



ICAO

International Civil Aviation Organization  
North American, Central American and Caribbean Office

WORKING PAPER

NACC/WG/RAP/02 —WP/17  
13/03/2023

**Second Meeting of Rapporteurs of the North American, Central American and Caribbean Working Group (NACC/WG/RAP/02)**

ICAO NACC Regional Office, Mexico City, Mexico, 28 to 31 March 2023

**Agenda Item 5: Update of the Action Plans of the Task Groups of the NACC/WG, of the NACC/WG Action Plan and of the regional activities in the Development of the Projects of the CAR/SAM Regional Planning and Implementation Group (GREPECAS)**

**INTEROPERABILITY TESTS FOR THE EXCHANGE ON THE AERONAUTICAL MESSAGE HANDLING SYSTEM (AMHS) OF OPERATIONAL METEOROLOGICAL (OPMET) DATA IN ACCORDANCE WITH THE ICAO WEATHER INFORMATION EXCHANGE MODEL (IWXXM)**

(Presented by the MEVA/TMG Rapporteur)

| <b>EXECUTIVE SUMMARY</b>  |  |
|---|--|
| This paper presents a summary of tests carried out by Cuba, jointly with other States/Organizations, to demonstrate the interoperability of the systems of all parties in the OPMET data exchange according to the IWXXM model on AMHS. |  |
| <b>Action:</b>  | Suggested actions are listed in section 4.   |
| <i>Strategic Objectives:</i>  | <ul style="list-style-type: none"><li>• Strategic Objective 1 – Safety</li><li>• Strategic Objective 2 – Air Navigation Capacity and Efficiency</li><li>• Strategic Objective 5 – Environmental Protection</li></ul> |
| <i>References:</i>  | <ul style="list-style-type: none"><li>• Thirty-First MEVA Technical Management Group Meeting (MEVA/TMG/31), Kingston, Jamaica, 24 to 26 May 2016</li></ul>   |

**1. Introduction**

1.1 In 2016, during the MEVA/TMG/31 meeting, the first activities for the exchange of coded meteorological information in XML format on AMHS were recommended. The stated objectives were:

- a) test the data exchange using the File transfer body part (FTBP) of AMHS messages, as it supports the encrypted information to be disseminated
- b) the rough estimate of the bandwidth required by this traffic;
- c) the coding and validation of the OPMET information according to the IWXXM.

1.2 In order to comply with amendment 78 of ICAO Annex 3, which indicates that as of 5 November 2020, each State should disseminate its OPMET information using both the Traditional alphanumeric codes (TAC) format, and the format defined by the IWXXM, Cuba implemented the OPMET TAC data translator to OPMET IWXXM, whose source of information is the dissemination of existing TAC data.

1.3. The OPMET TAC to OPMET IWXXM data translator is an application responsible for generating files in XML format from the data bulletins in TAC format that are disseminated by the OPMET data bank. Once it receives TAC data to be encoded, it generates the corresponding XML file, compresses it and then inserts it into the FTBP of the AMHS message that will take them to their destinations, through the Aeronautical fixed service (AFS). From the communications point of view, it is nothing more than a User Agent (UA) that makes use of functional groups (FG) belonging to the AMHS extended service level, necessary to manage the information contained in the FTBP.

1.4. The operational implementation of the dissemination of OPMET data according to the IWXXM model on AMHS must be preceded by tests that allow the verification of the systems and networks involved in such dissemination.

## 2. Discussion

2.1 The OPMET Data Bank of Cuba, as the National OPMET Centre (NOC), is responsible for the reception and validation of all OPMET messages required internationally, which are generated by all national originators, with the aim of creating the bulletins that will be disseminated later according to the regional distribution scheme.

2.2 The OPMET data dissemination implementation process according to the IWXXM model must be preceded by tests whose objectives are:

- a) Verify that the AMHS message centres participating in the test successfully exchange messages containing FTBPs.
- b) Verify that the applications of each party generate XMLs from TAC messages and create a compressed FTBP for the exchange through AMHS.
- c) Verify the generation of AMHS messages according to the profile corresponding to the exchange of meteorological data according to the IWXXM model. Review the references in the **Appendix** to this working paper.
- d) Demonstrate the validity and correct conformation, according to the IWXXM 3.0.0 model, of the generated XML files.
- e) Carry out load stress tests aimed at:
  1. Identifying potential limitations of the systems under test, using large volumes of message traffic, prior to the operational exchange of Interpersonal messages (IPM) with FTBPs.

2. Test the adequate and/or expected behaviour of the systems under stress.
3. Assist in the validation of link channel bandwidth and network capacity.

2.3 Taking into account the unexpected behaviour that load stress procedures can cause, these will only be carried out using systems and network infrastructures intended solely for testing, with the aim of not affecting operational AFS messaging.

2.4 Prior to carrying out the tests, procedures were defined and agreed between the parties. These procedures were based on those described in [1], [2] and [4] of the appendix to this working paper.

2.5 The test procedures were grouped into phases, defined by their objectives:

| Phase | Objectives to meet |
|-------|--------------------|
| I     | 2.2.1              |
| II    | 2.2.2, 2.2.3       |
| III   | 2.2.4              |

2.6 To carry out the tests, Cuba uses the environment shown in Figure 1, made up of:

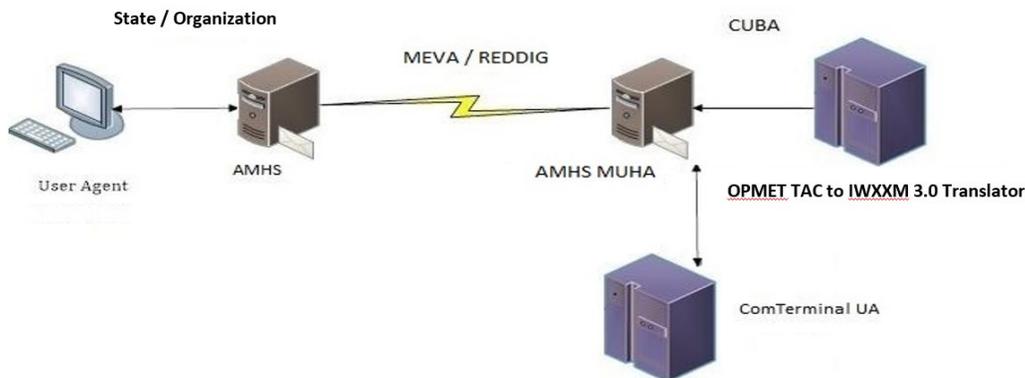


Fig. 1: Test environment for OPMET data exchange according to IWXXM.

- a) AMHS Message Center in Havana, Cuba (MUHA)
- b) UA ComTerminal: Application for testing purposes, which is used to generate AMHS messages as indicated in the scenarios of the procedures to follow. It can generate AMHS messages with basic level of service, as well as AMHS messages that make use of the FTBP functional block of the extended service level. It could generate, if necessary, huge message queues during stress testing procedures (Phases I and III).
- c) TAC to IWXXM translator: UA that upon receiving an OPMET TAC message (Meteorological aerodrome report [METAR], Aeronautical special meteorological report [SPECI], Terminal area forecasts [TAF], Significant meteorological information [SIGMET]) generates the corresponding XML file, according to the IWXXM 3.0.0 model, and compresses it. It places the resulting .gz file in the FTBP of an AMHS message and sends it through its message centre (Phases II and III).

2.7 The types of OPMET data exchanged during the tests were:

| Data type              | Designator | Example   |
|------------------------|------------|---|
| METAR                  | LA         | A_LACU31MUHA031900_C_MUHA_20221003190036.xml.gz |
| SPECI                  | LP         | A_LPCU31MUHA031253_C_MUHA_20221003125406.xml.gz |
| TAF (VT >= 12 hours)   | LT         | A_LTCU31MUHA031100_C_MUHA_20221003110106.xml.gz |
| SIGMET Wind Shear (WS) | LS         | A_LSCU31MUHA191920_C_MUHA_20220919192426.xml.gz |

2.8 So far, interoperability tests have been carried out with:

| State/Organization                                  | Phases carried out | Observations            |
|---|--------------------|-------------------------|
| United States/Federal Aviation Administration (FAA) | I, II*, III        | Successfully concluded. |
| Regional OPMET Data Bank (RODB) of Brasilia         | I, III             | Successfully concluded. |
| COCESNA   | I                  | Successfully concluded. |

(\*Including stress load procedures)

2.9 During the load stress tests (\*), with the support of the MEVA network provider, monitoring of the link channel for tests between Cuba and United States was carried out.

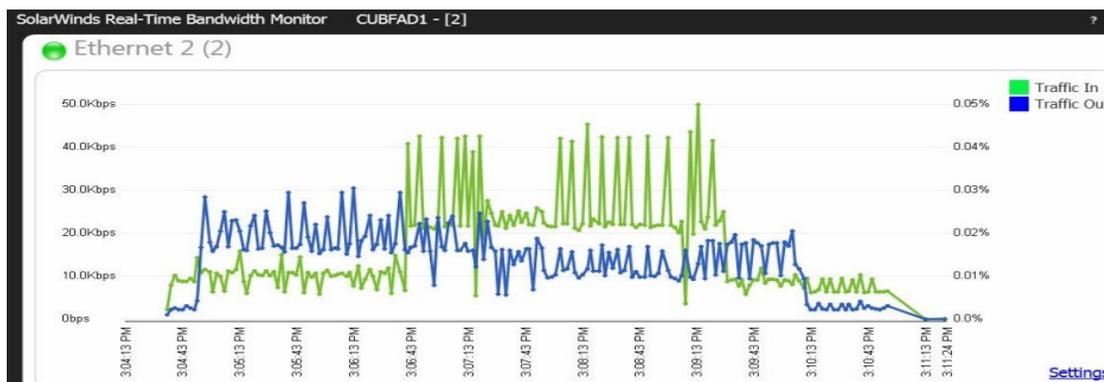


Fig. 2: Bandwidth utilization during a load stress procedure between Cuba and United States.

2.10. Fig. 2 shows the use of bandwidth during the transfer of 200 messages, with compressed XML files of an average size of 3.5 KB, between the AMHS test centres in Cuba and United States. Each party originated 100 messages from its endpoint.

### 3. Conclusions

3.1 Interoperability tests are crucial during the implementation process of the operational dissemination of OPMET IWXXM data over AMHS.

3.2 During the implementation of AMHS messaging, testing between message centres used the basic service level. The interoperability tests for the OPMET IWXXM data exchange constitute a necessary scenario to verify the capacity of these centres to handle the FTBP, as defined in the AMHS extended service level.

3.3 In anticipation of increased demand for bandwidth, from the use of the extended service level of AMHS to support the dissemination of OPMET data according to IWXXM, the network for the Caribbean Air Navigation Services Network (CANSNET), the next generation of MEVA, it needs to have similar tests, at the regional level, that allow to anticipate the requirements of the communication links amongst States in the new context.

#### **4. Recommended Actions**

4.1 The Meeting is kindly invited to:

- a) review the information presented in this Working Paper;
- b) plan and promote these interoperability tests in States of the region, taking into account that it is possible to carry them out in phases, depending on the conditions for carrying out each of them;
- c) contribute with the results obtained in each test that is carried out to the development of other regional projects.

-----

**APPENDIX**  
**BASE REFERENCE DOCUMENTS FOR THE TESTS**

1. EUR Doc 020: EUR AMHS Manual v14.0, EUR AMHS Interoperability Test Guidelines for COM Centers with FTBP relay capabilities. [1]
2. EUR Doc 020: EUR AMHS Manual v14.0, EUR AMHS Pre-Operational Test Guidelines for COM Centers with FTBP relay capabilities. [2]
3. EUR AMHS Manual v14.0, Appendix H—Application/Service oriented AMHS Profiles. [3]
4. ICAO Guidelines for the Implementation of OPMET Data Exchange Using IWXXM; Fourth Edition, Nov, 2020 [4]

— END —