Agenda Item 4: **Assessment of operational requirements to determine the implementation of improvements in communications, navigation and surveillance (CNS) capabilities for operations in route and terminal area**

FOLLOW-UP OF THE IMPLEMENTATION OF TE AMHS INTERCONNECTION

(Presented by the Secretariat)

SUMMARY

This working paper presents information on the activities carried out since the SAM/IG/17 meeting for the implementation of AMHS interconnections in the SAM Region.

REFERENCES:

- Report of the SAM COM/MET/2012 Implementation Meeting (Lima, Peru, 1-3 August 2012).
- Report of the SAM OPMET Exchange Meeting - OPMET 2014 (Lima, Peru, 27-29 October 2014).
- Report of the Third Meeting of the Programmes and Projects Review Committee - PPRC/3 (Lima, Peru, 21-23 July 2015).
- Report of the Seventeenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/17) - Regional Project RLA/06/901 (Lima, Peru, 9-13 May 2016).
- Fourth Meeting of the Programmes and Projects Review Committee - PPRC/4 (Lima, Peru, 12-14 July 2016)
- Final report of the Sixteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/16) - Regional Project RLA/06/901 (Lima, Peru, 19-23 October 2016).
- AMHS interconnection follow-up teleconferences (1 June, AMHS interconnection Brasilia–Ezeiza; 20 July, interconnection Brasilia-Asunción; 8 September, AMHS interconnection SAM-AFI; 22 September, AMHS interconnection Brazil-United States; and 28 September, AMHS interconnection Brazil-Colombia).

ICAO strategic objectives:	*A – Safety* *B – Air navigation capacity and efficiency*

1. Introduction

1.1 The migration from AFTN to AMHS in the SAM Region started in 2005, with the first AMHS implementation in Argentina. At present, all SAM States have an AMHS system installed, except for French Guiana, which continues using AFTN.

1.2 With the installation of AMHS, most SAM States have modernised their communication media through the implementation of IP communication networks, thus initiating ATN (aeronautical telecommunication network) implementation, which will also serve for transmitting other ATN air-ground applications (AIDC, ATIS D, ADS, CPDLC, etc.).

1.3 For the implementation of AMHS in the SAM Region, consideration was given to CAAS addressing and an IPv4 addressing plan, which may be found in the ICAO SAM website http://www2010icaoint/SAM/Pages/ES/eDocumentsDisplay_ESaspx?area=CNS.

1.4 Intra- and inter-regional interconnection of AMHS systems is aimed at replacing the existing AFTN circuits with new circuits that will permit the transmission of a larger amount of information (ATS data) at a higher speed, using the regional REDDIG II digital network. The ultimate goal is full migration of all AFTN circuits to the AMHS link.

1.5 The interconnection of AMHS systems is one of the regional air navigation priorities of the Declaration of Bogota. It is foreseen that, by the end of 2016, 100% implementation of the 26 AMHS interconnections required for the SAM Region will be achieved. In order to support the implementation of AMHS interconnection in the SAM Region, guidance documents have been developed, such as the *Guide on the operational interconnection of AMHS systems*, a model Memorandum of Understanding (MoU) for the implementation of the AMHS interconnection, which may be found on the website mentioned in paragraph 13 of this working paper. Furthermore, two AMHS courses have been conducted, and meetings of the CNS group have been held within the context of the SAM implementation (SAM/IG) meetings, as well as many teleconferences. For the purpose of coordinating the implementation of AMHS interconnections, the States have designated focal points, an updated list of whom appears in **Appendix A** to this working paper.

2 Discussion

AMHS interconnection

2.1 Since the SAM/IG/17 meeting, the only AMHS interconnection that has been implemented is the one between Argentina and Venezuela, which is operational since June 2016. This AMHS interconnection is in addition to the 6 AMHS interconnections already operational in the SAM Region (Peru-Colombia, Peru-Ecuador, Guyana-Suriname, Argentina-Paraguay, Brazil-Peru, and Argentina-Venezuela).

2.2 The situation of the remaining intra-regional AMHS interconnections is as follows: full P1 connections and positive AMHS operational trials were conducted between Argentina-Brazil, Argentina-Peru, Argentina-Uruguay, and Peru-Venezuela. At the inter-regional level, full P1 connection and positive operational trials were conducted between Brazil and Spain.

2.3 Coordination was initiated for the conduction of connectivity trials between Brazil and Paraguay (28 July 2016), Brazil-Colombia (28 September 2016), Brazil-United States (12 September), and between the SAM and AFI Regions (Recife-Dakar and Ezeiza–Johannesburg) (8 September 2016).

2.4 **Appendix B** to this working paper contains a table that shows the status of implementation of all AMHS interconnections to date.

2.5 In accordance with the Declaration of Bogota, the goal is to achieve 26 AMHS interconnections by the end of 2016. To date, 11 AMHS interconnections have been implemented, 6 of which are in the operational phase and the remaining ones are awaiting completion of operational trials. It is expected that the States will report to the Meeting on the progress made and their plans for completing the interconnections.

2.6 The SAM/IG/17 meeting recalled that the PPRC/3 meeting had noted that the AMHS application was not being fully used, and that it was operating like the AFTN, only with alphanumeric characters, without attachments, which could contain information such as tables and graphs.

2.7 In this sense, the SAM/IG/17 meeting recalled that the PPRC/3 had established a working group to start developing and implementing a strategy for effective use of AMHS, made up by Brazil, United States, Dominican Republic, and D programme coordinators of the CAR/SAM Regions. The working group considered that OPMET exchange in XML/GML digital format (recommended by Amendment 77 to Annex 3 – *International air navigation meteorological service for OPMET exchange: Convert the exchange of XML products into a recommended practice - November 2016*), would represent an effective use of AMHS, in view of the fact that the AFTN network did not meet the minimum requirements for the transmission of messages in XML format (limited to 2500 characters per message), and could result in message errors. Therefore, the effective implementation of XML/GML *should expedite the implementation of AMHS interconnections.*

2.8 Initial trials for the transmission of OPMET messages in XML format as an attachment to AMHS messages were conducted in 2013 between Peru-Ecuador and Argentina-Paraguay. These trials were conducted pursuant to Conclusion COM/MET/12/03 *Trials of OPMET exchange in digital format* (*XML/GML*) formulated by the COM MET/12 meeting. The results of these trials were not satisfactory, since it was possible to transmit the OPMET message in XML format but it was not possible to open the attachment. These results were presented at the OPMET 2014 meeting, which urged States to continue with the trials. It also considered that, in support to these trials, an ICAO workshop should be conducted on the XML/GML format, which took place in Lima, Peru, on 18 September-2 October 2015.

2.9 In early October 2016, Brazil conducted a trial with Peru through the Brasilia-Lima AMHS circuit, routing AMHS messages with the attached XML file (unzipped), AMHS messages with the attached file (compressed using GZIP), and AMHS messages with the attached file (compressed using EXI). The messages were received by Peru, but could not be opened and were retransmitted back. In order to conduct the trials, use was made of the ICAO document shown in **Appendix C** to this working paper. The OPMET message (METAR) in XML format is shown in **Appendix D**.

2.10 Brazil and Peru will continue testing the transmission of OPMET messages in XML format through the AMHS circuit between Brasilia and Lima, and present the final results of the remaining trials to this SAM/IG/18 meeting.

3 Suggested action

3.1 The Meeting is invited to:

a) Take note of the information presented herein; and

b) review and comment on the activities for the implementation of the AMHS interconnection, shown in section 2 of this working paper and its respective appendices, and report on the progress made and the plans to complete AMHS interconnections.

- END -

APÉNDICE A / APPENDIX A

NATIONAL FOCAL POINTS/PUNTOS FOCALES NACIONALES
IMPLEMENTATION OF INTERCONNECTION OF AMHS SYSTEM /IMPLANTACIÓN INTERCONEXIÓN DE SISTEMAS AMHS

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
ARGENTINA	DGCTA/ANAC	Javier Vittor	Especialista CNS	(54 11) 4480-2362 (54 911) 6894-0692	javiervittor@gmail.com
		Moira Callegari	Jefe departamento CNS (ANAC)	(54 11) 594-13097	mcallegare@anac.gob.ar
BOLIVIA	AASANA	Remigio Blanco	Responsable de Telecomunicaciones AASANA	(591 2) 237-0340	rblanco@aasana.bo
BRAZIL/ BRASIL	DECEA	Francisco Almeida	Jefe de División de Coordinación técnica SDTE/DECEA	(55 21) 2101-6461 (55 21) 99499-6762 (5521) 98552-0829	franciscoalmeida@hotmail.com
		Tomy Marques de Souza	Asesor de comunicaciones	(21) 21016392 (5521)982547971	tomytms@decea.gov.br
COLOMBIA	UAEAC	Gabriel Guzmán	Especialista de Comunicaciones	(571) 296-2940 (57) 317-656 7202	gabriel.guzman@aerocivil.gov.co
CHILE	DGAC	Christian Vergara	Especialista comunicaciones	(56 2) 836-4005 (56 2) 644-8345	cvergara@dgac.gob.cl
ECUADOR	DAC	Raul Avellan	Especialista CNS coordinador sistema AMHS	(593 4) 269-2829 (593 9) 9530-2735	raul.avellan@aviacioncivil.gob.ec
GUYANA	Guyana Civil Aviation	Mortimer Salisbury	Supervisor - AN & T	(592) 261-2569	mbsalisbury2000@yahoo.com

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
GUYANA FR.	Service de la Navigation Aérienne aux Antilles-Guyane (SNA-AG)	Michel Areno	Head French Guiana ACC	(594) 694455617	michel.areno@aviation-civile.gouv.fr
PANAMA	Autoridad Aeronáutica Civil (AAC)	Daniel de Avila	Supervisor Dep. de COM	(507) 315 9877/78/44	ddavilah@hotmail.com
		Abdiel Vásquez	Jefe Depart. CNS	(507) 315-32/78/44	abvasquez@aeronautica.gob.pa
PARAGUAY	DINAC	Víctor Morán Maldonado	Jefe Departamento de Comunicaciones	(595 21) 758 5208 (595 21) 758 5252 (595 21) 758 5286	moranchu@gmail.com
		Alejandro Ibarrola	Jefe sección AMHS		aleiba40@gmail.com
PERÚ	CORPAC	Jorge Garcia	Jefe de Comunicaciones	(511) 2303131	jgarcia@corpac.gob.pe
		Raúl Anastasio Granda	Supervisor Comunicaciones AMHS-AFTN Área de Comunicaciones Fijas Aeronáuticas	(511) 230-1018	ranastacio@corpac.gob.pe
SURINAM/ SURINAME	Ministry of Transport, Communication and Tourism, Civil Aviation Department	Mitchell Themen	CNS Technical Division	(597) 325-123 (597) 325-172 (597) 497-143	mickiano@live.com
URUGUAY	DINACIA	Wilson Pelayo	Jefe de Comunicaciones	(598) 26826224	wiledda@hotmail.com
VENEZUELA	INAC	Samuel Sánchez	Jefe coordinación AMHS		s.sanchez@inac.gob.ve
		Norelys Blanco	Servicios Integrados COM Maiquetía (SIM-COM)	(58 212) 3552010	norelys.blanco@inac.gob.ve

APPENDIX B

AMHS INTERCONNECTION REQUIREMENT AND DATE OF IMPLEMENTATION

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
Argentina	Bolivia	Dec 2016	
	Brazil	Sep 2016	Pending operational implementation. Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016
	Chile	Dec 2016	
	Paraguay	Mar 2012	Implemented and operational
	Peru	Oct 2016	Positive P1 connectivity between MTA Ezeiza y MTA Lima (March 2016). Pending operational tests.
	Uruguay	Dec 2016	Connectivity in Protocol P1 level between MTA Ezeiza – Montevideo achieved, pending Montevideo – Ezeiza tests (March 2016)
	Venezuela	June 2016	Implemented and operational
Bolivia	Argentina	Dec 2016	
	Brazil	Dec 2016	
	Peru	Dec 2016	
Brazil	Argentina	Sep 2016	Pending operational implementation. Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016
	Bolivia	Dec 2016	
	Colombia	Dec 2016	
	Guyana	Dec 2016	
	French Guiana	TBD	
	Paraguay	Oct 2016	Tests of P1 interconnectivity started mid July 2016 MTA
	Peru	Dec 2015	Implemented and operational 14 December 2015
	Suriname	Dec 2016	
	Uruguay	Dec 2016	
	Venezuela	Dec 2016	
	Spain	Sep 2016	Pending operational implementation. Operational tests successfully completed. Connection made through CAFSAT.
	United States	Mar 2017	Technical coordination began on May 2016

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
Chile	Argentina	Dec 2016	
	Peru	Dec 2016	
Colombia	Brazil	Dec 2016	
	Ecuador	Dec 2016	
	Panama	Dec 2016	
	Peru	Sep 2010	Implemented and operational
	Venezuela	Dec 2016	
Ecuador	Colombia	Dec 2016	
	Peru	Julio 2012	Implemented and operational
	Venezuela	Dec 2016	
French Guiana (France)	Brazil	TBD	AMHS pending implementation
	Venezuela	TBD	AMHS pending implementation
Guyana	Brazil	Dec 2016	
	Suriname	Jun 2011	Implemented and operational
	Venezuela	Dec 2016	
Panama	Colombia	Dec 2016	
Paraguay	Argentina	Mar 2012	Implemented and operational
	Brazil	Oct 2016	IP interconnectivity tests began mid July 2016
Peru	Argentina	Oct 2016	Positive P1 connectivity between MTA Ezeiza y MTA Lima (March 2016)
	Bolivia	Dec 2016	
	Brazil	Dec 2015	Implemented 14 December 2015
	Chile	Dec 2016	
	Colombia	Sep 2010	Implemented
	Ecuador	Jul 2012	Implemented
	Venezuela	Oct 2016	Positive P1 connectivity between MTA Lima y MTA Maiquetia. Pending operational tests
Suriname	Brazil	Dec 2016	
	Guyana	Jun 2011	Implemented and operational
	Venezuela	Dec 2016	
Uruguay	Argentina	Dec 2016	Positive P1 connectivity between Ezeiza and Montevideo achieved. Pending tests between Montevideo and Ezeiza (March 2016)
	Brazil	Dec 2016	
Venezuela	Argentina	Jun 2016	Implemented and operational
	Brazil	Dec 2016	

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
	Colombia	Dec 2016	
	Ecuador	Dec 2016	
	Guyana	Dec 2016	
	French Guiana	TBD	AMHS pending implementation
	Peru	Jun 2016	Positive P1 connectivity between MTA Lima y MTA Maiquetia. Pending operational tests
	Suriname	Dec 2016	

APPENDIX C

(Draft) IWXXM Bi-Lateral Testing
using
File Transfer Body Part (FTBP)

Project Test Plan

Version: 1.0

REVISION HISTORY

ID	*Date*	*Revised By*	*Summary of Changes*

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 PURPOSE 1
1.2 PROJECT BACKGROUND 1
1.3 TEST SCOPE 1
1.4 IWXXM BILAERAL TESTING 2
1.4.1 Project Test System 2
1.4.2 Test Phases 3
1.4.2.1 Phase I – Communications Capability Verification 3
1.4.2.2 Phase II – IWXXM Encoding and Exchange Verification 4
1.5 REFERENCE MATERIALS 4

2. PROJECT MANAGEMENT AND OVERVIEW 5

ANNEX A: PHASE 1 – COMMUNICATIONS CAPABILITY VERIFICATION 2-1

ANNEX B: PHASE II – IWXXM ENCODING AND EXCHANGE VERIFICATION 2-3

1.0 INTRODUCTION

1.1 Purpose

This Project Test Plan provides the strategy for evaluating the readiness of the system components required for the exchange and application of International Civil Aviation Organization (ICAO) Operational Meteorological (OPMET) information encoded in eXtensible Markup Language (XML) format. This plan documents the project scope, responsibilities, tasks and schedules required in testing the bi-lateral exchange of ICAO XML OPMET information using the ICAO Weather Information Exchange Model (IWXXM).

1.2 Project Background

In November of 2013, amendments to ICAO Annex 3 – *Meteorological Service for International Air Navigation* and WMO Document No. 49 were made allowing the bi-lateral exchange of four OPMET products (i.e., METAR, SPECI, TAF, and SIGMET)[1] in XML, between states in a position to do so. Concurrently the IWXXM 1.0 was released, which is an XML representation of those OPMET products. The current plan for implementing the exchange of XML products is based on the ICAO three year amendment cycle:

> **November 2016** - ICAO Annex 3 amended to make the exchange of XML products a recommended practice. Additionally, more ICAO Annex 3 products will be allowed to be exchanged in XML
>
> **November 2019** - ICAO Annex 3 amended to make the exchange of XML products a mandatory practice. Additionally, the remaining ICAO Annex 3 products will be allowed to be exchanged in XML

IWXXM has not been tested for operational readiness in a bi-lateral fashion. As part of the activities under the MIE a suite of tests should be developed to discover operational issues prior to 2016 when IWXXM exchange becomes a recommended practice.

In support, a Concept of Operations for the Transition of OPMET Data Exchange using IWXXM to enable System-Wide Information Management (SWIM) has been developed by the European Data Management Group (DMG) [Ref A]. The proposed bi-lateral testing will verify the feasibility of the DMG concepts and help identify implementation issues for consideration.

Currently ICAO OPMET data is exchanged in TAC format using AFTN/CIDIN or AMHS (basic service). The format of the OPMET data is limited to fit within traditional AFTN messaging limitations. Whilst this has met the needs of the Aviation community it is not possible to exchange more Modern XML format messaging.

1.3 Test Scope

The goal of the bi-lateral testing activity is to implement an operational prototype environment that would be used to:

- identify any limitations in the IWXXM model that can be discovered through pseudo-operational bi-lateral exchanges

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1 Per ICAO Doc 8400 – *Procedures for Air Navigation Services, ICAO Abbreviation and Codes*: METAR = Aerodrome routine meteorological report. SPECI = Aerodrome special meteorological report. TAF = Aerodrome forecast. SIGMET = Information concerning en-route weather phenomena which may affect the safety of aircraft operations

- track and feed discovered limitations back to the responsible groups for resolution (such as the IWXXM developer group)
- serve as a basis for evaluating the concepts and procedures of the operational environment that will eventually be implemented
- engage with OPMET organizations to increase communication and awareness regarding upcoming changes
- Provide validated answers to some of the questions raised in the CONOPS

The prototype environment is needed for initial testing for the 2016 rollout. In addition, it may also be useful in future phases of IWXXM testing as updates are made to the IWXXM model.

The testing environment should be as close to the operational environment as practical:

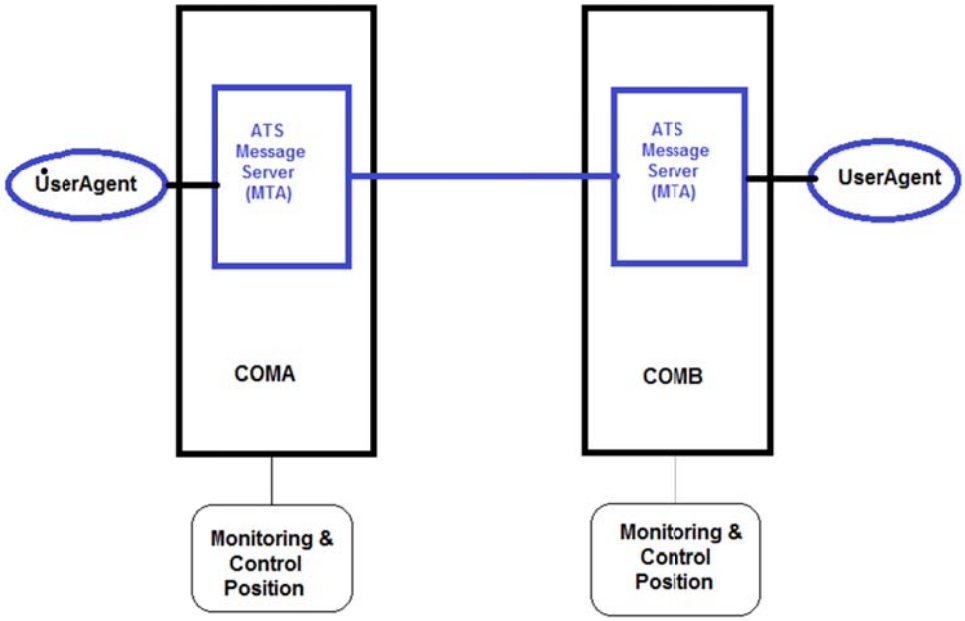
- involving the operational organizations who will be responsible for IWXXM; or those who are responsible for producing and consuming OPMET information which is currently encoded in the Traditional Alphanumeric Code (TAC)
- using protocols and methods (such as network infrastructure) as similar as possible to that envisioned for future XML exchanges

1.4 IWXXM Bilateral Testing

The message exchange testing with international and national partners should proceed in phases. The objectives of each phase are outlined in Section 1.4.2. The details for each test phase are contained the Annexes A-D.

1.4.1 Project Test System

Both test systems should have operational AMHS link, and P1 connection setup. Two User Agents should be used to exchange traffic with File Transfer Body Part. The User Agent can be either a P3 or P7 User Agent. The testing environment is as shown in the figure below:



Network Analysis software can be used to monitor X.400 traffic and its effect on network Bandwidth. The software can be agreed on prior the test.

1.4.2 Test Phases

1.4.2.1 Phase I – Communications Capability Verification

Phase 1 will test whether the AFS network infrastructure is capable of passing XML/IWXXM messages. Testing network infrastructure is not the primary focus of testing, but it is an important prerequisite for IWXXM testing. Static (not real time) IWXXM messages for each product would be exchanged across the circuits in the simplest manner.

Note 1: *These can be retrieved from various internet sources.*
Note 2: *Messages would ideally be passed over the network in World Meteorological Organization (WMO) Collections as defined in the IWXXM 1.0, similar to WMO bulletins today with the Traditional Alphanumeric Code (TAC) messages.*

The required AMHS infrastructure required is an AMHS UA connected to an MTA in one state, and a UA connected to an MTA in another state. The 2 MTA's should be interconnected. It is desirable that the MTA's are in a non-operational environment, but with correct addressing this could be achieved over an operational network.

This phase will comprise two stages.

1.4.2.1.1 Stage One

Messages could initially be passed in an uncompressed XML form these do not necessarily need to be iWXXM messages. This would demonstrate AMHS's capability to exchange the full XML character set.

1.4.2.1.2 Stage Two

Once this is successful they would be transmitted in a compressed form using GZIP[2] and Efficient XML Interchange (EXI) compression or whatever format is prescribed by ICAO. The compressed XML data will be exchanged in an AMHS FTBP. Messages will be transmitted both directions.

IMPORTANT NOTE: *It is understood that certain ICAO Regions have undertaken this testing already. Successful completion of such tests, means that testing can begin with Phase II.*

1.4.2.2 Phase II – IWXXM Encoding and Exchange Verification

Phase II expands Phase 1 to include real-time data and traffic volumes. It should also test file extensions, traffic flooding, compression techniques etc. OPMET products, METAR, SPECI, TAF, SIGMET will be exchanged bi-laterally encoded as XML. This phase would verify that real data can be exchanged in real-time and as well identify and correct any system errors (IWXXM and/or TAC converters) prior to operational use. Where the above cannot be done, an alternative option is provided below. Regardless of the approach taken the testing shall be as per the next two following steps:

Creation and Use (Host state -> International Partner):
Information is created as normal TAC messages by the Host State. These are converted to IWXXM for international distribution and then placed onto international circuits by the Host State. The messages are then received by International Partner.

Creation and Use (International Partner -> Host State):
Messages are passed to the Host State as IWXXM messages across international circuits (AHMS) as FTBP. These messages are integrated into Host State systems and operational consumers review the information and assess its correctness and utility.

Alternative option:
If a test network is not available or if real time data or the means to simulate realistic traffic volumes are not available. The above tests can be performed by sending between 20 and 50 messages directly from a message queue. In this case it will be critical to monitor network and system response times to allow a post-analysis to be performed to assess the network impact. This should be carefully monitored to ensure that live traffic is not adversely affected.

1.5 Reference Materials

A. *Concept of Operations for the Transition of OPMET Data Exchange using IWXXM to enable SWIM, Version V2.2, 15 July 2014, ICAO Meteorological Group in Europe (METG), European Data Management Group (DMG).*

B. *ICAO Annex 10 – Aeronautical Telecommunication; Vol. II, Communication Procedure*

C. *ICAO doc 9880- Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), First Edition – 2010*

D. *EUR Doc 020 – AMHS Manual*

2 GZIP is a file format and a software application used for file compression and decompression

2. PROJECT MANAGEMENT AND OVERVIEW

TBD

ANNEX A: PHASE 1 – COMMUNICATIONS CAPABILITY VERIFICATION

Phase 1 will test whether the network infrastructure is capable of passing XML/IWXXM messages. Testing network infrastructure is not the primary focus of testing, but it is an important prerequisite for IWXXM testing. Static (not real time) XML messages would be exchanged across the circuits in the simplest manner demonstrating the FTBP capability in AMHS.

Messages would initially be passed in an uncompressed XML form. Once this is successful they would be transmitted in a compressed form using the defined compression method possibly GZIP and EXI compression. Messages will be transmitted both directions.

A-1: Steps

1. Create static example of an XML message (preferably a METAR/TAF or SIGMET).
    a. For additional testing these could be in XML, GZIP compressed XML, and EXI compressed XML, embedded in a WMO XML Collection.
2. Create test circuit or identify operational circuit for testing with International Partners via AMHS
3. Exchange and verify correct message structure of static example messages in XML
4. Exchange, decompress, and verify GZIP-compressed static messages
5. Exchange, decompress, and verify EXI-compressed static messages
6. Compile test results and also describe the capabilities of AFTN and AMHS to distribute compressed and uncompressed XML messages.
7. Compile test results and describe the implications of observed XML data volumes on AMHS circuits.

A-2: Test Criteria/Metrics:

In-depth network or detailed protocol tests are out of scope. Phase I is included as a way to identify network issues separately from other issues. The primary purpose of the overall bi-lateral testing is to demonstrate AMHS's capability to meet the requirements to be able to exchange IWXXM product into the future.

Test Results are to be captured in the Test Report Form, given in Appendix C.

TEST REPORT FORM – PHASE 1			
Task	**Description/Result**	**Date**	**Performed By:**
Test Partners Identified			
Establish Test Circuit(s)			
Description (UAs, MTAs, intermediate switching centres, etc;)			
- Protocol(s)			
- Speed(s)			
Execute Test Plan			
Stage 1 - XML			
- iWXXM (Yes/No?)			
- Message Types			
- Message Volumes			
- Results			
Stage 2 - EXE			
- Message Types			
- Message Volumes			
- Results			
Stage 2 - GZIP			
- Message Types			
- Message Volumes			
- Results			
Results/Observations			

ANNEX B: PHASE II – IWXXM ENCODING AND EXCHANGE VERIFICATION

Phase II will expand Phase I to include real-time data. All four IWXXM products (METAR, SPECI, TAF, SIGMET) would be exchanged bi-laterally with data encoded as XML. This phase would verify that real data can be exchanged in real-time with all the variances and corner cases of the true operational environments.

Creation and Use (Host State-> International Partner):
METAR/SPECI, TAF and SIGMET as provided in TAC are converted to IWXXM for international distribution, which is placed onto the test international circuits, to demonstrate AMHS capability to meet the traffic volumes required, message flood scenarios should be introduced.

Creation and Use (International Partner -> Host State):
Messages are passed to the participant as IWXXM via AMHS as FTBP and are integrated into systems User Agents to look at the information and assess its correctness and utility.

B-1: Schedule

- Set up computing hosts, infrastructure.
- Create and test AMHS interconnection for bi-directional communications of XML messages
- Get real time IWXXM data (METAR, SPECI, TAF, SIGMET) data feeds running.
- Validate network and protocol capability to exchange high volumes of data this will look at virus checking, security, timeliness etc.

B-2: Test Criteria/Metrics:

Test Results are to be captured in the Test Report Form, given in Appendix C.

TEST REPORT FORM – PHASE 2			
Task	**Description/Result**	**Date**	**Performed By:**
Test Partners Identified			
Establish Test Circuit(s)			
Description (UAs, MTAs, intermediate switching centres, etc;)			
- Protocol(s)			
- Speed(s)			
Execute Test Plan			
Step 1 – TAC converted to IWXXM			
- Message Types			
- Message Volumes (low)			
- Results			
- Message Types			
- Message Volumes (high)			
- Results			
Step 2 – IWXXM as FTBP			
- Message Types			
- Message Volumes (low)			
- Results			
- Message Types			
- Message Volumes (high)			
- Results			
Alternative Option -			
- Message Types			
- Message Volumes (low)			

TEST REPORT FORM – PHASE 2			
Task	**Description/Result**	**Date**	**Performed By:**
- Results			
- Message Types			
- Message Volumes (high)			
- Results			
Results/Observations			

APPENDIX D

<?xml version="1.0" encoding="UTF-8"?>
<wfs:FeatureCollection xsi:schemaLocation="**http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd http://metgate http://tiberius.meteo.fr:80/geoserver/wfs?service=WFS&version=2.0.0&request=DescribeFeatureType&typeName=metgate%3Ametariwxxm**" timeStamp="**2016-05-25T13:57:02.150Z**" numberReturned="**1**" numberMatched="**1**"
xmlns:xsi="**http://www.w3.org/2001/XMLSchema-instance**"
xmlns:gml="**http://www.opengis.net/gml/3.2**" xmlns:metgate="**http://metgate**"
xmlns:xs="**http://www.w3.org/2001/XMLSchema**"
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GAULL</gml:name><saf:designator>07157</saf:designator><saf:locationIndicatorICAO>LFPG</saf:locationIndicatorICAO><saf:ARP><gml:Point gml:id="**ref-point-LFPG**" srsName="**http://www.opengis.net/def/crs/EPSG/0/4979**" srsDimension="**3**" axisLabels="**Lat Lon Altitude**" uomLabels="**deg deg m**"><gml:pos>49.016666666666666 2.5166666666666666 109</gml:pos></gml:Point></saf:ARP></saf:Aerodrome></sam:sampledFeature><sams:shape><gml:Point gml:id="**obs-point-LFPG**" srsName="**http://www.opengis.net/def/crs/EPSG/0/4979**" srsDimension="**3**" axisLabels="**Lat Lon Altitude**" uomLabels="**deg deg m**"><gml:pos>49.016666666666666 2.5166666666666666 109</gml:pos></gml:Point></sams:shape></sams:SF_SpatialSamplingFeature></om:featureOfInterest><om:result><iwxxm:MeteorologicalAerodromeObservationRecord gml:id="**observation-record-LFPG-20160511T123000Z**" cloudAndVisibilityOK="**false**"><iwxxm:airTemperature uom="**Cel**">18</iwxxm:airTemperature><iwxxm:dewpointTemperature uom="**Cel**">15</iwxxm:dewpointTemperature><iwxxm:qnh uom="**hPa**">1002</iwxxm:qnh><iwxxm:surfaceWind><iwxxm:AerodromeSurfaceWind variableDirection="**true**"><iwxxm:meanWindSpeed uom="**kn**">3</iwxxm:meanWindSpeed></iwxxm:AerodromeSurfaceWind></iwxxm:surfaceWind><iwxxm:visibility><iwxxm:AerodromeHorizontalVisibility><iwxxm:prevailingVisibility uom="**km**">10</iwxxm:prevailingVisibility><iwxxm:prevailingVisibilityOperator>ABOVE</iwxxm:prevailingVisibilityOperator></iwxxm:AerodromeHorizontalVisibility></iwxxm:visibility><iwxxm:presentWeather xlink:title="**Light precipitation of rain**" xlink:href="**http://codes.wmo.int/306/4678/-RA**"/><iwxxm:cloud><iwxxm:AerodromeObservedClouds><iwxxm:layer><iwxxm:CloudLayer><iwxxm:amount xlink:title="**Scattered**" xlink:href="**http://codes.wmo.int/bufr4/codeflag/0-20-008/2**"/><iwxxm:base uom="**ft**">1200</iwxxm:base></iwxxm:CloudLayer></iwxxm:layer><iwxxm:layer><iwxxm:CloudLayer><iwxxm:amount xlink:title="**Broken**" xlink:href="**http://codes.wmo.int/bufr4/codeflag/0-20-008/3**"/><iwxxm:base uom="**ft**">8400</iwxxm:base></iwxxm:CloudLayer></iwxxm:layer></iwxxm:AerodromeObservedClouds></iwxxm:cloud></iwxxm:MeteorologicalAerodromeObservationRecord></om:result></om:OM_Observation></iwxxm:observation></iwxxm:METAR></metgate:data><metgate:mwoname>LFPG</metgate:mwoname><metgate:mwolocation><gml:Point srsName="**urn:ogc:def:crs:EPSG::4326**" srsDimension="**2**"><gml:pos>49.016667 2.533333</gml:pos></gml:Point></metgate:mwolocation><metgate:mwocreationdate>2016-05-25T12:00:00Z</metgate:mwocreationdate><metgate:insertiondate>2016-05-25T12:18:48.261Z</metgate:insertiondate></metgate:metariwxxm></wfs:member></wfs:FeatureCollection>