conveying the implementation issues of the proposal to phase in System Wide Information System (SWIM) and subsequently phase out Air Traffic Service Message Handling System (AMHS) and Air Traffic Service Inter-Facility Data Communication (AIDC). The proposal was specified in the twelfth Air Navigation Conference AN-WP/8643. The recommendation from the United States and Asia/Pacific Region was that a global SWIM Operational Concept should be developed, IPv6 network configuration and related documentation be finalized and cost-benefit analysis for the implementation of an IPv6 network and SWIM at the Regional level be conducted;
- The Group noted that the FAA presented this information at the ACP WG I/16 held in Montreal 28-30 January 2013 to convey APAC views in support of SWIM environment. It was supported by ACP WG I/16 and ANC-12 set the priority of a global SWIM Operational Concept development as one of their top five actions to be presented at the ICAO Assembly to be held in September 2013;
- The Group noted that SWIM is considered an environment that has an environment that has to be incorporated into existing AFS infrastructure before its functions can be optimized. This means the SWIM functions and associated services or messages have to be identified for integration and upgrade. The first step is to develop the global SWIM Operational Concept, then identify associated message/service for integration/upgrade. After the global SWIM Operational Concept becomes available, then regional planning activities could be initiated;
- The Group noted and confirmed that AMHS will continue to be relied on to ensure global conveyance of aeronautical messages for the foreseeable future;
- Any ICAO Region that does not have a common IP network, such as the APAC Region, would be required to plan and implement a common dynamic IP network to support the future SWIM environment. They will also need to enhance AFS messaging with facilities such as Regional Directory Service and Extended AMHS service as specified in ICAO Docs. 9880/9896; and
- The Group supported the proposal for the development of a global SWIM Operational Concept and highlighted the need for further ICAO standardization before Regional implementation planning could be initiated.

ICAO Western and Central AFRICA Region

- The Second Meeting of the AFI Message Handling System Implementation Task Force (AMHS/I/TF/2) held in Dakar from 28 to 31 May 2013 agreed to develop a draft ATN/AMHS implementation strategy and the required documents including: AFI ATN/AMHS Implementation Plan Document, AFI ATN Routing Structure, ATSAMHS Naming Plan, AFI AMHS Test Procedure Manual AMHS Addressing Directory and other additional aiming to facilitating the implementation of AMHS. The meeting also encouraged States to adopt a cooperative approach, through the development and conclusion of Memorandums of Understanding (MoUs) when implementing AMHS to ensure harmonized implementation and system interoperability.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) The meeting is invited to note information provided in the paper; and
- b) The meeting is also invited to discuss relevant issues of implementation of ATN/AMHS for harmonized interoperability.
