



**Agenda Item 6: Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations**

**FOLLOW-UP TO AMHS INTERCONNECTION IN THE SAM REGION**

(Presented by the Secretariat)

SUMMARY	
This working paper presents a follow-up to regional activities pertaining to AMHS interconnection, since SAM/IG/8 meeting.	
REFERENCE:	
• Report of SAM/IG/8 meeting (Lima, Perú, 10-14 October 2011)	
<b>ICAO strategic objectives:</b>	<i>A – Safety C – Environmental Protection and Sustainable Development of Air Transport</i>

**1. Background**

1.1 With AMHS implementation completed by Bolivia and Ecuador at the end of 2011, all SAM States, minus French Guiana (France) and Uruguay, have AMHS installed.

1.2 Panamá has purchased a new AMHS from Thales, which will substitute the current basic AMHS. The operation of the new system is scheduled for the end of the first quarter of 2012. Uruguay has drafted, with the support of the ICAO Technical Cooperation, a technical specifications document for the purchasing, installation and operation of an AMHS, and the bidding process is expected to start this year. **Appendix A** to this working paper shows the current AMHS installed in the SAM Region. .

**2. Analysis**

2.1 Works for the interconnection of the two first AMHS installed in the SAM Region were completed in March 2012: The Ezeiza MTA installed in 2005, and the Asuncion MTA installed in 2007. In this manner, there are now the MTA interconnections in the SAM Region using P1 Protocol (Argentina-Paraguay, Colombia-Perú and Guyana-Suriname).

2.2 A inicio del 2012 se firma un nuevo Memorándum de Entendimiento (MoU) para la interconexión de sistemas AMHS en la Región entre Ecuador-Perú. En este MoU se especifica que el periodo de pruebas iniciaría el primer trimestre del 2012 y la operación, para finales de marzo de 2012.

2.3 Since SAM/IG/8 meeting, MoUs for AMHS interconnection between Chile-peru and Peru-Venezuela pend completion. The MoUs have been examined technically and operationally-wise, and signed by one of the parties.

2.4 At the ICAO/FAA Workshop (Miami, Florida, 10-12 April 2011), in follow-up to AMHS implementation in the NAM/CAR Regions, Trinidad & Tobago indicated its interest in conducting AMHS trials with Venezuela. In October 2011, Curacao later also informed its interest in carrying out AMHS tests. In this regard, Venezuela should analyze the possibility of drafting MoUs with Curacao and Trinidad & Tobago. **Appendix B** shows the updated action plan on AMHS interconnection in the SAM Region.

2.5 With the aim of supporting MHS interconnection i the SAM Region and considering that practically all States have implemented the AMHS, but that their interconnection has been carried out only between a reduced number of States, the Sixth Workshop/Meeting of the SAM Implementation Group (SAM/IG/6, Lima, Peru, 18-22 October 2010), being aware of the delay in the implementation of the AMHS, formulated the Conclusion SAM/IG/6-9 - *Actions required for AMHS interconnection*, which included the need to make arrangements to train personnel in the interconnection tasks, with the aim of minimizing the dependency of their providers.

2.6 To that end, it has been considered convenient to arrange the delivery of the course on ATS Message Handling System (COM-AMHS) offered by the Eurocontrol training centre, which content is detailed in **Appendix C** to this working paper. The course could be carried out in Lima, Peru, from 16 to 20 July 2012.

2.7 The objective of the course is to present information on the technical design of an AMHS (data networks, server topology, user configuration, routing tables, monitoring and supervision tools, interconnection with other AMHS, etc.), as well as on operational topics such as the design of a certain routing, the correct routing policies, migration strategies from AFTN to AMHS, with particular attention on contents related with AMHS interconnection and resolution of operational procedures and scaling of incidences.

2.8 The course is aimed at technical and operational personnel in charge of the AMHS installation, operation and maintenance, and will be conducted by a specialist with wide experience in AMHS from the EUROCONTROL CNS/ATM Systems Instilux Training Centre (Luxembourg). The course is conducted 3 to 4 times a year in this centre, with the possibility of developing it at other locations.

2.9 This course will be covered by the RLA/03/901 Project - *REDDIG Management System and Administration of the Satellite Segment*, as part of the training activities planned for the 2012. In this regard, a letter was sent to all RLA/03/901 project members, requesting their approval by 15 May 2012 for the costs to be charged against project RLA/03/901.

### 3. **Analysis**

3.1 The Meeting is invited to:

- a) Note the information presented;
- b) Analyze the progress made in AMHS interconnection, indicated in section 2 and in Appendix B of this working paper;
- c) Examine the contents of the AMHS course programme, shown in Appendix C for approval; and
- d) Analyze any other aspects related with this agenda item that the Meeting might deem necessary.

-----

**APPENDIX A/ APENDICE A**

**STATUS OF IMPLEMENTATION OF AMHS IN THE SAM REGION**  
**ESTADO DE IMPLANTACION DE LOS SISTEMAS AMHS EN LA REGION SAM**

<b>STATE/ ESTADO</b>	<b>MANUFACTURER/ FABRICANTE</b>	<b>YEAR OF INSTALLATION/ AÑO DE INSTALACION</b>	<b>REMARKS/ OBSERVACIONES</b>
ARGENTINA	RADIOCOM	Dec 2005	Three MTAs installed: Ezeiza, Cordoba and Comodoro Rivadavia/ Se tienen instalados tres MTA: Ezeiza; Córdoba; y Comodoro Rivadavia  Ezeiza MTA connected with MTA Asuncion using P1 protocol (March 2012) / MTA Ezeiza conectado con Protocolo P1 con el MTA de Asuncion (Marzo 2012)
BOLIVIA	THALES	Dec 2011	Equipment installed at the end of 2011 / Equipos instalados a finales del 2011
BRASIL	RADIOCOM	Jun 2009	Two MTAs installed: Brasilia; and Manaus Se tienen instalados dos MTA: Brasilia; y Manaus
CHILE	THALES	Jun 2010	The AMHS system was completed by the end of 2010 El sistema AMHS se completó a finales del 2010
COLOMBIA	COMSOFT	Dec 2009	AMHS interconnectad with Perú. First AMHS interconnection in the CAR SAM Region Está interconectado con el AMHS con Perú. Primera interconexión AMHS en las Regiones CAR/SAM
ECUADOR	THALES	Feb 2012	A new AMHS from Thales was installed and in operation since February 2012 / Un nuevo sistema AMHS de la marca Thales fue instalado y está en operación desde febrero de 2012
GUYANA	SKYCOM	2011	Operational since May 2011. AMHS interconnected with Surinam, with P1 Protocol / En operación desde finales de mayo 2011. Está interconectado en AMHS con Surinam con protocolo P1
FRENCH GUIANA (FRANCE)	AFTN SIGMA		Version 17 will be installed in June 2012 / La versión V17 se realizará en junio de 2012
PANAMA	COCESNA  THALES	2009  2012	Panama approved the acquisition of a new AMHS system from THALES, the same it is expected to be in operation at the end of the first quarter 2013 / Panamá aprobó la adquisición de un Nuevo sistema AMHS de la Marca Thales que estará operacionalmente en operación a finales del primer trimestre de 2013
PARAGUAY	RADIOCOM	2007	An update of its AMHS was made in March 2012 / Una actualización del sistema AMHS se realizó en marzo de 2012

STATE/ ESTADO	MANUFACTURER/ FABRICANTE	YEAR OF INSTALLATION/ AÑO DE INSTALACION	REMARKS/ OBSERVACIONES
PERU	COMSOFT	Jun 2009	AMHS interconnected with Colombia since November 2010. First AMHS interconnection in the CAR/SAM Regions / Está interconectado con el AMHS con Colombia desde noviembre de 2010. Primera interconexión AMHS en las Regiones CAR/SAM
SURINAME	SKYCOM	2011	Operational since the start of 2011. Interconnected with Guyana / En operación desde inicios de 2011. Interconnectado con Guyana
URUGUAY	AFTN from Global Weather		Currently in the purchasing process / Se encuentra en el proceso de adquisición
VENEZUELA	RADIOCOM	2010	AMHS installed since the end of 2010 / Sistema AMHS instalado desde finales del 2010

-----

## APPENDIX B

## ACTION PLAN FOR THE INTERCONNECTION OF AMHS SYSTEMS IN THE SAM REGION

ITEM	ACTIVITY	RESPONSIBLE	EXPECTED RESULT	STATUS	FINALIZATION DATE
1	2	3	4	5	6
1	Review of the ATN Regional Plan as regards AMHS implementation	Secretariat	Revised ATN ground applications plan (Table CNS 1Bb)	Completed	Jun 2009
2	Review and assignment of intra-regional routers IP addressing	Secretariat	Assignment of IP addressing	Completed	Jun 2009
3	Review of CAAAS addressing plan	SAM States	Revised CAAS addressing Plan	Completed	Jun 2009
4	Prepare interconnection protocol tests to determine bandwidth required for transmission of AMHS messages between MTAs through REDDIG	RLA/06/901 project CNS Expert	Protocol interconnection tests. A guide for the operational interconnection of AMHS systems was drafted	Completed	Dec 2009
5	Preparation of Guide for the Operational Interconnection of AMHS Systems in the SAM Region	RLA/06/901 project CNS Expert	Guide for the operational interconnection of AMHS systems in the SAM Region	Completed	Oct 2009
6	Drafting of a model MoU for the interconnection of AMHS	Argentina	Model MoU for the interconnection of AMHS	Completed	Oct 2009
7	<p>MoU for the interconnection of AMHS currently implemented in the SAM Region:</p> <ul style="list-style-type: none"> <li>a) Argentina-Brazil</li> <li>b) Argentina-Chile</li> <li>c) Argentina-Peru</li> <li>d) Argentina-Paraguay</li> <li>e) Brazil-Colombia</li> <li>f) Brazil-Paraguay</li> <li>g) Brazil-Peru</li> <li>h) Chile-Peru</li> <li>i) Colombia-Peru</li> <li>j) Colombia-Panama</li> <li>k) Colombia-Venezuela</li> <li>l) Peru-Venezuela</li> <li>m) Brazil-Suriname</li> <li>n) Guyana-Venezuela</li> <li>o) Suriname-Venezuela</li> <li>p) Brazil-Guyana</li> <li>q) Guyana-Suriname</li> <li>r) Brazil-Venezuela</li> <li>s) Bolivia-Peru</li> <li>t) Bolivia-Brazil</li> <li>u) Bolivia-Argentina</li> <li>v) Ecuador-Peru</li> <li>w) Ecuador-Colombia</li> <li>x) Ecuador-Venezuela</li> </ul> <p>The AMHS interconnection MoU in French Guiana (France) and Uruguay should be drafted once AMHS installation is completed at national level.</p>	SAM States involved	MoU for interconnection of AMHS systems between SAM States having AMHS implemented.	Valid a), b) c), d), f), g), i), q) & v) completed	<ul style="list-style-type: none"> <li>h) Oct 2012</li> <li>j) Mar 2013</li> <li>k) Jul 2012</li> <li>l) Jul 2012</li> <li>m) Oct 2012</li> <li>n) Oct 2012</li> <li>o) Oct 2012</li> <li>p) Oct 2012</li> <li>r) Oct 2012</li> <li>s) Oct 2012</li> <li>t) Dec 2012</li> <li>u) Dec 2012</li> <li>w) Mar 2013</li> <li>x) Mar 2013</li> </ul>

ITEM	ACTIVITY	RESPONSIBLE	EXPECTED RESULT	STATUS	FINALIZATION DATE
1	2	3	4	5	6
8	<p>Phase I Interconnection trials between MTAs of:</p> <ul style="list-style-type: none"> <li>a) Argentina-Brazil</li> <li>b) Argentina-Paraguay</li> <li>c) Brazil-Paraguay</li> <li>d) Colombia-Peru</li> <li>e) Argentina-Chile</li> <li>f) Argentina-Peru</li> <li>g) Brazil-Peru</li> <li>h) Guyana-Suriname</li> <li>i) Ecuador-Peru</li> <li>j) Brazil-Colombia</li> </ul> <p>Types of tests to carry out: Network transportation; Network connectivity; Message exchange; Preparatory phase.</p> <p><b>Note:</b> Inclusion has been made of only the AMHS interconnected between States having implemented and signed the MoU.</p>	Argentina, Brazil, Chile, Colombia, Paraguay, Peru and REDDIG Administration	Interconnection trials between Argentina, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru and Suriname MTAs	<p>Valid</p> <ul style="list-style-type: none"> <li>a) message exchange trials were held between Brasilia (Brazil) and CIPE (Argentina) MTAs</li> <li>c) MoU was updated, as entrance node to Brazil will be Curitiba, and the network connectivity, and transport and exchange of messages tests will be carried out.</li> <li>b), d) and h) Operational interconnection trials completed</li> <li>c), e), i), and j) No tests carried out</li> </ul>	<ul style="list-style-type: none"> <li>a) Jun 2011</li> <li>b) Dic 2011</li> <li>c) Dic 2011</li> <li>e) Mar 2012</li> <li>f) Mar 2012</li> <li>g) Mar 2012</li> </ul>
9	<p>Operational interconnection implementation at the following MTAs:</p> <ul style="list-style-type: none"> <li>a) Argentina-Paraguay</li> <li>b) Argentina-Brazil</li> <li>c) Argentina-Chile</li> <li>d) Argentina-Peru</li> <li>e) Brazil-Paraguay</li> <li>f) Brazil-Peru</li> <li>g) Colombia-Peru</li> <li>h) Guyana-Suriname</li> <li>i) Ecuador-Peru</li> <li>j) Brazil-Colombia</li> </ul> <p><b>Note:</b> Inclusion has been made of only the AMHS interconnected between States having implemented and signed the MoU.</p>	Argentina, Brazil, Chile, Colombia, Paraguay and Peru	Operational implementation of AMHS systems	AMHS interconnection completed between following MTA, using P1 protocol and operational: Colombia-Peru Guyana-Suriname Argentina-Paraguay	<ul style="list-style-type: none"> <li>a) Mar 2012</li> <li>b) Jan 2012</li> <li>c) TBD</li> <li>d) Oct 2012</li> <li>e) Oct 2012</li> <li>f) Oct 2012</li> <li>i) Dec 2012</li> <li>j) Mar 2013</li> </ul>

## **APPENDIX C / APÉNDICE C**

### **COURSE ON ATS MESSAGE HANDLING SYSTEM (COM-AMHS) CURSO SOBRE EL SISTEMA DE TRATAMIENTO DE MENSAJES ATS (COM-AMHS)**

#### **MODULE 01: THEORY FOR THE USER**

##### **1. INTRODUCTION**

Module Objectives  
The References for this course

##### **2. DATA COMMUNICATIONS TECHNOLOGY**

Seven Layers  
Role of Communications in an ATM System  
ICAO Data Applications  
ATN Upper/Lower Layer Protocols  
The move to IP  
So, what is ATN?

##### **3. MESSAGING AND E-MAIL**

What is a Message?  
The Postal Analogy  
Point to Point Messaging  
Store and Forward / Retrieve Messaging

##### **4. ATC MESSAGING AND AFTN/CIDIN**

The ATC Requirement for Messaging  
Current Messaging Requirements  
Messaging Application - an ATC Example  
ICAO Protocols and Standards  
Services provided by the AFTN  
AFTN Procedures  
AFTN Addressing  
ICAO Regions  
Message Formats  
AFTN Inter-Centre Communication  
AFTN Limitations  
Why migrate to AMHS  
Benefits of AMHS  
The Way Forward

##### **5. X.400 : DEFINING THE TERMS**

What is MHS?  
Standards Development  
What is a Message Handling System?  
Message Structure  
MHS Information Objects  
MHS Services  
The MHS Architecture  
(A)MHS components: (ATS) Message Server  
(A)MHS components: (ATS) User Agent  
(A)MHS Components: The Message Store

(A)MHS Components: Access Units  
The Journey of a Message  
Management Domains  
ADMDs and PRMDs  
AMHS Management Domains  
'XX' Country Codes  
OR-Address Forms  
The Need for Directory Services  
Directory Overview  
Security Threats  
The MHS Security Functional Groups

**6. X.400 - THE COMMUNICATIONS PROTOCOLS**

Connecting MHS System Components  
MHS Protocols  
Underlying Networks: Physical vs. Logical Connections  
AMHS Network over underlying network  
Levels of connectivity in the AMHS architecture  
Why not SMTP?

**7. X.400 - MTS AND IPMS**

MTS Functional Groups  
Basic MTS Envelope  
Delivery Reports  
Non-Delivery Reports  
The IPMS Elements of Service & IPM Heading  
Receipt, Non-Receipt & Other Notifications

**8. FROM MHS TO AMHS - ICAO ATN SARPS**

AMHS SARPs Development  
Basic and Extended Services  
Selected Functions of the Extended Services  
AMHS components: AFTN/AMHS Gateway  
AMHS Message Formats  
Message and Report Mappings  
Message Field Mappings  
Scenarii for an AFTN SS Message  
AMHS address types  
The A in AMHS

**9. STRATEGY**

PENS: Pan European Network Services over IP  
The PENS - Status  
PENS contract signed  
COM05  
COM05 progress report  
Where are we today with AMHS?  
HARE Programme  
Single European Sky - Messaging  
AMHS in SESAR  
SWIM and SESAR  
Future Communications Infrastructure



**10. AMHS IN THE WORLD**

AMHS in ASIAPAC  
AMHS ASIAPAC Network  
Transition - ASIAPAC  
AMHS in CARSAM

**11. CONCLUSION**

Conclusion  
Programme

**MODULE 02: AMHS SYSTEM DESIGN AND TECHNICAL ISSUES**

**1. INTRODUCTION**

Objectives

**2. DRIVERS FOR AFTN/CIDIN MIGRATION**

Reminder: Why migrate to AMHS

**3. AMHS SYSTEM DESCRIPTION**

AMHS System Description  
General AMHS Overview  
ATSMHS traffic flows  
How does an X.400 system work?  
AMHS information model  
AMHS Objects  
Flow of Information Objects in AMHS  
AMHS activity over underlying networks  
ATM applications over UNDERLYING NETWORKS  
Topology of AMHS servers: centralised vs. distributed  
Network characteristics determined by topology  
European ATS Messaging Profile  
AMHS QoS Requirements

**4. AMHS SYSTEM DESIGN CRITERIA**

Phases for AMHS Deployment  
Transaction Examples  
Technical Criteria  
Modular Solution  
Scalable and Portable Solution

**5. AMHS USER TYPES**

Evolution/Migration of Users  
TYPE of ATM COMs SERVICES  
Objectives for the User Migration Process  
How does a User Agent Work?  
What does the User do?  
... and what tools does the user have?  
UA: Free Text Format Message  
UA: Auto-Formatting AIS Messages  
UA: Auto-Formatting ATS Messages  
UA: Auto-Formatting MET Messages  
UA: Non Delivery Reports (NDR)  
UA: Receipt Notifications (RN)  
UA: Tracking Sent Messages  
UA: Filtering Tool  
UA: Message Backup  
AU: Access Unit  
Logical Connections for the ICARO/AMHS Solution  
Access Unit: EAD Solution  
EURONOTAM (I): COMMUNICATIONS FLOW  
EURONOTAM (II): PHYSICAL TOPOLOGY  
Exercises

**6. AMHS SYSTEM MANAGEMENT TOOLS**

Support Levels  
Main AMHS Management Tools  
High Level Administration Tool (HILA) (1)  
HILA (2): Users and Adjacent MTAs  
HILA (3): Local Users Administration  
HILA (4): Adjacent MTAs Admin  
HILA (5): Routing Table Administration  
Local and Central Supervision  
SNMP Alarms Supervision  
End-to-End View Based on SNMP  
Tracking Tool (1)  
Tracking Tool (2): Web-based Administration Tool  
Tracking Tool (3): Search Criteria  
Tracking Tool (4): Results  
Messaging Activity Monitor (1)  
Messaging Activity Monitor (2): Users' View  
Messaging Activity Monitor (3): Adjacent MTA's View  
Messaging Activity Monitor (4): Alarms View  
Messaging Activity Monitor (5): Global View  
UA Archive: Control Position  
AMHS Queue Monitoring  
Historical Data Storage Manager  
Statistics  
Time Synchronisation: Network Time Protocol NTP  
Remote Monitoring

## **7. AMHS COMMON FACILITIES**

Common Facilities  
Pan-European IP Network: PENS  
Example: Madrid-Frankfurt IP Connection  
PENS current situation  
MAIN OBJECTIVES AND BENEFITS OF PENS  
POTENTIAL PENS USERS  
CONSIDERATIONS About SWIM, AMHS and PENS  
Transition Plan IPv4/IPv6  
Protocol Stacks for Transition-Phase AMHS Applications  
CIDIN Management Center (CMC)  
EUR/NAT COM Chart  
ATS Messaging Management Centre (AMC)  
Directory Services  
Name Resolution  
Address Conversion  
UA: Directory Query  
Inter-Regional Gateways  
An MTA with Dual Stacks  
SITA TYPE B / AMHS Gateway (1) : Initial Situation  
SITA TYPE B / AMHS Gateway (2): Message Migration  
AMHS Security  
Testing and Training Facilities  
Examples of Testing Tools  
Human resources analysis for IP/AMHS interoperability activities  
Platform Standardization Test

## **MODULE 03: AMHS OPERATIONAL ISSUES**

### **1. AMHS OPERATIONAL ISSUES**

Main AMHS Operational Issues  
AMHS Addressing: CAAS  
AMHS Addressing: XF  
AMHS Addressing: CAAS and XF  
AMHS Addressing: CAAS vs. XF  
How to define a national CAAS scheme  
AMHS Addressing Registry  
XF Address Conversion: Use of the ICAO registry  
CAAS Addr. Conversion: Use of the ICAO registry  
Global AMHS Address Registration  
International Topology and Routing Strategy  
Conversion between an AMHS IPM and an AFTN message  
Mapping priorities  
Conversion of AFTN Service Messages  
Acknowledgement of SS-priority messages  
Reception of an AMHS message with ATS-Message-header SS and RN not requested  
Reception of an AMHS message with ATS-Message-header no SS and RN requested  
Reception of RN with subject message not generated by the AFTN/AMHS GW  
AMHS to AFTN Direction (reception of a Non-Receipt-Notification)  
Message rejection due to the use of an unknown addressee indicator or recipient  
Rejection of an AFTN-to-AMHS message: Transfer of NDR to the control position  
Reception of NDR with subject message not generated by the AFTN/AMHS GW  
AFTN to AMHS direction: Unsuccessful conversion of addressee indicator in incomi

AFTN to AMHS Direction (unsuccessful conversion of origin OGN indicator)  
AMHS to AFTN Direction (unsuccessful conversion)  
AMHS to AFTN Direction (non-delivery and out-of-line situations)  
Legal AMHS Recording  
Legacy Procedures  
Management of MTA names and passwords  
Replacing CIDIN operator messages with AFTN service messages  
Associations between MTAs: Dialogue mode  
Simultaneous P1 associations  
Application and network timers optimization  
AMHS operational issues

## **2. OPERATIONAL AFTN MIGRATION TO AMHS**

AFTN to AMHS Migration  
Decisions during AMHS Planning  
Pre-requisite tasks  
Tasks to be performed with every AMHS COM centre  
Testing phases  
Preoperational scenario  
Details of the preoperational phase  
AFTN Flows migration to AMHS: Objectives  
AFTN Flows migration to AMHS: Initial situation  
AFTN Flows migration to AMHS: Step 1  
AFTN Flows migration to AMHS: Step 2  
AFTN Flows migration to AMHS: Step 3  
AFTN Flows migration to AMHS: Step 4a  
AFTN Flows migration to AMHS: Step 4b  
Operational AFTN migration to AMHS  
Interconnection considerations

## **3. THE FIRST PROJECT ACTIVITIES**

Current Status  
FIRST  
Outcomes of the FIRST Team  
First Operational IP Link: MADRID-FRANKFURT  
FIRST Team: Testing Structure  
FIRST Team: Testing Development

## **4. CONCLUSION , DOCUMENTATION AND GLOSSARY**

ICAO documentation  
AMHS SARPs sub-volume 3  
Need for Amendment to SARPs (PDRs)  
Glossary  
Conclusion