INTERNATIONAL CIVIL AVIATION ORGANIZATION

GUIDELINES FOR THE IMPLEMENTATION OF OPMET DATA EXCHANGE USING IWXXM

Fifth EDITION – October 2023

TABLE of CONTENTS

TABLE of FIGURES

1 Introduction

1.1 Purpose

The main intention of this document is to assist with the implementation of the International Civil Aviation Organization (ICAO) Meteorological Information Exchange Model (IWXXM) for operational meteorological (OPMET) data and its intra- and inter-regional exchange over the Aeronautical Fixed Service (AFS).as defined in Annex 3 to the Convention on International Civil Aviation, *Meteorological Service for International Air Navigation*.

This document will be updated as new provisions relating to IWXXM and its exchange are introduced into Annex 3 and when new technologies become available to support the migration into a System-Wide Information Management (SWIM) environment.

1.2 Background

The bilateral exchange of meteorological information in IWXXM format was introduced in November 2013 through Amendment 76 to ICAO Annex 3. This enabled States to exchange OPMET data in both Traditional Alphanumeric Code (TAC) format as well as in extensible mark-up language (XML) and more precisely geography mark-up language (GML) formats.

The introduction of IWXXM as an international standard format for the exchange of meteorological information represented the start of a significant change from the provision and exchange of textual OPMET data towards a digital environment, in support of the ICAO Global Air Navigation Plan (GANP) and a transition towards a SWIM environment.

Since its inception, OPMET data has been promulgated by systems with data products initially designed to be human readable. Due to bandwidth limitations, these products are highly compact to facilitate a regular and efficient flow of data.

The exchange of meteorological information in IWXXM format became a Recommended Practice in Amendment 77 to ICAO Annex 3, with applicability of November 2016. Some States began exchanging digital products in IWXXM from early 2017. The exchange of meteorological information in IWXXM format became a Standard in November 2020, as indicated in Amendment 78 to ICAO Annex 3 and in accordance with the applicability of Amendment 79 to ICAO Annex 3.

The use of OPMET data in TAC format presents an obstacle to the digital use of the data, as it often contains typographical errors, is poorly structured and lacks validation. This makes the handling of global data difficult to use correctly and expensive to maintain. These significant difficulties have been highlighted during past code changes. Coding practices in TAC format also present an obstacle to efficient automation as State coding exceptions are commonly used.

IWXXM represents the first step to move to an environment where the systems handling this data can make more use of standard applications and techniques. The development of new systems which provide and support digital OPMET requires initial investment, but enabling data exchange standards for other domains such as AIXM (Aeronautical Information Exchange Model) and FIXM (Flight Information Exchange Model) together with IWXXM will lead to a cost reduction due to the implementation of widely used data modelling techniques including OGC (Open Geospatial Consortium) segments. Consequently, users will be presented with opportunities to create new products at a lower cost by combining data from different aviation domains.

Leading up to the transition to IWXXM, it was essential that the transition towards the use of IWXXM was adequately planned and equipped to make reliable data sets available to users for exploitation as soon as possible at both regional and a global scales. This guidance document provides elements and steps for achieving that aim by defining common definitions and concepts, as well as structured phases to be implemented in relation to the international exchange of OPMET data.

1.3 Intended Audience

This document is intended for use by meteorological data providers and consumers involved in the exchange of IWXXM data at the local, regional and global scales.

2 Current Operations and Capabilities

2.1 Current Capabilities

Current capabilities involved with the international exchange of meteorological information include OPMET data exchange in TAC format, via the AFS, primarily the Aeronautical Fixed Telecommunications Network (AFTN) and Automated Message Handling System (AMHS) protocols, as well as the Secure Aviation Data Information Service (SADIS) and World Area Forecast System (WAFS) Internet File Service (WIFS).

AMHS provides a mechanism for the exchange of IWXXM information as attachments by utilising the AMHS File Transfer Body Part (FTBP) feature over the AFS.

2.2 Data Producer/Originating Unit

The Data Producer provides meteorological information. Since November 2020 data should be produced in both TAC and IWXXM formats.

Data Producers are expected to produce both TAC and IWXXM as close to source as possible. Ideally both are made at source.

2.3 Data Aggregator

The function of the Data Aggregator is to take individual reports, perform limited data validation and aggregate them into bulletins. Bulletins consist of one or more reports of the same type (e.g. METAR).

2.4 Data Switch

A Data Switch routes the data according to the World Meteorological Organization (WMO) abbreviated header structure, TTAAii CCCC, of the bulletin. The bulletin header fulfils the regulations described in WMO Doc No 386, *Manual on the Global Telecommunication System*.

Whilst it is anticipated that IWXXM would be disseminated to the same recipients as TAC, during the earlier years of IWXXM implementation, only a subset of recipients may be capable of receiving IWXXM due to a lack of AMHS with FTBP. As a result, the distribution addresses of TAC and IWXXM will likely initially differ and will need to be updated to align with the capabilities of the intended recipient lists.

2.5 National OPMET Centre (NOC)

The role of the NOC is to gather and validate all internationally required OPMET messages, (refer to the Regional (electronic) Air Navigation Plans) generated by all originating units within a State, to compile national data into bulletins and to distribute them internationally according to the regional distribution schema.

A NOC should perform the following functions:

- Data Aggregator; and
- Data Switch.

2.6 Regional OPMET Centre (ROC)

A ROC is responsible for collecting data from NOCs and validating all required data in its area of responsibility (AoR), according to the regional distribution schema.

Each ROC is responsible for the collection of required OPMET data from the other ROCs in the Region, and for the dissemination to the other ROCs of the required data from its AoR.

A ROC should perform the following functions:

- Data Aggregator; and
- Data Switch.

2.7 Inter-regional OPMET Gateway (IROG)

An IROG is responsible for the collection of all required OPMET data from its interregional area(s) of responsibility (IAoR) and the dissemination to the ROCs in its Region.

Furthermore, the IROGs are responsible for collection and dissemination of their Region's required OPMET data to their partner IROGs.

The IROG is responsible for the validation of the bulletins sent to the IROGs of its IAoR and received from their IAoR.

For data exchange, an IROG should perform the following functions:

- Data Aggregator; and
- Data Switch.

2.8 International OPMET Databank

An International OPMET Databank provides the capability for users to interrogate TAC data through the AFTN or AMHS. In some Regions the databank is known as a Regional OPMET Databank (RODB).

Operational principles:

- OPMET Databank Requests:
    - Requests for TAC data can be sent via the AFS using AFTN or AMHS. These requests work as described in current RODB Interface Control Documents (ICD) or equivalent document.

      For example: RQM/SALOWW/WSEBBR/WSLFFF=
    - The above example describes the syntax of TAC requests:
        - "RQM/" is used as the start of the query;
        - only the T_1T_2 message types defined by the World Meteorological Organization (WMO) are allowed;
        - the request is sent to the AFTN address of the International OPMET Databank.
- OPMET Databank Replies:
    - Replies to TAC requests are described in the current RODB ICD;
    - Reply reports of a request will be aggregated into one or more messages, according to the same rules used by the Data Aggregators (e.g. no mixing of message types in one file);
    - The RODB ICDs should specify a standardised set of information and error replies, specifically when the required data are not defined (example: request for a SIGMET with a wrong location indicator).

3 Proposed service concept

3.1 Operating principles

This section outlines the general principles for transitioning the international exchange of OPMET data in IWXXM format. These principles are still based on continued use of the WMO abbreviated header structure and all participating States exchanging IWXXM via AMHS with FTBP enabled. The intention is to support both the introduction of IWXXM and from then the managed migration of information from TAC to IWXXM-based international exchange of various meteorological products, which starts with Aerodrome Meteorological Reports (METAR/SPECI), Aerodrome Forecasts (TAF), Tropical Cyclone Advisories (TCA), Volcanic Ash Advisories (VAA), Space Weather Advisories (SWXA), AIRMET and SIGMET.

3.1.1. Managing the transition

A group responsible for managing the transition should be identified in each ICAO Region, for the necessary intra- and inter-regional coordination, and should be guided by Meteorological Panel (METP) Working Group on Meteorological Information Exchange (WG-MIE) with the support of WMO.

It is assumed that different Regions will progress at different rates. It is necessary to create a plan that facilitates these differences in implementation pace.

The METP WG-MIE has developed this Guidelines document to assist all ICAO Regions with the transition to IWXXM exchange. Each ICAO Region may also establish a regional version of the document to provide regional information and references, but it is important that this should maintain alignment to the global guidelines to ensure the inter-regional exchange is not affected. To simplify management of both the global and regional documentation, Regions are encouraged to only modify or add appendices.

One example of regional information would be tests for NOCs for exchanging IWXXM via the AFS using AMHS with FTBP and AMHS profile for IWXXM data, as indicated as guidance in the Appendix A and Appendix B of this document.

It would be recommended that this regional information be contained in an appendix to the main regional document, whereby it could be reviewed and agreed, in particular in those Regions who have not yet established such regional information.

Note: Groups such as Data Management Group for EUR, the Bulletin Management Group for MID and the Meteorological Information Exchange Working Group (MET/IE) for APAC could be the right groups to manage this transition (or equivalent groups in other Regions). Where AMHS is being used, close cooperation with the State COM (Communications) Centre is advised to assure an efficient management of AMHS links and interconnections between adjacent Regions.

3.1.2. Variances to IWXXM

Where a State has a requirement to exchange additional elements (such as remark sections) within their IWXXM, the State will be required to design, test and implement an extension to the IWXXM schema. These national extensions can only be supported when implemented in a globally standardized way. The use of extensions within the IWXXM is discouraged and should only be utilised where absolutely necessary.

If a State decides to use an extension to the standard IWXXM schema, the schema and schematron rules need to published / made available to enable data consumers to ingest the information carried by the extension. The ICAO METP WG-MIE is currently exploring possibilities on how a centralised repository with information on existing extension and the schemas of the extensions are available.

3.1.3. Translation

A State is required to produce IWXXM data in addition to TAC data for international exchange from November 2020 (Amendment 79). Generating information in both IWXXM and TAC formats will help minimize, the translation between formats as much as possible. It will also avoid operational translation and conversion from IWXXM to TAC and onward forwarding, as the bi-directional conversion will not necessarily result in the same TAC message.

Where a translation from TAC to IWXXM is necessary and conducted, the translation centre or service and date/time of when the translation occurred will be identified within the XML message (refer to section 5.3).

3.1.4. Data Collection

When creating a feature collection of the same type of IWXXM messages (e.g. METARs), further named as "bulletin", the aggregating centre or service identifier and date/time group of when the collection was created will be indicated within the XML message. The aggregating centre metadata will be defined as part of a globally accepted GML/XML model.

Only regular reports (e.g. METAR and TAF) will be aggregated. Non-regular reports (e.g. SIGMET, SPECI, AIRMET and VAA) will NOT be aggregated.

A single bulletin will only contain TAC or IWXXM, never both.

A single file will contain only one bulletin.

3.1.5. Transmission & Routing

Given the size and character set of IWXXM messages, it will not be possible for these messages to be transmitted via AFTN. The file containing the bulletin will be compressed, and FTBP under Extended AMHS will be used to exchange IWXXM data internationally through the AFS.

The principles of exchanging IWXXM data on AMHS are further described in section 5.1.4 but, in general, rules similar to those governing the exchange of TAC data are applied.

The WMO abbreviated header structure (TTAAiiCCCC) will be part of the filename of the FTBP and used as data identifier. The routing of IWXXM messages will associate this data identifier with AMHS address(es) that the message should be sent to.

As a file name extension, the gzip (.gz) suffix will be used to identify compressed data using globally agreed compression technique for meteorological data.

Note: The number of FTBPs and the maximum message size are subject to the AMHS specifications and recipients User Capabilities. It would be highly desirable to have a common agreed maximum limit size for AMHS messages between all ICAO Regions. A total size of AMHS message (including FTBP) up to 4MB should be considered, as already defined in some Regions. The available network path between the Originator and Recipient must be completely AMHS with FTBP support for successful message delivery. It does not necessarily require each COM Centre in the path to operate AMHS in Extended Services to relay an AMHS message with FTBP. To ensure that delivery is within the capabilities of the recipient, it is advised that the User Capabilities are coordinated before the establishment of regular communications. In some Regions, this information may be available through Directory Services (X.500/EDS). The available bandwidth for each 'hop' in the network should be considered by COM Centres when switching to AMHS FTBP operations.

3.1.6. Compliance Testing

A command line validation tool for IWXXM compliance test is available at: https://github.com/NCAR/crux

3.1.7. IWXXM Versions, Compatibility Table and Update Policy

New IWXXM versions may be released at most two times a year, related to the WMO Fast Track Cycles. Since the Nov. 2021 release a new naming schema of IWXXM releases was introduced, referring to the respective Fast Track cycle.[1]

The versioning of IWXXM packages[2] follows the major.minor.patch schema. Major changes are the introduction of new packages / products, or compatibility breaking changes in existing packages. Major changes are generally related to Annex 3 Amendments, compatibility breaking changes for existing packages are strictly avoided. Minor changes may be caused by slight updates of existing packages or products, introduced by Amendments of Annex 3, too. Patches are bugfixes or slight enhancements with minimal operational impact. These changes might be published independently from Annex 3 Amendments.

For each IWXXM version, schemas, schematron rules, release notes and supporting information is published on the WMO Codes repository, https://schemas.wmo.int/iwxxm . Additional information, including a table

[1] For example, the IWXXM Version released in Nov. 2021 was named 2021-2, referring to the 2nd Fast Track Cycle in 2021.

[2] A package within an IWXXM Release could be considered as a single product, e.g. METAR, TAF, SWX, etc.

explaining which IWXXM version for each product has to be used after the respective applicability date of an ICAO Annex 3 Amendment, is maintained on the WMO IWXXM community page, at https://community.wmo.int/en/activity-areas/wis/iwxxm.

Outdated versions of IWXXM will stay published on https://schemas.wmo.int/iwxxm. This is a technical requirement when decoding and ingesting archived data. Therefore, there will be no change on IWXXM schemas once published. Nevertheless, which IWXXM version may be used for actual data is defined by the compatibility table mentioned before.

3.1.8. International OPMET Databank

In order to allow IWXXM data retrieval from International OPMET Databanks, a standard set of queries for IWXXM data will also need to be developed, agreed and documented. The initial interface for ad hoc requests for IWXXM data will follow similar rules as the TAC requests (refer to section 4.1.5). It is expected that the range of queries and the method of access will become more extensive as users migrate into a SWIM environment.

3.1.9. Aeronautical Information Metadata

IWXXM imports AIXM for describing aeronautical features as required by the individual type of report. This includes descriptions of an aerodrome or a flight information region (FIR). A challenge remains in obtaining the correct information, especially for centres that perform translation from TAC to IWXXM on behalf of another State. Therefore, obtaining this information from an authorized source (details to be determined) is implied, in order to provide the right piece of information that characterises the data (e.g. for a METAR, the airport location indicator and official airport name, and optionally its latitude, longitude, altitude etc …).

An aeronautical feature should ultimately be referenced in an IWXXM report by a link to a time instance of the feature managed by the respective authority, therefore avoiding possible inconsistencies between the transported metadata inside the IWXXM data and the state of this piece of aeronautical information at the indicated time of reference.

4 Functional requirements - Framework

This section is intended to describe the generalized elements which can be used to establish a framework for the exchange of IWXXM data, both intra- and inter-regionally. One key aspect is that the framework needs to be flexible to permit development of an intra-regional structure suitable to the requirements, but at the same time allow for establishment of controlled and coordinated exchange between Regions.

The framework is organized into a basic set of functions/type of operations as described in section 4.1. A list of requirements that should be met to carry out each respective function as well as illustrations on how these functions may be performed/combined are provided in the same section.

4.1 Functional definitions

4.1.1 Data Producer/Originating Unit

TAC Producer

The TAC Producer produces meteorological information in TAC format only.

IWXXM Producer

The IWXXM Producer produces meteorological information in IWXXM format. The IWXXM Producer may provide information in both TAC (until no longer required in Annex 3) and IWXXM forms.

Data Producer

The Data Producer function may be performed by an aeronautical meteorological station (e.g. producing a METAR), a MWO producing AIRMET or SIGMETs or by an Aerodrome Meteorological Office (AMO) providing TAFs. Figure 1 depicts a comparison of IWXXM and TAC producers.

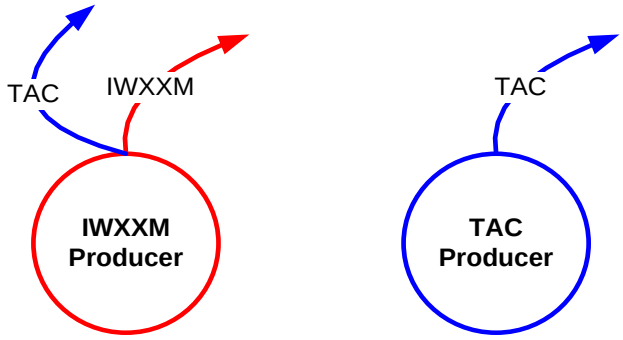

Figure 1: Comparison of IWXXM and TAC Producers

For an IWXXM Producer, the following functions could be the subject to compliance testing:

- The Producer output will conform to the IWXXM Schema;
- The Producer output will pass IWXXM Schematron/business rules; and
- The Producer will apply appropriate (defined) metadata following agreed ICAO rules and regulations.

4.1.2 Data Aggregator

This function takes individual IWXXM reports, decompresses them if already compressed, aggregates them (multiple METAR or TAF reports), applies the Feature Collection Model and then compresses the file containing the resulting information. The aggregation shall consist of one or more reports of the same type (e.g. METAR, TAF).

The 'Feature Collection Model' (Collect) is currently used to represent a collection of one or more GML feature instances of the same type of meteorological information. The intent is to allow XML encoded meteorological information to be packaged in a way that emulates the existing data distribution practices used within AFS. Figure 2 depicts the data aggregation process.

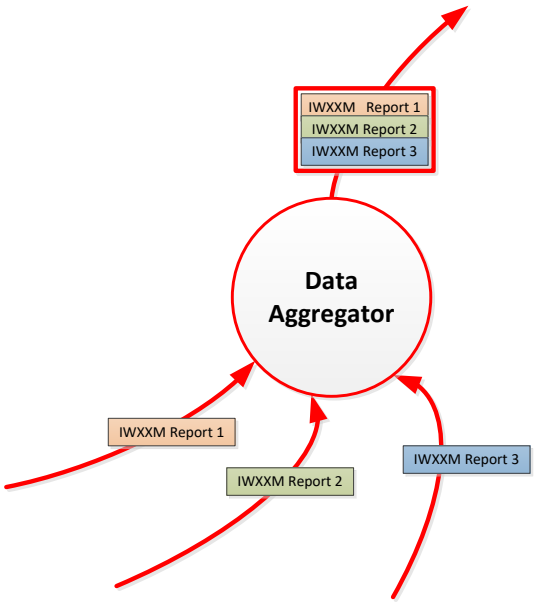

Figure 2: Data Aggregation

For an IWXXM Aggregator, the following functions could be the subject of compliance testing.

- The Aggregator output will conform to the IWXXM Schema;
- The Aggregator output will pass IWXXM Schematron/business rules;
- The Aggregator will apply a correct filename to its output;
- The Aggregator correctly compresses data applying an appropriate suffix; and
- The Aggregator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

4.1.3 Data Translation Centre

A data translator converts TAC data into IWXXM on behalf of their State and/or another State (i.e. when the data producer is unable to do so). A bi-lateral or regional agreement should be defined for such circumstances. To do so, it shall be able to parse incoming TACs and apply the data to IWXXM schema. It is expected that this will be carried out on a bulletin basis so that the translator will always be associated with a Data Aggregator function.

It is highly likely that not all incoming TAC messages will be translatable due to non-conformance with TAC standards. There will be a need to develop and implement procedures to address any non-compliant data, which may involve further translation where predefined arrangements have been made. Refer to section 5.3 for more details. Figure 3 depicts the Data Translator generating IWXXM messages from TAC.

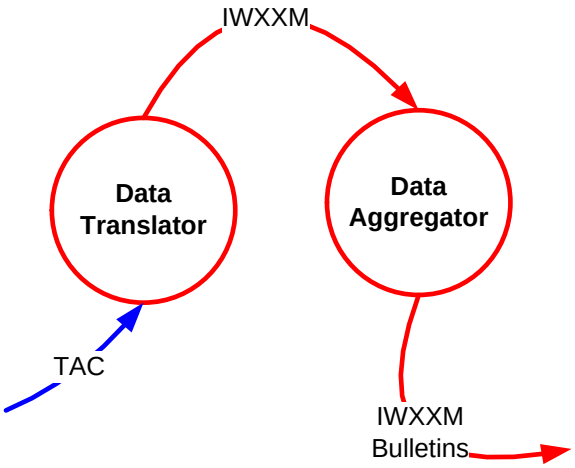

Figure 3: Data Translator generating IWXXM from TAC

Note: A Translation centre should also perform Aggregator functions. Whilst the IWXXM Schema may be extended for national translation purposes, an emphasis on maintaining the purity of the schema should be maintained. Where extensions to the schema are proposed to be disseminated internationally, these should follow the WMO extension mechanism for extending the schema and the extensions should be standardised where possible with other States, so that the benefits of the extensions use can be realised by all ICAO members.

4.1.4 Data Switch

A Data Switch will route IWXXM data according to the TTAAiiCCCC part of the filename of the FTBP. The filename including the current WMO bulletin header will be structured as follows (WMO naming convention A):

A_TTAAiiCCCCYYGGgg*BBB*_**C**_CCCC_YYYYMMddhhmmss**.xml**.gz

Where the elements in black and bold are fixed elements and:

- TTAAiiCCCCYYGGgg is the current WMO header with the date time group
- *BBB* is ***optional*** (as usual),
- CCCC is the repeated CCCC part from TTAAiiCCCC,
- YYYYMMddhhmmss is the date/time group

Note: gzip is used in the MET domain. The ideal situation is to define the same compression technique for all types of ICAO data. If different compression techniques were to be required, they will need to be coordinated and globally agreed upon.

The routing table will associate this TTAAiiCCCC data identifier with the AMHS addresses where the data should be sent to. The compressed file will be named with the suffix appropriate to the compression and sent onto AMHS.

FTBP name examples with METAR from LFPW:

A_LAFR31LFPW171500_C_LFPW_20151117150010.xml.gz

1st retarded bulletin: A_LAFR31LFPW171500RRA_C_LFPW_20151117150105.xml.gz

1st corrected bulletin: A_LAFR31LFPW171500CCA_C_LFPW_20151117150425.xml.gz

T1T2 (from TTAAii) for aviation IWXXM data types:

The WMO, in WMO-No.386 - *Manual on the Global Telecommunication System,* defines the following data type designators:

- Aviation Routine Reports (METAR) LA
- Aerodrome Forecast (TAF) (VT < 12 hours) LC
- Tropical Cyclone Advisory LK

- Space Weather Advisory LN
- Special Aviation Weather Reports (SPECI) LP
- Aviation General Warning (WS SIGMET) LS
- Aerodrome Forecast (TAF) (VT >= 12 hours) LT
- Volcanic Ash Advisory LU
- Aviation Volcanic Ash Warning (WV SIGMET) LV
- AIRMET LW
- Aviation Tropical Cyclone Warning (WC SIGMET) LY

Figure 4 depicts the aggregation of TAC and IWXXM data.

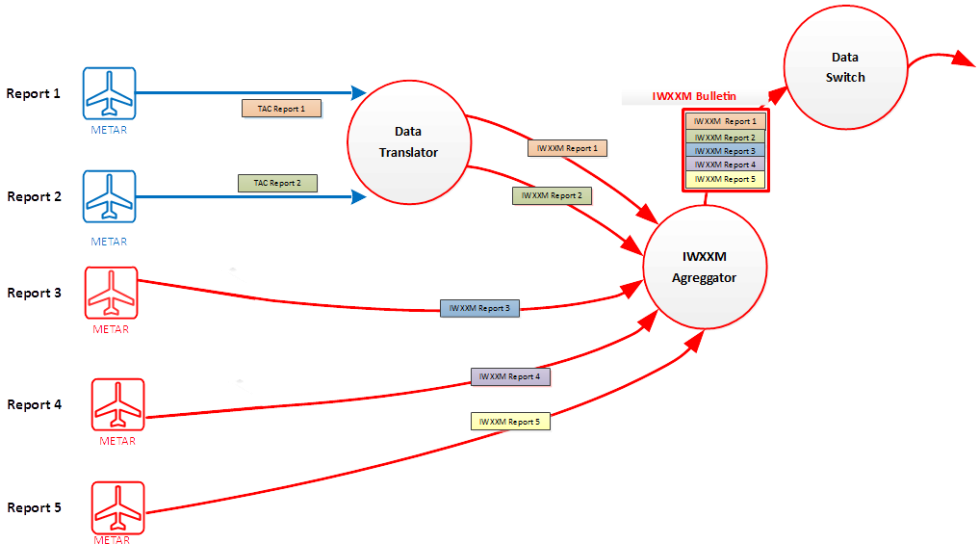

Figure 4: Aggregation of TAC and IWXXM data

4.1.5 International OPMET Databank

An International OPMET Databank (called Regional OPMET databank (RODB) in some regional documentation) will provide the capability for users to request IWXXM data through the AFS in much the same way as the RODBs currently and provide global TAC data.

The databank function shall not translate TAC messages to IWXXM format. Such translation should be done upstream by a Translation Centre, unless the Databank has formal arrangements to convert TAC to IWXXM on behalf of a State.

Although the implementation of Net Centric Services is beyond the scope of this document, the Databank element could provide Net Centric services in addition to the AFS based IWXXM interrogation capabilities. As soon as agreed descriptions of the interface to request data via web-services are available, this additional feature may be added for the Databank.

For an IWXXM OPMET Databank, the following functions could be the subject of compliance testing:

- The Databank output shall conform to the IWXXM Schema;
- The Databank output shall pass IWXXM Schematron/business rules;
- The Databank has an AMHS interface supporting FTBP;
- The Databank shall only send the response back to the originator;
- The Databank shall aggregate the reply reports according to the same rules used by the Data Aggregators;

- The Databank shall apply a correct filename to its output;
- The Databank correctly compresses data applying an appropriate suffix; and
- The Databank shall respond correctly to the standard interrogations.

Figure 5 below illustrates a possible implementation of an OPMET Databank with combined TAC and IWXXM functionalities.

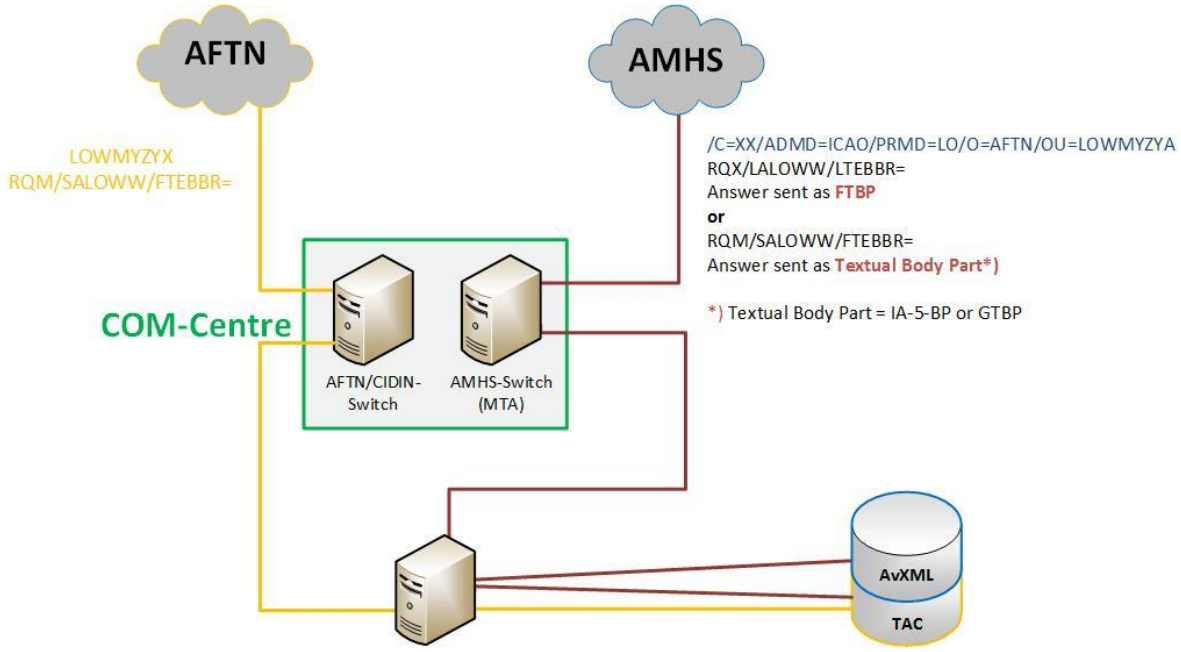

Figure 5: The implementation of a combined TAC & IWXXM Databank

Technical principles:

- Interfaces:
  - the Databank has an AMHS P3 connection to the AMHS Message Transfer Agent (MTA) of a COM centre; and
  - in case the COM Centre still serves AFTN users, the Databank may have a separate AFTN connection to the COM Centres AFTN switch or alternatively, the COM Centre will take care of the AFTN-AMHS conversion.
- Databank tables: data in IWXXM and data in TAC are stored in separate sets of tables.

Operational principles:

- Databank Requests
  - Requests for TAC data can be sent via AFTN or via AMHS as international reference alphabet number 5 (IA5) text). These requests will continue to work as described in the current RODB ICDs.
  - Requests for IWXXM data shall be sent via AMHS as Textual Body Part.
  - Requesting data in IWXXM will work in a similar way as requesting TAC data. The above example uses a syntax similar to the TAC requests, but:
    - "RQX/" is used as the start of the query; and
    - Only the new IWXXM T_1T_2 message types defined by WMO are allowed.

    For example: RQX/LALOWW/LTEBBR/LSLFFF=
  - Requests for TAC data and requests for IWXXM data shall not be mixed.

- Any violation of the above principles (e.g. the request “RQX/LSLOWW=” received via AFTN), will result in an automatic reply sent by the databank, informing the user that this is not allowed.

- Databank Replies
  - Replies to TAC requests will continue to work as described in the current RODB ICDs.
  - Reply reports of an IWXXM request will be aggregated into one or more files, according to the same rules used by the Data Aggregators, e.g. no mixing of message types in one file.
  - These files will be compressed and a correct file name with appropriate suffix supplied.
  - These files will be sent as FTBP through AMHS and directory services should be used to ensure the recipient is capable to receive this
  - The RODB ICDs will specify an extended set of standardised information & error replies.

5 Generation and use of IWXXM

The IWXXM format is not intended to be read in its raw form by humans. It is intended as a structured, 'machine to machine' message that is then subsequently processed for human interpretation/interaction.

5.1 Operational Status Indicator (Permissible Usage)

Under certain circumstances it has been and will continue to be necessary to distribute meteorological information for test and exercise purposes. To support this need, the IWXXM schema may incorporate non-operational flags.

5.1.1 Definition of Operational and Non-Operational messages

An operational message is one that is intended to be used as the basis for operational decision making. As such, the content of the message may result in decisions that may affect any or all phases of flight by any authorised and competent stakeholder (i.e. air navigation service providers (ANSPs), airport authorities, pilots, flight dispatchers etc). Recipients of such messages (either automatic or human) would therefore expect that the information is sourced from a competent entity and that originating equipment (e.g., sensors) are serviceable and that any human involvement is carried out by qualified, competent personnel.

A non-operational message is one that is not intended to be used for operational decision making, even though it may contain realistic data (particularly during an exercise). Recipients of such messages shall ignore the content of the message with regard to decision making. Non-operational messages may be further classified as either being related to a Test or an Exercise.

Definition of Test and Exercise.

There is no official definition of a test or exercise message. In some instances, the two words are used interchangeably. Since the use of Test or Exercise indicators would only be used in messages identified as Non-Operational, there are circumstances where one may be more appropriate than the other.

Test messages may be issued for the following reasons:

- As an ad-hoc message to test distribution of a particular message, such as SIGMET when, for example, a new system is installed at an originating centre.
- As part of a more organised test of message routing for non-scheduled messages such as SIGMET.
- As part of the process to introduce IWXXM messages by a particular entity. In this instance, IWXXM messages may be issued on a regular basis over a period of weeks or months in advance of operational status.

In the above cases the messages may contain either realistic data or no data.

Exercise messages may be issued for the following reasons:

- As a national or regional (or more rarely 'global') organised event intended to permit stakeholders to become familiar with the data content of messages. An example would be for regional Volcanic Ash Exercises where stakeholders wish to provide training and 'desk top' scenarios for rare events.

Under exercise scenarios, the messages will contain realistic data (though not necessarily valid data). For instance, volcanic ash exercises sometimes use volcanic ash data based on historical wind patterns to ensure that the requisite training is provided (i.e. to ensure the volcanic ash data impacts particular FIRs).

5.1.2 Technical Detail on the Operational Status Indicator

Operational Messages:

- Every IWXXM message that is issued for operational purposes shall set the IWXXM element name 'permissibleUsage' to Operational.
- Under such circumstances no other information relating to the operational status shall be included.

Non-Operational Messages:

- Every IWXXM message that is issued for non-operational purposes shall set the IWXXM element name 'permissibleUsage' to Non-Operational.

- Under such circumstances, it will be necessary to provide additional information relating to the reason for the non-operational status.
- The 'permissibleUsageReason' field shall be set to either Test or Exercise.
- The ' permissibleUsageSupplementary' field should contain a short description to provide further information. This is a free text field and is intended to contain the reason for the test or exercise. For example;
  - A Volcanic Ash Exercise message may include the name of the exercise in this field 'EUR VOLCEX16'.
  - An organised regional SIGMET test may likewise include 'APAC SIGMET TEST 02 Nov 2016'.
  - For an entity initially issuing IWXXM data as it enters the final phase of transition to IWXXM, production may include 'TEST IWXXM DATA PRE-OPERATIONAL' or similar.
- Whilst the 'permissibleUsageReason' field may be left empty, this is not considered to be good practice. Where possible, the field should contain some description of the reason for the Test or Exercise.

The examples below are provided for reference:

Example 1: Operational IWXXM data

```
<IWXXM:CLASSNAME ... permissibleUsage ="OPERATIONAL">...</IWXXM:CLASSNAME>
```

Example 2: 'Test' IWXXM data

```
<IWXXM:CLASSNAME ... permissibleUsage ="NON-OPERATIONAL" permissibleUsageReason
="TEST" permissibleUsageSupplementary ="EUR SIGMET TEST
17/09/2018">...</IWXXM:CLASSNAME>
```

Example 3: 'Exercise' IWXXM data

```
<IWXXM:CLASSNAME ... permissibleUsage ="NON-OPERATIONAL" permissibleUsageReason
="EXERCISE" permissibleUsageSupplementary ="EUR VOLCEX
12/03/2018">...</IWXXM:CLASSNAME>
```

Notwithstanding the explicit inclusion of Test and Exercise indicators in all IWXXM messages, it is considered to be best practice to always forewarn stakeholders of Test events, and in particular Exercise events, whenever possible. The message originator, and/or the Exercise Coordinator where applicable, should consider the most appropriate method to notify stakeholders. A non-exhaustive list of methods would include: State Letter, Exercise Directives, administrative messages and emails.

It should be noted that, independently of the status of the data, the distribution of data should remain the same (whether the permissibleUsage is Operational or Non-Operational).

5.2 Unique GML:ID

The gml:id attribute is required to be unique within an XML/GML document. it is not difficult for an IWXXM message creator to make all gml:id unique with the use of, say, natural keys. However, when similar types of IWXXM messages, like METAR/SPECI or TAF, are aggregated (with the use of the Collect schema for example), there may be cases of overlap if natural keys are used.

Therefore, it is recommended Version 4 of Universal Unique Identifier (UUID - a 128-bit number) is used for gml:id to uniquely identify the object or entity. A fragment of IWXXM METAR message aggregated with Collect schema showing the use of UUIDv4 in gml:ids is as follow:

```
<collect:MeteorologicalBulletin … gml:id= "uuid.6f353602-12a1-40a7-b6b5-3edb14c6241e">

<collect:meteorologicalInformation>

<iwxxm:METAR … gml:id="uuid.15ff064a-6dc4-41e0-bafa-8ee78ed4dc25">

…
```

A schematron rule should be added from IWXXM v3 to mandate the use of UUIDs in gml:id for IWXXM messages.

5.3 Translating TAC to IWXXM

A Translation Centre will typically be placed after the NOC, ROC or RODB and its correction facilities, if any. Message correction is typically a function of the data originator, NOC or ROC, not the Translation Centre.

When generating the IWXXM message, the translator shall include IWXXM fields which define where and when the translation has been carried out in order to provide traceability. This shall be achieved by introducing agreed metadata elements (centre identifier and time stamp) that is part of IWXXM.

Annex 3 includes Test and Exercise fields in the TAC templates for SIGMET, AIRMET, VAA and TCA, since these non-scheduled messages may be issued during Tests and Exercises. These fields should be considered by Translation Centres when generating permissibleUsage IWXXM field. When uncertain, such as when translation fails, the IWXXM should always be presumed to be operational (refer to section 5.1) so that the original TAC message is available for reviewing by a human.

If tests or exercises are being attempted when TAC->IWXXM translation is occurring then results will likely be problematic as there is little chance that a TAC TEST message will go through a translation service with the created IWXXM message having the appropriate flags. Instead a “translation failed” is much more likely and will probably still be flagged “operational” .

.

5.3.1 Pre-requisites for Translation Centres

The following items are considered pre-requisite for data translation centres:

- Operate on a permanent 24/7 basis with 24-hour support;
- Maintain a robust network between MET node and national AFS node (example, redundant or dual connectivity for the telecommunication links);
- Maintain access to the incoming TAC data and outgoing IWXXM (an AMHS enabled AFS Centre supporting FTBP that is able to send IWXXM data to the AFS);
- Provide IWXXM bulletin compilation (collection) capability; and
- Maintain an archive of at least the last 28 days data and logs, of at least the last 2 months translation details (at minimum, full WMO header received, time of reception, rejection or not).

5.3.2 Data Validation

The data validation should be based upon the following:

- Annex 3 provisions / WMO regulations should be used as the basis of validating received TAC information.
- The most recent official version of the IWXXM schema/Schematron should be applied, unless an explicit agreement between the requiring centre and the Translation Centre is agreed.
- The format should be based upon WMO – No. 306, *Manual on Codes*, Volume I.1, Part A – Alphanumeric Codes FM where applicable; and the WMO FM201 (collect) and FM 205 (Met Information Exchange Model) should be followed.
- The aeronautical metadata descriptions follow AIXM schema. The process for updating metadata should be documented.

5.3.3 Incomplete (Partial) Translation

When TAC to IWXXM translation is necessary but fails, an IWXXM message of the corresponding type (METAR, TAF, etc.) without any translated MET parameters, but containing the original TAC message, should be disseminated to users for their manual interpretation. It is also recommended that, if possible and where agreed, an error message be sent to the TAC originator encouraging the TAC originator to re-issue a valid TAC message for subsequent translation and distribution. Another possible policy would consist in having regular monitoring for an agreed period, or an analysis of past data, and communicate back pertinent elements on errors in coding policy to data originators, regional data exchange working groups and/or some users, where agreed.

Transmitting an IWXXM message with minimum data will allow users to monitor only a single meteorological data stream, reducing the dependency on the TAC stream.

The following minimum set of data should be considered:

METAR:

METAR (COR) CCCC YYGGggZ

TAF:

TAF (COR/AMD) CCCC YYGGggZ

SIGMET/AIRMET:

CCCC SIGMET | AIRMET ... VALID YYGGgg/YYGGgg

VAA:

DTG, VAAC

TCA:

DTG, TCAC

SWXA:

DTG, SWXC

where " | " indicates a logical "OR", "(group)" indicates an optional group.

5.3.4 Monitoring Functions

The Translation Centre should monitor incoming TAC messages and keep statistics on the data received and IWXXM generated. The statistics collected should be based upon the detail of IWXXM Validation Statistics to be Gathered by ROCs an RODBs (section 7.1).

5.3.5 Validation of the Translator

A TAC to IWXXM Translator could be the subject of compliance testing of the following:

- The Translator output will conform to the agreed IWXXM Schema;
- The Translator output will pass IWXXM Schematron/business rules;
- The Translator will successfully translate a standard set of TAC test data;
- The Translator provides metadata related to when and where data have been translated (section) - such metadata conforms to the agreed metadata structure; and
- The Translator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

The test cases and operational tests to demonstrate the capability of the translator should be made available on request.

The expected data quality of incoming TAC data should be clearly stated and the limitation on the translator (e.g., what will be done/what will not or cannot be done) should be stated.

5.3.6 Commencement of Translation Services

It is recommended that initially, the Translator should generate data and set the Operational Status Indicator field as “non-operational” and disseminate the IWXXM to a reduced number of recipients wishing to receive the IWWXM to ensure that all the relevant procedures and operations are in place and are clearly understood.

If deemed necessary, a learning strategy could be applied such as the reception for an agreed defined period prior to the operational dissemination of the IWXXM data. During that period, there could also be another defined contact point on the TAC-producer side to be reached during business hours. In case of an incorrect/rejected TAC message, a procedure should be in place to contact the appropriate State and to request corrections to the incoming TAC.

The date to start the operational exchange of data should be agreed, as should an agreed date to review the continued provision (or cessation) of the service.

5.3.7 Translation Agreement

The Translation Agreement shall be maintained by the Translation Centre and applicant State. A copy of the agreement shall also be lodged with the relevant ICAO Regional Office. The following elements should be contained in the service agreement. The following elements should be contained in the service agreement:

- Hours of Translation Centre operations (24 hours, 365 days a year);
- Business contact details (e.g. name, phone, email) for both the Translation Centre and the applicant State;
- Operational (24Hr) contact details for both the Translation Centre and the applicant State;
- Details of which data is to be translated (e.g. WMO Header(s) of TAC data, locations indicators, frequency);
- Details of whether the originator should be notified, and the method of notification, when translation of individual messages fails;
- IWXXM distribution details (AFS addresses of recipients that are capable of receiving the IWXXM);
- Notice period for changes to the incoming TAC data;
- Details of which metadata should be used to derive the limits of airspace (boundaries, base, top);
- The process for updating aeronautical metadata;
- Archiving requirements; and
- Procedures on what will be done in case of a failure of all or part of the Translation Centre functionality.

6 Requirements to Transition

To achieve an efficient transition towards IWXXM, a range of activities are required that will impact not only the network itself, but also the Message Switching Systems and most of the end-user systems.

6.1 Transitioning to IWXXM

The following elements should be in place prior to the exchange of OPMET data in IWXXM format.

6.1.1 Managing the Transition

Regional group(s) should be designated to deal with the transition in order to further define and monitor:

- Intra-regional plans on AMHS infrastructure/links and IWXXM data exchange between the ROCs, and between the ROCs and RODBs.
- Intra-regional implementation plans on IWXXM data exchange by the States to their ROC.
- Agreement to define how the testing platform and software should be made available and accessible to each State.

It is desirable that responsible group(s) for managing the transition in each ICAO Region be identified and established, that could be responsible for defining the Regions structure and capabilities in the context of the framework.

Furthermore, a full liaison should be established and maintained between the ICAO groups in charge of meteorology & data exchange and groups in charge of the AFS network.

For data translation purposes, if there is a systematic need for the translation of data on behalf of a State, this may be performed by the dedicated ROC for the part of the Region under its Area of Responsibility and the IROGs for the inter-regional distribution.

6.1.2 Documentation

ICAO and WMO documentation and provisions describing the IWXXM code itself should be published and made available, as well as documentation referencing the appropriate schemas and rules in order to utilize the new format.

Cyber Security

Appropriate AFS security elements should be defined by the ICAO groups in charge of information management / networks in order to introduce the operational exchange of IWXXM data via extended AMHS.

It is recommended that appropriate malware and anti-virus precautions are exercised as a bare minimum when dealing with FTBP messages.

6.1.3 Operations

- ROCs & IROGs should have the capability to aggregate and switch IWXXM data.
- ROCs & IROGs may have the capability to act as translation centres.
- NOCs should be ready to exchange IWXXM data.
- RODBs should have all the capabilities to deal with both IWXXM and TAC data.
- IWXXM producers should have processes to manage updates to metadata.
- RODBs should implement and document a standard set of queries for IWXXM data.
- ROCs to have processes and procedures for the notifying, and implementing, changes to IWXXM bulletins (e.g. a Meteorological Notification (METNO) Procedure).

6.1.4 Processes

An established process should be defined to ensure that data generated by Data Producers are compliant. In order to promote the use of IWXXM, the process should be widely known and shared, with tools to check the compliance state of the data easily accessible and usable.

An identical process should be agreed to initiate and enable the IWXXM exchange between Regions.

An AMHS network with FTBP enabled should be available to support exchange IWXXM data between those States wishing to do so. Corresponding AMHS connections should be made available between those Regions exchanging IWXXM data.

Source of Metadata

Updated processes, or notification on modifications about aeronautical information metadata by the States, should be established, or metadata sources should be defined and agreed.

Action Plan to Reduce Formatting Errors

Actions plans based on monitoring results about OPMET data not following the agreed coding rules should be undertaken in order to assist States in detecting and correcting incorrect coding policies.

A procedure that the ROC may use on how to deal with errors in IWXXM-messages, in particular taking into account errors detected in converting TAC-reports is required. This procedure would ideally provide a clear description on how to report errors to a State that provides these data and clearly define the service and its limitation.

Inter-regional Cooperation/Coordination

The following should be in place:

- Processes and notification on modifications regarding IWXXM bulletins headers between adjacent Regions.
- Identification of the inter-regional exchanges solely based on required OPMET data. Actions plans to clearly define the inter-regional data/bulletins to be exchanged.
- Inter-regional plans to follow the AMHS infrastructure/links between AFS nodes supporting inter-regional data exchange of neighbouring IROGs.
- Implementation plans for inter-regional exchange between IROGs.
- A process to introduce IWXXM into the contingency plans for the IROGs.

6.1.5 Processes

Institutional and Technical Issues

- A communication plan should be established and enacted by ICAO and WMO to inform States and users about the IWXXM code, the metadata use, and the new procedures to retrieve ad hoc data from the RODBs.

Action Plan about Data Validation

- Regions should implement action plans to address data validation issues identified through monitoring of both TAC and IWXXM.
- Messages that do not pass validation against the XML schema will still be distributed and will not be rejected by ROCs/RODBs.
- States shall arrange the validation of their IWXXM messages against the corresponding XML schema and make corrections to the process of generating their IWXXM messages as necessary, as per quality management processes.
- The ROC/RODB should conduct validation of IWXXM messages within their Region/area of responsibility, excluding validation of 'State extensions'.
- ROC/RODBs should gather statistics on long-term validation results, broken down by State and Region, and provide this information to the relevant ICAO Regional Office and the relevant METP Working Group (in particular WG-MIE and the Meteorological Operations Working Group (WG-MOG)) to identify common or troublesome data quality issues.
- Users should be encouraged to continue to validate messages and remain responsible for ensuring that the received IWXXM messages are suitable for their purposes.
- Users should review the IWXXM PermissibleUsage field to determine whether the message is suitable for operational, test or exercise purposes.

Regional Coordination/Planning

The Regional group(s) designated to support the implementation of IWXXM should define and monitor:

- Intra-regional plans regarding AMHS infrastructure/links and IWXXM data exchange between the ROCs, and between the ROCs and RODBs.
- Intra-regional plans regarding the IWXXM data exchange by the States to their ROC.
- ROC Contingency Plans support the exchange of IWXXM data.

Inter-regional Cooperation/Coordination

- The inter-regional procedures to support notification of changes to AMHS infrastructure/links between IROGs and changes to IWXXM bulletins.
- The Contingency plans for the IROGs should include the exchange IWXXM data.
- It is proposed that bilateral agreements between neighbouring IROGs are set up for the translation of TAC data. This agreement should include notification processes on IWXXM data newly produced by the specific Region.

Figure 6 below provides an example of how an ICAO Region will interface with two other ICAO Regions. In this example, it is assumed that:

- There is no operational exchange of IWXXM data between Region 1 and Region 3.
- There is operational exchange of IWXXM data between Region 2 and Region 1.

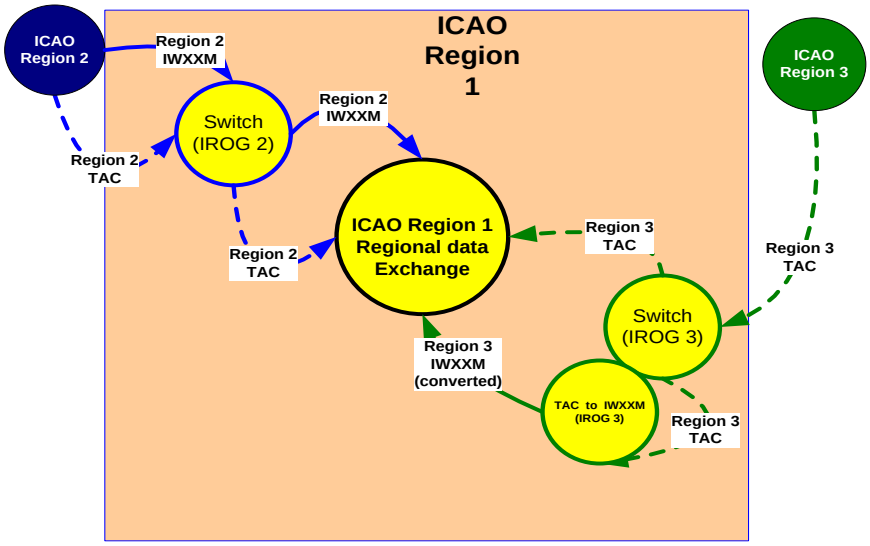

Figure 6: Inter-regional exchange of OPMET between Region 1 with Region 2 (IWXXM & TAC capable) and Region 3 (TAC capable)

6.1.6 METNO / Catalogue

It has been agreed that the METNO process, as used in the EUR and APAC regions, be used globally to advertise changes to the OPMET data distributed via the AFS. The METNO is used to keep data catalogues up to date, providing an overview of the actual available OPMET-data, without performing monitoring exercises all the time.

The suggested timeline for METNO from initial publication to change implementation is as follows. Changes become operational on AIRAC dates[3]. Regions currently using the METNO process have a role who acts as the Focal Point (FP) for the entire region. Regions adopting the METNO are advised to consider how this role could be established. Appendix C contains the detailed structure of the METNO.

Minimum date before	Action	Subsequent activity/ additional notes
29 days	NOCs wishing to make changes send planned changes to ROC	Via email
28 days	ROC collect changes in their area	usually by email/AFS
21 days	ROC sends collated changes to regional FP	FP reviews changes and shares with their regional group (usually RODBs & ROCs), usually by email/AFS
7 days	ROCs provide the AFS routing (addressing) of newly METNO registered OPMET bulletins (TTAAii CCCC) to the: 1) ROCs within its Area of Responsibility 2) NOCs within its Area of Responsibility and when data is eligible for inter-regional distribution 3) inter-regional IROGs within its Area of Responsibility.	At this point the changes in the METNO are fixed as systems will start making changes in anticipation.
Day 0	**Operational changes go live**	**This must be on an AIRAC date**

Table 1: Generic timeline for the METNO process

[3] AIRAC dates as published by EUROCONTROL https://www.nm.eurocontrol.int/RAD/common/airac_dates.html

7 Data Validation and Statistics

7.1 IWXXM Validation Statistics to be Gathered by ROCs an RODBs

Regions should invite their ROCs, IROGs, and/or RODBs to provide statistics about IWXXM data reception, state of compliance of the received data, IWXXM version used, data volume etc. as a measure of the state of IWXXM implementation.

This section defines the general rules about gathering statistics with the aim of providing and proposing a globally consistent way of defining such statistics, assisting the inter-regional comparison and providing a solid basis for the Regions to use those statistics as a way to measure IWXXM implementation progression.

7.1.1 Data and Type of Data

Regular Data

Location indicators used within IWXXM reports should be ICAO compliant (as available on the integrated Safety Trend Analysis and Reporting System (iSTARS)) and in conformance with the MET tables defined in the eANPs. It should be noted that the eANP only requires METAR and TAF for the AOP (Aerodrome Operations) aerodromes. In addition, if desired, statistics on the agreed exchange of METAR and SPECI for non-AOP aerodromes can be provided. A clear distinction should appear while presenting statistics to easily discriminate data related to AOP aerodromes from non-AOP aerodromes.

The statistics for IWXXM data should be identical to those provided for TAC data, so as to provide a clear comparison between TAC and IWXXM data produced for the same location and to provide the number of received messages per day (excluding NIL, corrected (COR) and amended (AMD)).

Whilst the validation of all messages is encouraged, NIL, AMD and COR messages should not be taken into consideration while producing statistics.

Non-regular data

The location indicators for non-regular data should also be ICAO compliant (as available on iSTARS) and in conformance with the MET tables defined in the eANPs. For SIGMET, and where applicable AIRMET, they refer to FIR, FIR/UIR, CTA.

Statistics should also be generated for VAA, TCA and SWXA.

7.1.2 Proposed Statistics

Availability

For regular data, availability statistics for IWXXM should be identical to those provided for TAC, so as to provide a clear comparison between the TAC and IWXXM data produced for the same location and to provide the number of received messages per day (excluding NIL, COR or AMD). For AIRMET and SIGMET, the cancelled data should not be considered. For VAA, TCA and SWXA, the number of advisories per Centre should be provided.

The statistics for VAA, TCA and SWXA is by nature more complex as Centres may refer to phenomena in other Regions, cover multiple FIRs and does not directly refer to location indicators. The distinction between an Advisory that concerns a specific AoR can only be derived by analysing the MET content. Therefore, basic statistics about Advisory reception by the ROC/RODB from the Advisory Centre may be considered as a starting point, without any consideration of the content.

Timeliness

Timeliness statistics for IWXXM data should be identical to those provided for TAC data, as to provide a clear comparison between TAC and IWXXM data produced for the same location. The statistics should take into consideration the same source of information as for availability.

Specific statistics about IWXXM model or version

IWXXM validation

The validation against schema/Schematron (i.e. success rate) should be provided. Statistics about the validation should be provided per IWXXM version and will provide a good indication on what data are produced for which IWXXM version.

IWXXM model versions

Statistics per station and per version should be provided. The statistics should provide information on which version is used for the dissemination of which data, per location indicator (and VAAC/TCAC/SWXC for VAA/TCA/SWXA).

Operational/non-operational data

Statistics of non-operational versus the total number of data (i.e. percentage of non-operational reports delivered) should be provided.

Incomplete/Partial Translations

Statistics of incomplete/partially translated versus the total number of reports should be provided.

Data volume

Statistics of total data volume for the same location indicator (VAAC/TCAC/SWXC for VAA/TCA/SWXA) and daily average/daily total volume should be provided.

Additional groups (extensions)

Some statistics could be presented about the number of data with extensions versus the total number of data (with and without extension) per location indicator (VAAC/TCAC/SWXC for VAA/TCA/SWXA).

Another statistic about the daily average/ daily total volume of extensions compared to the total volume of data per location indicator (VAAC/TCAC/SWXC for VAA/TCA/SWXA) could also be provided.

Optional statistics

ROCs/RODBs could also choose to provide additional statistics about validation failure, to identify deviations from the models, which could be used to derive systematic errors such as the inclusion of additional data elements via methods other than the global agreed way, non-conformance on cardinality or NIL reason for missing mandatory Annex 3 elements.

7.1.3 Statistics Presentation

Statistics should be made available and presented per ICAO Region, then per State, then per location indicator (CCCC) with each time an aggregation of the provided statistics from the sub-levels to the upper level (CCCC → State → Region). For VAA/TCA/SWXA, it should be presented per Advisory Centre.

The statistics should be collated on a daily basis, then by monthly basis. The statistics could be provided offline, the day after or some days after.

7.2 IWXXM Validation Statistics to be Gathered by SADIS & WIFS

The SADIS and WIFS Provider States are investigating the value and effort to produce global sets of statistics based upon the data received at their gateway. The details are likely to be the same or similar to those produced by ROCs or RODBs but this is yet to be confirmed.

8 Acronyms and Terminology

AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AIRMET	Information concerning en-route weather phenomenon which may affect the safety of low-level aircraft operations
AIXM	Aeronautical Information Exchange Model
AMHS / ATSMHS	Air Traffic Services Message Handling System
AMO	Aerodrome Meteorological Office
Annex 3	Annex 3 to the Convention on International Civil Aviation, *Meteorological Service for International Air Navigation*
AOP	Aerodrome Operations
AoR	Area of Responsibility
APAC	ICAO Asia/Pacific Region
Collect	Feature Correction Model
COM	Communication
DB	Databank
eANP	Regional (electronic) Air Navigation Plan
EUR	ICAO European Region
FIR	Flight Information Region
FIXM	Flight Information Exchange Model
FP	Focal Point. A regional role to coordinate METNO changes
FTBP	File Transfer Body Part
GANP	ICAO Global Air Navigation Plan
GML	Geography Markup Language
IAoR	Inter-regional Area of Responsibility
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IHE	IPM Heading Extension(s)
IPM	Interpersonal Messaging (AMHS)
IROG	Inter-regional OPMET Gateway
iSTARS	integrated Safety Trend Analysis and Reporting System
IUT	Implementation Under Test
IWXXM	ICAO Meteorological Information Exchange Model
METAR	Aerodrome Routine Meteorological Report
METP	ICAO Meteorology Panel
MTA	Message Transfer Agent
MWO	Meteorological Watch Office
NDR	Non-Delivery Report

NOC	National OPMET Centre
OGC	Open Geospatial Consortium
OID	Object Identifier
OPMET	Operational Meteorological Information
P3	Message Submission and Delivery Protocol
ROC	Regional OPMET Centre
RODB	Regional OPMET Databank (International OPMET Databank)
RQM	Meteorological Databank Request in TAC-format
RQX	Meteorological Databank Request in IWXXM-format
SADIS	Secure Aviation Data Information Service
SIGMET	Information concerning en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations
SPECI	Aerodrome Special Meteorological Report
SWIM	System-Wide Information Management
SWXA	Space Weather Advisory
SWXC	Space Weather Advisory Centre
TAC	Traditional Alphanumeric Code Form
TAF	Aerodrome Forecast
TCA	Tropical Cyclone Advisory
TCAC	Tropical Cyclone Advisory Centre
UA	User Agent
VAA	Volcanic Ash Advisory
VAAC	Volcanic Ash Advisory Centre
WAFS	World Area Forecast System
WG-MIE	ICAO METP Working Group on Meteorological Information Exchange
WG-MOG	ICAO METP Meteorological Operations Working Group
WIFS	WAFS Internet File Service
WMO	World Meteorological Organization
XML	Extensible Markup Language

Appendix A: AMHS Profile Information to Support IWXXM Exchange

1. Introduction

A number of standards have been established by the International Standards Organization (ISO) for Message Handling Systems.

In order to describe which standards or group of standards, together with options and parameters, are needed to accomplish a function, it is necessary to specify a profile. Such profiles have been standardized by ISO and are known as International Standardized Profiles (ISPs). Profiles standardize the use of options and other variations in the base standards and deal primarily with the use of implemented capabilities in order to meet requirements for interoperability and efficient interworking.

ICAO Doc 9880 - *Technical Specifications for ATN using ISO/OSI Standards and Protocols*, Part II - *Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS)* contains the detailed technical specifications for ATSMHS (i.e. AMHS) based on a number of international standards and ISPs, complemented by additional requirements. The basic and the extended AMHS services meet the basic requirements of the respective ISPs but additional features and supplementary functions are incorporated as necessary in ICAO Doc 9880, Part II. In order to express conformance requirements, i.e. static capability, ICAO Doc 9880, Part II uses the classification defined in the ISPs to include different levels of support (mandatory, optional, etc.). These requirements, applying to the related parameters or elements are specified in the form of Profile Requirement Lists (PRLs). In a limited number of cases, the PRLs may also include dynamic behaviour requirements, using another classification also defined in the ISPs.

It is noted that the classification of a feature as mandatory in the ISPs corresponds to a requirement regarding static capability, i.e. the ability to generate and/or receive, encode and/or decode a specific parameter, but not to use this parameter in every message sent or received. The same logic is applicable to ICAO Doc 9880, Part II and, as an example, the EUR AMHS Manual.

Furthermore, it is recalled that in ICAO Doc 9880, Part II, for the Basic AMHS, the interface between the ATS Message User Agent and the ATS Message Server has been left open, since this is often an implementation matter local to each AMHS Management Domain. Conversely, for the Extended AMHS, implementation of a P2/P3 or P2/P7 profile compliant with the relevant MHS ISP (among ISP AMH23 to AMH26) is mandated.

The question of compliance with a P2/P3 or P2/P7 ISP for AMHS conformance should be addressed in the context of an implementation making use of some functionalities part of the Extended Service (i.e FTBP), but not of the whole of it. In particular, it is not specified whether a partial Extended Service implementation which does not include AMHS Security requires conformance with one of the AMH23 to AMH26 profiles or not.

User agents may be implemented exclusively for the support of a specific application/service. Such dedicated user agents may not need to implement all the features defined by ICAO Doc 9880, Part II, and parts of regional AMHS Manuals, where defined. For example, dedicated user agents implemented for the exchange of OPMET data formatted based on the IWXXM model are not supposed to generate messages with SS priority. Similarly, these user agents are not expected to receive messages with SS priority, although this could happen at the reception direction, at least by mistake.

Mandating implementation of features which are not required by the application/service served by certain user agents may generate additional complexity and impose implementation delay, effort and cost, without any operational benefit. In order to eliminate such impediments and facilitate the adoption of the AMHS by end users, the need of defining application/service oriented AMHS profiles, which clarify requirements and may relax some of them by mandating less features than the current AMHS specification, should be recognized. The definition of an IWXXM profile which is applicable to explicit, limited environments, i.e. submission of OPMET data, taking into consideration which features are useless for the specific application/service. The relaxed requirements concern message submission only.

Implementations complying with an application/service oriented AMHS profile are accepted for connection to the AMHS, although possibly not fully compliant from a formal standpoint, provided that conformance to the AMHS IWXXM profile is verified.

2. AMHS Profile for OPMET IWXXM data exchange

AMHS is the intended communication means for MET IWXXM data exchanges using FTBP.

AMHS UAs complying with ICAO Doc 9880, Part II and where applicable, with the additional provisions of regional AMHS Manual, are capable to originate and receive AMHS messages containing such data. The support by UAs of IHE, defined in ICAO Doc 9880, Part II as part of the Extended AMHS, is additionally required but represents a minor upgrade already available in several UA implementations.

However, to ensure unambiguous interpretation of messages upon reception, and to facilitate their origination, it is necessary to establish a detailed specification of X.400 and AMHS parameters to be adopted for conveyance of such messages, including those associated with the AMHS FTBP.

2.1. Scope of the profile

This profile specification is established for application by AMHS UAs submitting and/or receiving OPMET data in IWXXM format through a P2/P3 or a P2/P7 interface, implemented as part of the following centres or systems:

- National OPMET Centre (NOC)
- Regional OPMET Centre (ROC)
- Inter-regional OPMET Gateway (IROG)
- Regional OPMET Databank (RODB)
- Any terminal or system receiving or requesting OPMET data in IWXXM format from one of the above centres/systems

This specification is based on the following assumptions, which identify topics out of scope of the AMHS profile, which are addressed in the MET domain:

- The MET domain may add further data types to the IWXXM without affecting the AMHS profile. It is assumed that irrespective of the data format (bulletin or report), the MET domain will always pass an unstructured binary file with a defined file-name to the AMHS.
- Data compression will always be performed in the MET domain. The AMHS will not perform compression.
- The MET Domain will define procedures for the submission of RQX messages to RODBs.

2.2. Definition of the profile

A profile based on the exclusive use of the Extended Service shall be used. As a result, the IHEs need to be used to carry the ATS priority, Filing time and Optional Heading Information. However, only some of the functional groups which are part of the Extended Service are needed for the profile, namely FTBP and IHE. More specifically, the profile does not require support of AMHS security.

2.3. Number of body parts

The IPM body shall contain exactly one body-part which is an FTBP.

The body part selection shall be as represented using the following tabular description.

Ref	*Element*	*Doc 9880 static support (Extended Service) Orig/Rec*	*Doc 9880 reference*	*Dynamic action upon generation of IWXXM message*	*Value and/or comments*
Part 2: AMH21/A.1.3 IPM body					
1	ia5-text	O/M		X	
1.2	data	M/M	3.3.3	X	
10	bilaterally-defined	O/M	3.3.5	X	
Part 3: AMH21/A.1.3.1 Extended body part support					
1	ia5-text-body-part	O/M		X	
9	bilaterally-defined-body-part	O/M	3.3.5.1	X	
11	general-text-body-part	M/M	3.3.3 and Part 4, Table 3-1	X	
12	file-transfer-body-part	M/M	3.3.5.1 and 3.3.5.2	G	AMH21/ A.1.3.3
M = mandatory support (static support) O = optional support (static support) or optionally generated (dynamic behaviour) G = generated X = not used					

Table 2: Body part selection for the IWXXM profile (derived from ICAO Doc 9880 Part II Tables 3-1 and 3-2)

2.4. Selection of IPM heading parameters and parameter values

The IPM Heading parameter selection and values are listed in Table 2 below.

Ref	*Element*	*Doc 9880 static support (Extended Service) Orig/Rec*	*Doc 9880 reference*	*Dynamic action upon generation of IWXXM message*	*Value and/or comments*
Part 1: AMH21/A.1.2 IPM heading fields					
1	this-IPM	M/M	3.1.2.2.1, 3.1.4.2.1 (AMH21 support)	G	
2	originator	M/M		G	Address of the originating OPMET system (MET switch)
3	authorizing-users	O/M		X	
4	primary-recipients	M/M		G	Recipient addresses are populated by the MET switch based on its routing table (EUR Doc 033 section 5 .1.4)
5	copy-recipients	M/M		X	
6	blind-copy-recipients	O/M		X	
7	replied-to-IPM	M/M		X	
8	obsoleted-IPMs	O/M		X	
9	related-IPMs	O/M		X	
10	subject	M/M		G	This field shall carry the TTAAiiCCCCYYGGgg BBB part of the filename of FTBP. It is assumed that the subject field is easier to access for human operators in case of retrieval or analysis of transferred messages
11	expiry-time	O/M		X	
12	reply-time	O/M		X	
13	reply-recipients	O/M		X	
14	importance	O/M		X	The receiving UA shall assume that this field takes its default value (“normal”)
15	sensitivity	O/M		X	
16	auto-forwarded	O/M		X	
17	extensions	M/M	3.3.4.1	G	
17.6	authorization-time	M/M	3.3.4.2	G	Equivalent to filing time
17.12	originators-reference	M/M	3.3.4.3	X	To avoid confusion with the use of this field in the IHE context (where it is carrying data converted to/from AFTN OHI)

Ref	*Element*	*Doc 9880 static support (Extended Service) Orig/Rec*	*Doc 9880 reference*	*Dynamic action upon generation of IWXXM message*	*Value and/or comments*
17.13	precedence-policy-identifier	M/M	3.3.4.5, 3.3.4.6 and 3.3.4.7	G	OID value {iso (1) identified-organisation (3) icao (27) atn-amhs (8) parameters (0) amhs-precedence-policy (0)} (see Doc 9880, 3.3.4.7)
Part 4: AMH21/A.1.5 common data types					
1	RecipientSpecifier				
1.2	notification-requests	M/M	3.3.6	X	
1.2.1	rn	M/M	3.3.6	X	IWXXM never use priority SS
1.2.2	nrn	M/M		X	Doc 9880 does not foresee the presence of nrn-request
1.4	recipient-extensions	M/M	3.3.4.1	G	
1.4.3	precedence	M/M	3.3.4.8	G	Equivalent to priority GG: precedence value = 28 (TAF, METAR/SPECI, and also in case of AMD, COR or RTD reports/bulletins) Equivalent to priority FF: precedence value = 57 (AIRMET, SIGMET, VAA, TCA)
2	ORDescriptor				
2.1	formal-name	M1/M1		G	Used for originator-address and recipient-addresses

M = mandatory support (static support)
M1 = mandatory O/R name minimal support (static support)
O = optional support (static support) or optionally generated (dynamic behaviour)
G = generated
X = not used

Table 2: IPM Heading parameters for the IWXXM profile
(derived from ICAO Doc 9880 Part II Table 3-2)

2.5. Content of body parts

The parameters composing the FTBP shall be in line with the details provided in Table 3 below.

The reference to the EUR DOC 020 have been indicated to provide more details, if needed.

Ref	*Element*	*ATS Messaging Service Profile - static support Orig/Rec*	*European ATS Messaging Service Profile - Reference*	*Dynamic action upon generation of IWXXM message*	*Value and/or comments*
1	related-stored-file	-			
2	contents-type				
2.1	document-type				
2.1.1	document-type-name	M/M	A.2.4.2.1	G	default OID value: 1.0.8571.5.3 {iso(1) standard(0) 8571(8571) document-type(5) unstructured-binary(3)}
3	environment				
3.1	application-reference				
3.1.1	registered-identifier	O/M	A.2.4.2.2 and A.2.4.2.6	G	OID value: 1.3.27.8.1.2 {iso (1) identified-organisation (3) icao (27) atn-amhs (8) application (1) digital-met (2)}
3.4	user-visible-string	O/M	A.2.4.2.6	G	“Digital MET”
4	compression	-			See para below
5	file-attributes				
5.1	pathname				
5.1.1	incomplete-pathname	O/M	A.2.4.2.3	G	bulletin file name as specified in section 5.1.4
5.5	date-and-time-of-last-modification	O/M	A.2.4.2.4	O	
5.13	object-size				
5.13.2	actual-values	O/M	A.2.4.2.5	O	
6	extensions	-			
M = mandatory support (static support) O = optional support (static support) or optionally generated (dynamic behaviour) G = generated X = not used					

Table 3: File Transfer parameters for the IWXXM profile

Compression of the data to be transferred, if needed, shall be performed in the MET domain before creating the FTBP. This avoids using the “compression” field of FTBP, reduces the UA complexity and limits the FTBP functionality to message exchange mechanisms.

The IWXXM data itself shall be included in the FileTransferData element of the file-transfer-body-part. It should be noted that ISO/IEC 10021-7 / ITU-T X.420 (section 7.4.12) specifies the ASN.1 encoding to be used, and that ISO/IEC ISP 12062-2 (section A.1.3.1) expresses additional recommendations regarding this encoding, which should be “octet-aligned EXTERNAL”. Only one EXTERNAL component should be used.

2.6. Selection of used P3/P1 envelope parameter values

The mapping of P2 parameters onto P3 envelope parameters shall be as specified in ICAO Doc 9880 and X.420.

IPMs with a precedence value of 28 shall use the priority abstract-value “non-urgent”. IPMs with a precedence value of 57 shall use the priority abstract-value “normal”.

The encoded-information-types in the P3 submission-envelope shall be limited to the OID value specified for FTBP (see ITU-T X.420:1999 7.4.12.8, 20.4.c and Annex C), i.e. OID {joint-iso-itu-t(2) mhs(6) ipms(1) eit(12) file-transfer(0)}.

2.7. Relaxed requirements from complete AMHS specification

Implementers must be aware that due to the “relaxed” status of the requirements above, any of these requirements may be reverted back to a “mandatory” status in a future profile version, as soon as the need for the corresponding missing feature(s) appears operationally. Conformance with the profile implies a commitment to support such evolutions in the profile, which may be considered as “return-to-normal” in terms of AMHS conformance.

Appendix B: Sample Tests for NOCs to Conduct when Introducing IWXXM

1. Proposed Conformance Tests

General description

This section proposes a list of functional tests that allows verification of conformance of User Agent (UA) implementations dedicated for OPMET IWXXM data exchange.

The proposed conformance tests are divided to three categories:

- profile specific submission tests;
- profile specific delivery tests; and
- submission and delivery tests.

The scope of the profile specific submission and delivery tests is to ensure conformance of UA implementations specifically deployed for the conveyance of OPMET IWXXM data to the respective profile. A test identification scheme of the form WXMxnn has been used, where x=1 is used for submission tests and x=2 for delivery tests. Wherever applicable and to provide more details, reference to the respective EUR AMHS Manual Appendix D-UA test is made.

Specific UA conformance testing is to ensure that UA implementations dedicated for OPMET IWXXM data exchange will not malfunction upon reception of a field or element not defined by the specific profile, but classified as mandatory in the ISPs and thus also mandatory in AMHS.

2. Tests

Profile specific submission tests

WXM101	**Submission of an IPM including a bulletin consisting of METAR**
Test criteria	The test is successful if the UA submits an IPM including a bulletin consisting of METAR according to the profile defined in Appendix A of this document

Scenario description	Submit from the UA under test an IPM including a bulletin consisting of METAR.
	
	Check that:
	• the P3 submission-envelope includes the following parameters with the correct values:
	  ○ *originator-name*: OR-name of the originator
	  ○ *recipient-name*: OR-name of each recipient of the message
	  ○ *content-type*: 22
	  ○ *encoded-information-types*: OID 2.6.1.12.0
	  ○ *priority*: non urgent
	• the following IPM heading fields are present with the correct values:
	  ○ *originator*: address of the originating OPMET system (MET switch)
	  ○ *primary-recipients*: recipient addresses as populated by the MET switch
	  ○ *subject*: TTAAiiCCCCYYGGggBBB part of the filename of FTBP
	  ○ *importance*: normal, if present
	  ○ *authorization-time* of the IPM heading extensions field: equivalent to filing time
	  ○ *precedence-policy-identifier* of the IPM heading extensions field: OID 1.3.27.8.0.0
	  ○ *originators-reference* of the IPM heading extensions field: absent
	• the following elements in the common data types are present with the corresponding values:
	  ○ *precedence*: 28
	  ○ *formal-name*: originator address and recipient addresses
	• the elements *rn* and *nrn* in the common data types are absent
	• the message has exactly one file-transfer-body-part
	• the parameters composing FTBP are according to ISO/IEC ISP 12062-2 (see section A.2.4.2 of the EUR AMHS Manual Appendix B) and the following elements are present with the correct values:
	  ○ *document-type-name*: OID 1.0.8571.5.3

	○ *registered-identifier*: OID 1.3.27.8.1.2 ○ *user-visible-string*: 'Digital MET' ○ *incomplete-pathname*: bulletin file name as specified in section 5.1.4 for example: A_LAFR31LFPW171500_C_LFPW_20151117150010.xml.[compression_suffix] ○ If generated, check the element *date-and-time-of-last-modification* ○ If generated, check the element *actual-values*, the value of which represents the size of the Attachment data in bytes • the elements *related-stored-file*, *compression* and *extensions* of the FTBP parameters are absent • The IWXXM data itself are included in the FileTransferData element of the file-transfer-body-part; the octet-aligned encoding should be used.
EUR AMHS Manual, Appendix D-UA ref:	CTUA1501, FTBP Capability

WXM102	**Submission of IPMs including bulletins of different file size consisting of METAR**
Test criteria	The test is successful if the UA submits several IPMs including bulletins of different file size consisting of METAR according to the profile defined in Appendix A of this document.
Scenario description	Submit from the UA under test a sequence of several IPMs including each time a bulletin of different file size consisting of METAR. The size of the message should not exceed the limit defined in the regional AMHS Manual. Check all parameters listed in test case WXM101, with the corresponding values. If the element *actual-values* is generated check each time the respective value, which represents the size of the Attachment data in bytes.
EUR AMHS Manual Appendix D-UA ref:	CTUA1501, FTBP Capability with different body-part size

WXM103	**Submission of an IPM including a bulletin consisting of SPECI or TAF**
Test criteria	The test is successful if the UA submits an IPM including a bulletin consisting of SPECI or TAF according to the profile defined in Appendix A of this document
Scenario description	Submit from the UA under test an IPM including a bulletin consisting of SPECI. Check that all parameters and their respective values are in accordance to test case WXM101, except that the value of the element *incomplete-pathname* is according to the bulletin file name as specified in section 5.1.4. The test is repeated with the submission of an IPM including bulletin consisting of TAF.
EUR AMHS Manual Appendix D-UA ref:	CTUA1501, FTBP Capability

WXM104	**Submission of an IPM including a bulletin consisting of AIRMET**
Test criteria	The test is successful if the UA submits an IPM including a bulletin consisting of AIRMET according to the profile defined in Appendix A of this document.
Scenario description	Submit from the UA under test an IPM including a bulletin consisting of AIRMET.

	Check that all parameters and their respective values are in accordance to test case WXM101, except that: • the *priority* abstract value of the P3 submission-envelope is normal • the value of the element *precedence* is 57 • the value of the element *incomplete-pathname* is according to the bulletin file name as specified in section 5.1.4.
EUR AMHS Manual Appendix D-UA ref:	CTUA1501, FTBP Capability

WXM105	**Submission of an IPM including a bulletin consisting of SIGMET or VAA or TCA**
Test criteria	The test is successful if the UA submits an IPM including bulletin consisting of SIGMET or VAA or TCA according to the profile defined in Appendix A of this document.
Scenario description	Submit from the UA under test an IPM including a bulletin consisting of SIGMET. Check that all parameters and their respective values are in accordance to test case WXM101, except that: • the *priority* abstract value of the P3 submission-envelope is normal • the value of the element *precedence* is 57 • the value of the element *incomplete-pathname* is according to the bulletin file name as specified in section 5.1.4. The test is repeated with the submission of an IPM including bulletin consisting of VAA. The test is repeated with the submission of an IPM including bulletin consisting of TCA.
EUR AMHS Manual Appendix D-UA ref:	CTUA1501, FTBP Capability

Profile specific delivery tests

WXM201	**Delivery of an IPM including a bulletin consisting of METAR**
Test criteria	The test is successful if an IPM, including a collection consisting of METAR, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.

Scenario description	The MTA sends an IPM including a bulletin consisting of METAR.
	Check that the UA under test receives the IPM with the following parameters:
	• the message delivery envelope includes the following parameters with the correct values:
	  ○ *originator-name*: OR-name of the originator
	  ○ *this-recipient-name*: OR-name of the recipient to whom the message is delivered
	  ○ *content-type*: 22
	  ○ *encoded-information-types*: OID 2.6.1.12.0
	  ○ *priority*: non urgent
	  ○ *message-delivery-identifier*: it shall have the same value as the message-submission-identifier supplied to the originator of the message when the message was submitted (X.411, section 8.3.1.1.1.1)
	  ○ *message-delivery-time*: it contains the time at which delivery occurs and at which the MTS is relinquishing responsibility for the message (X.411, section 8.3.1.1.1.2)

	• the following IPM heading fields are present with the correct values:
	  ○ *originator*
	  ○ *primary-recipients*
	  ○ *subject*: TTAAiiCCCCYYGGggBBB part of the filename of FTBP
	  ○ *importance*: normal, if present
	  ○ *authorization-time* of the IPM heading extensions field: equivalent to filing time
	  ○ *precedence-policy-identifier* of the IPM heading extensions field: OID 1.3.27.8.0.0
	  ○ *originators-reference* of the IPM heading extensions field: absent
	• the following parameters in the common data types are present with the corresponding values:
	  ○ *precedence*: 28
	• the elements *rn* and *nrn* in the common data types are absent
	• the message has exactly one file-transfer-body-part
	• the parameters composing the FTBP are according to section A.2.4.2 of the EUR AMHS Manual Appendix B and the following elements are present with the correct values:
	  ○ *document-type-name*: OID 1.0.8571.5.3
	  ○ *registered-identifier*: OID 1.3.27.8.1.2
	  ○ *user-visible-string*: 'Digital MET'
	  ○ *incomplete-pathname*: bulletin file name as specified in section 5.1.4 IWXXM CONOPS, for example: A_LAFR31LFPW171500_C_LFPW_ 20151117150010.xml. [compression_suffix]
	  ○ If generated, check the element *date-and-time-of-last-modification*
	  ○ If generated, check the element *actual-values*, the value of which represents the size of the Attachment data in bytes
	• the elements *related-stored-file*, *compression* and *extensions* of the FTBP parameters are absent
	• The IWXXM data itself are included in the FileTransferData element of the file-transfer-body-part; the octet-aligned encoding should be used.

EUR AMHS Manual Appendix D-UA ref:	CTUA1601, FTBP Capability

WXM202	**Delivery of IPMs including bulletins of different file size consisting of METAR**
Test criteria	The test is successful if several IPMs, including bulletins of different file size consisting of METAR, sent by an MTA are received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	The MTA sends a sequence of several IPMs including each time a bulletin of different file size consisting of METAR. Check that the UA under test receives all IPMs and that the parameters described in test case WXM201 are received with the corresponding values. If the element *actual-values* is present check each time the respective value, which represents the size of the Attachment data in bytes.
EUR AMHS Manual Appendix D-UA ref:	CTUA1601, FTBP Capability with different body-part size

WXM203	**Delivery of an IPM including a bulletin consisting of SPECI or TAF**
Test criteria	The test is successful if an IPM, including a bulletin consisting of SPECI or TAF, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.

Scenario description	The MTA sends an IPM including a bulletin consisting of SPECI. Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except the element *incomplete-pathname* which value is according to the bulletin file name as specified in section 5.1.4. The test is repeated with the delivery of an IPM including a bulletin consisting of TAF.
EUR AMHS Manual Appendix D-UA ref:	CTUA1601, FTBP Capability

WXM204	**Delivery of an IPM including a bulletin consisting of AIRMET**
Test criteria	The test is successful if an IPM, including a bulletin consisting of AIRMET, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	The MTA sends an IPM including a bulletin consisting of AIRMET. Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except that: • the *priority* abstract value of the P3 submission-envelope is normal • the value of the element *precedence* is 57 • the value of the element incomplete-pathname is according to the bulletin file name as specified in section 5.1.4.
EUR AMHS Manual Appendix D-UA ref:	CTUA1601, FTBP Capability

WXM205	**Delivery of an IPM including a bulletin consisting of SIGMET or VAA or TCA**
Test criteria	The test is successful if an IPM, including a bulletin consisting of SIGMET or VAA or TAF, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	The MTA sends an IPM including a bulletin consisting of SIGMET. Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except that: • the *priority* abstract value of the P3 submission-envelope is normal • the value of the element *precedence* is 57 • the value of the element incomplete-pathname is according to the bulletin file name as specified in section 5.1.4. The test is repeated with the delivery of an IPM including a bulletin consisting of VAA. The test is repeated with the delivery of an IPM including a bulletin consisting of TCA.
EUR AMHS Manual Appendix D-UA ref:	CTUA1601, FTBP Capability

The execution of the delivery tests defined in EUR DOC 020 (EUR AMHS Manual) Appendix D-UA is encouraged.

However, if this is not possible, the following test list from EUR DOC 020 (EUR AMHS Manual) Appendix D-UA is suggested.

Basic Delivery Operations (A2)	
CTUA201	Deliver an IPM to the Implementation Under Test (IUT) – basic capability (A2)
CTUA203	Deliver an IPM containing optional-heading-information in the ATS-message-header
CTUA204	Deliver an IPM containing different kinds of recipient addresses
CTUA206	Deliver an IPM with invalid originator address similar to CAAS
CTUA207	Deliver an IPM with invalid originator address similar to XF

Specific Delivery Operations	
CTUA401	Deliver a non-delivery report (NDR) to an AMHS user

Enhanced Delivery UA Capability	
CTUA601	Deliver an IPM with the implemented capability of one body-part
CTUA602	Deliver an IPM with the implemented capability of two body-parts

Delivery Operations (A2-IHE)	
CTUA1201	Deliver an IPM with IHE to the IUT – basic capability (A2-IHE)
CTUA1203	Deliver an IPM with IHE, containing optional heading information
CTUA1204	Deliver an IPM with IHE, containing different kinds of recipient address

Specific Submission Operations with IHE	
CTUA1303	Checking of default envelope elements (flag setting) in submitted IPMs with IHE

Specific Delivery Operations with IHE	
CTUA1401	Deliver a non-delivery report (NDR) to an AMHS user

Enhanced Delivery UA Capability with IHE	
CTUA1602	Deliver an IPM with IHE with the implemented capability of two body-parts

Appendix C: FORMAT of a METNO bulletin

The below METNO structure is designed to be used by an authorised data producer of Meteorological data to notify neighbouring NOCs, ROCs, RODBs and regional centres of additions, deletions and changes to their regularly distributed products. This notification is expected to be sent ahead of the change date so receivers systems can have the changes incorporated and as well as ARINC distribution.

As of 2023, there are 2 ICAO regions (APAC & EUR) that already use this approach to publicising impending changes. They have some additional expectations specified in their respective operations handbooks:

- EUR: EUR Doc 18 (EN) , current Edition 12.[4]
- APAC https://www.icao.int/APAC/Documents/edocs/2022-03_ROBEX-HB_14th-Ed.pdf

The regional handbooks may contain more information pertinent to the respective areas. If there is no further localised provisions for your region then this document should apply.

description	format	Fictitous example snippits
METNO header	**NO**AA**99** CCCC YYGGgg - AA : 2 character area designator - CCCC : issuing centre - YYGGgg : day hour minute issue time in UTC	NOBX99 EBBR 162359
Message Identifier (METNO) + Product Description (EUR OPMET) + AIRAC Date (YYMMDD) that these changes will be applied (usually 21 days ahead)	**METNO** <area> **OPMET** YYMMDD	**METNO EUR OPMET 220714** for a message issued from Brussels to the European area issued 16th June 2022 (previous line above) for changes becoming live 14th July 2022
Adding a new bulletin This is to be used when a completely new bulletin is planned to be distributed	**NEWBUL** TTAAii CCCC LocID,LocId… - TTAAii CCCC – proposed header information of new bulletin - LocId… – a list of CCCCs of each ICAO location to be included in this bulletin	**NEWBUL FCMJ31 LWSK LWSK LWOH** **NEWBUL WVCZ31 LKPR LKAA**

[4] Link to document Folder on the ICAO EUR/NAT website: https://www.icao.int/eurnat/pages/eur-and-nat-document.aspx?RootFolder=%2FEURNAT%2FEUR%20and%20NAT%20Documents%2FEUR%20Documents%2FEUR%20Documents%2F018%20-%20OPMET%20Handbook

Deleting a Bulletin This is to be used when an existing bulletin is planned to be discontinued. There is no need to mention all the contained location(s)	**DELBUL** TTAAii CCCC, or **DELBUL** TTAAii CCCC FIR/UIR for Non-Routine bulletin where applicable	**DELBUL FTOS31 LOWM** **DELBUL WSRA31 ALAK UATT**
To add report(s) to existing an bulletin: This statement is used when a new location indicator(s) is added to an already registered bulletin N.B. this specifies the changes to the bulletin not the before or after state	**ADDRPT** TTAAii CCCC LocId(s) - Adding reports LocId(s) to bulletin TTAAii that is issued by CCCC	**ADDRPT FCTU33 LTAA LTAJ LTCF LTCI LTFH** Notification to add reports for **LTAJ LTCF LTCI LTFH** to bulletin FCTU33 issued by LTAA
To remove report(s) from an existing bulletin N.B. this specifies the changes to the bulletin not the before or after state	**RMVRPT** TTAAii CCCC LocId(s) - removing reports LocId(s) from bulletin TTAAii that is issued by CCCC.	**RMVRPT FCSN31 ESWI ESOW ESSA ESSB ESSP ESSV** Notification to remove reports for ESOW ESSA ESSB ESSP ESSV in bulletin FCSN31 issued by ESWI
end of METNO	**END**	**END**
Notes: It is possible to combine a number of changes into a single METNO, even making multiple changes to a single report (remove some stations & add others). But caution is advised to avoid ambiguity. Also it is advised to keep changes in a single METNO contained to a single area (FIR etc). There is no provision for any use of wildcards (like "/")		Complete message: **NOBX99 EBBR 302359** **METNO EUR OPMET 221228** **NEWBUL FCMJ31 LWSK LWSK LWOH** **NEWBUL WVCZ31 LKPR LKAA** **DELBUL FTOS31 LOWM** **DELBUL WSRA31 ALAK UATT** **ADDRPT FCTU33 LTAA LTAJ LTCF LTCI LTFH** **RMVRPT FCSN31 ESWI ESOW ESSA ESSB ESSP ESSV** **END**

N.B the ADDRPT & RMVRPT describe the changes to a bulletin not the before or after state The registration of a new IWXXM bulletin by default no longer implies the introduction of the TAC equivalent. Or change to a existing bulletin. B.6.3.1.12 The registration of a new TAC OPMET bulletin does not automatically trigger the registration of an IWXXM bulletin equivalent.		

END