



**INTERNATIONAL CIVIL AVIATION ORGANIZATION
EUROPE AND NORTH ATLANTIC REGIONAL OFFICE**

ICAO Meteorological Information Exchange Model (IWXXM) Implementation Workshop

(Paris, France, 5 - 6 November 2019)

SUMMARY OF DISCUSSIONS

1. INTRODUCTION

1.1 The ICAO Meteorological Information Exchange Model (IWXXM) Implementation Workshop was held in Paris, France, from 5 to 6 November 2019. This event was organized by ICAO and the Data Management Group (DMG) of the Meteorology Group (METG) of the European Aviation System Planning Group (EASPG).

1.2 The workshop was attended by a total of 77 participants from 36 States, 4 industries, and ICAO. The list of participants and associated email addresses is at **Appendix A** to this Summary of Discussions.

1.3 The workshop recalled that Amendment 78 to Annex 3 applicable 5 November 2020 will require the exchange of OPMET data in IWXXM format for METAR, SPECI, TAF, SIGMET, AIRMET, Volcanic Ash Advisory (VAA), Tropical Cyclone Advisory (TCA) and Space Weather Advisory Information.

1.4 The workshop noted that IWXXM implementation is currently at 29% in the EUR Region for some elements, only one year away from the requirement date. Furthermore, the IWXXM survey conducted in 2015 resulted in an expectation that approximately 50% of States planned on completing this implementation by the end of 2018. This workshop was intended to assist in States in IWXXM implementation during the next year.

1.5 Mr. Wim Demol of Skeyes (Belgium) moderated the workshop and Mr. Christopher Keohan, Regional Officer, Meteorology (MET) was the Secretariat of the workshop.

1.6 Mr. Wim Demol highlighted that the participants of the workshop included a mix of COM, MET, IT, experts involved in ICAO and WMO global developments that would assist in making this workshop successful.

2. DISCUSSION

2.1 The workshop adopted the Agenda as provided at **Appendix B**.

Background information

SWIM & ICAO

2.2 The subject was addressed in **PPT01** presented by Belgium and the Secretariat. This presentation described the System Wide Information Management (SWIM) which consists of standards, infrastructure and governance enabling the management of ATM related information and its exchange between qualified partners via interoperable services. The workshop noted that within the governance of SWIM there are information exchange services, information exchange models and SWIM infrastructure. IWXXM is one of the information exchange models and a prerequisite for SWIM that lies in the information part of the SWIM scope. The workshop noted that OPMET data distribution uses a new ICAO message format IWXXM (coded in XML/GML) and a new communication technology, AMHS using File Transfer Body Part. However, the message distribution through the Regional OPMET Data Exchange (RODEX) scheme is ‘old school’, but a necessary first step towards SWIM.

2.3 The current inter-regional and intra-regional OPMET distribution was provided to the meeting. The question of how to adapt this distribution of data in the SWIM environment was posed and still undefined.

2.4 The ICAO structure on SWIM provisions (global level) and implementation (regional level) was also provided. Lastly, the new timeline that SWIM has been moved from Block 1 (beginning 2019) to Block 2 (beginning 2025) in the ICAO Global Air Navigation Plan (GANP) 2019 was presented.

ICAO high-level IWXXM implementation developments (including WMO, MET Panel (METP) Working Group on Meteorological Information Exchange (WG-MIE) and Information Management Panel (IMP))

2.5 The subject was addressed in **PPT02a** and **PPT02b** delivered by France and Germany. The IWXXM related work streams based on the Job Cards identified by the MET Panel were described in brief.

2.6 The main outcome of MIE/5 was that there would be a need to support more than one IWXXM version (some backward compatibility) and that updating to a new IWXXM version (either minor or major) will still require a system change (minor version would have backward compatibility). One significant outcome of MIE/6 was that the IWXXM Guidelines should specify how RODBs should provide OPMET information, when the requested IWXXM data is available in different IWXXM versions. IWXXM Guidelines will contain information on IWXXM versions, deletion and deprecation.

2.7 The workshop also noted that IWXXM Version 3.0.0 is required to implement by 5 November 2020. The future timeline of IWXXM versions will be structured by WG-MIE in coordination with WMO for global awareness in order to give enough time for software development and for data users (including ANSPs) to test and implement the new IWXXM version in a timely manner.

2.8 The workshop noted there is currently no plan for another major IWXXM version change thanks to the stability of TAC data (frozen unless a strong safety case is made) as well as the request by users to guarantee the backwards compatibility of upgrades. There will be an IWXXM version number 3.1.0 that includes updates for some OPMET elements.

2.9 Furthermore, WAFS SIGWX forecasts will be introduced in November 2022 and the associated schema should be developed for mid-2020 (Annex 3 and ICAO Doc 8896 to be updated). Progress has been made on investigating the elements that will make up the SIGWX IWXXM schema, but not yet finalized. In addition, identification of supplementary elements to support

SIGWX for Low-Level Flight operations will be pursued.

2.10 With reference to extensions, WG-MIE agreed there was a need to determine guidelines for developing; implementing, maintaining and documenting extensions and that there should be a repository for State extensions. An action was agreed to identify which extensions could become part (as optional elements) of the core MET information. This availability of the schema of a State extension is needed for validation. Furthermore, publication and amendment of State extensions should always be related to a specific IWXXM version and shall not be changed between releases. A procedure should be developed in order to notify users of an extension update.

2.11 Inter-Regional coordination entailed ensuring a complete delivery path over AMHS with File Transfer Body Part capabilities by using the approach taken in the EUR Region. That is, all COM Centres should inform the AMC of their capability to switch FTBP over AMHS. To improve inter-regional coordination on the notification of OPMET data dissemination between different ICAO Regions, harmonization of METNO procedures will be pursued beginning with the ICAO EUR and APAC Regions. This could result in an update of the EUR METNO procedure by changing from one to two AIRAC cycle time schedule.

2.12 It was envisioned that bulletins would cease with the implementation of SWIM. As long as RODEX is used as the MET-switching systems are based on headers to be switched, bulletins would remain. TAC cessation was envisioned to cease in 2026 in phased approach (details to be determined).

2.13 WMO TT-AvXML activities were provided in **PPT02b** presented by Germany. The workshop recalled the advantages of using IWXXM: georeferenced, use of extensions versus rigid TAC format, validation provides integrity of data.

2.14 WMO IWXXM schema approval process was provided: 1) Fast Track Amendment Procedure used for amendments that have minor financial or operational implications (e.g. a minor version or patch release) which takes six months from the completion of the draft amendment to implementation of the decision; 2) In Session / between Technical Commission Sessions Amendment Procedure that is used for amendments that have a noticeable financial or operational implications such as a major version release and takes eight months or more to complete.

2.15 An explanation on version numbering was provided: MAJOR.MINOR.PATCH. A MAJOR (X.y.z) version introduces major conceptual changes noting that forward data mapping is not guaranteed. A MINOR (x.Y.x) version introduces new model elements and capabilities noting forward data mapping is guaranteed. A PATCH (x.y.Z) version is limited to bug fixing noting forward and backward data mapping is guaranteed.

2.16 The difference from IWXXM 2.1.1 to 3.0.0 included: introduction of Space Weather Advisory and other Amendment 78 to ICAO Annex 3 changes; mandated the use of 2.5D for geospatial representation (in alignment with AIXM); simplified representation with the removal of OGC Observation & Measurement; enhanced schematron rules to include more checks to strengthen the validation process; and conducted numerous bug fixes and representation / code / documentation enhancements.

2.17 The workshop also noted that the schematron does not change without version number changes and therefore if a version is downloaded and no new versions issued, validating against an offline copy (e.g. on embedded systems or systems isolated from the internet) is an acceptable practice. It was unsure that the WMO/ICAO on-line validation tool was compliant with

IWXXM version 3.0.0; however, WMO will verify this in the coming weeks. Furthermore, the workshop noted with concern that the validation tool is probably not currently being maintained.

2.18 The workshop noted the ATM Information Reference Model (AIRM) is the ATM system-wide reference vocabulary for defining ATM information. The workshop was informed that to achieve semantic interoperability, features in XMs are mapped to concepts in AIRM. However, the current semantic mappings from IWXXM to AIRM were based on version 1.1 which has been deprecated noting that efforts are being made to refresh the mappings to IWXXM 3.0.

2.19 WMO recommended to ICAO WG-MIE to relax some IWXXM restraints due to TAC (e.g. min/max temp; dissipation of TC within forecast period; limit of 4 Runway Visual Range (RVR) reports per aerodrome; and 7 point polygon max for SIGMET), which was agreed by WG-MIE.

2.20 The workshop was informed of future weather objects to support as follows: WAFC SIGWX (high and mid-levels) features, Low-Level area forecast features, Regional Hazardous Warning Advisory features and high fidelity MET data.

Overview of Guidelines for the Implementation of OPMET Data Exchange using IWXXM in the EUR Region (EUR Doc 033)

2.21 The subject was addressed in **PPT03** delivered by the Data Management Group (DMG) member from Austria. The workshop noted that Traditional Alphanumeric Code (TAC) is not optimum for use as it is not geo-referenced, lacks validation, additional information not easy to include; lower temporal and spatial resolutions; and SWIM requires a machine readable format for web services. With reference to EUR Doc 033, the workshop reviewed the new functionalities and their definitions with a focus on current and new tasks for the various distribution centres. Technical aspects of IWXXM such as file naming, bulletin headers, variances to the IWXXM model versions, translation details, data collection, transmission and routing, compliance testing and aeronautical information metadata were reviewed.

2.22 The workshop noted that IWXXM compression in gzip is mandatory in the MET Domain.

Overview of Appendix H of the EUR AMHS Manual (EUR Doc 020)

2.23 The subject was addressed in **PPT04** delivered by the rapporteur of the AFS to SWIM Transition (AST) Planning Group (PG) from Greece. The workshop recalled that AMHS was identified to be the intended communication means for MET data exchange in the EUR Region, which is reflected in EUR Doc 033. Furthermore, an AMHS profile was developed for IWXXM and provided in Appendix H of the EUR AMHS Manual (EUR Doc 020). This was done so that User Agents do not necessarily have to support the full set of features specified in ICAO Doc 9880, Part II and Appendix B of the EUR AMHS Manual. Assumptions made in this profile were that the MET domain will always pass an unstructured binary file with a defined file-name to AMHS and data compression will always be performed in the MET domain.

2.24 Further changes to EUR Doc 020 can be made through a well-defined Change Control Mechanism and that other profiles for other domains (e.g. FIXM) could be considered in the future.

2.25 The workshop noted that AMHS can be used to exchange AIXM and FIXM noting that more global guidance is needed before adding associated profiles to Appendix H to EUR Doc

020. Furthermore, bandwidth constraint concerns should be monitored by the States (with use of IWXXM, AIXM and FIXM).

Steps on IWXXM implementation

2.26 This subject was addressed in **PPT05** delivered by the DMG member from Belgium based on outcomes of the 2016 Workshop on Implementing IWXXM for the exchange of OPMET data. These steps were provided for the various OPMET exchange positions (e.g. National OPMET Centre).

Bilateral testing

2.27 The subject was addressed in **PPT06** delivered by the DMG member from Austria. The workshop noted the IWXXM bilateral testing conducted by Austro Control and Roshydromet. Bilateral testing related to AMHS is in EUR Doc 020 Appendix H (profile specific submission tests, profile specific delivery tests and submission and delivery tests according to Appendix D-UA) noting that additional end-to-end testing related to MET (e.g. send MET data in IWXXM format to database and retrieve this data from database) would likely be captured in EUR Doc 033 through WG-MIE. To coordinate bilateral testing, all ROCs could consider work packages on testing with the NOCs to control the expected volume of testing during this year of implementation. Work packages related to IWXXM transition could include extension of translation services as well.

Status of IWXXM implementation including the use of extended AMHS

2.28 The subject was addressed by **PPT07**, **PPT08** and **PPT09** by the Secretariat. The workshop reviewed the IWXXM Survey Results from 2019; IWXXM implementation statistics (continuously monitored by updating via AIRAC Cycle information); and IWXXM translation agreements.

2.29 Survey results would be updated to reflect the IWXXM implementation for METAR and TAF for Belarus, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan and Uzbekistan. Furthermore, Bulgaria has provided implementation information in this regard. Italy was expected to provide updated information as well.

2.30 The workshop was reminded to use METNO procedures for informing of issuing IWXXM data (reference EUR Doc 018). The IWXXM aggregations must mirror the contents of the TAC bulletins.

2.31 The workshop noted that translation agreements under the AoR of ROC London would be updated from ROC Toulouse to ROC London by mid-2020. Furthermore, ROC TAC to IWXXM translation for another State may be extended beyond November 2020 and will be discussed at DMG with a proposal to METG30, but translation services are not intended to last forever.

Regional OPMET Data Banks (RODB)

2.32 This workshop noted that requests for IWXXM data (RQX) from the RODBs is not common and believed currently only done for testing purposes. In addition, the meeting noted that RODBs do not translate from TAC to IWXXM.

2.33 In the future, requests for information in context of SWIM from the RODBs should be coordinated with the method used for SADIS and WIFS, when developed.

IWXXM implementation

States

2.34 The subject was addressed in several presentations provided by Austria (**PPT10**), Belgium (**PPT11**), France (**PPT12**), Italy (**PPT13**), Serbia (**PPT14** by SMATSA Llc), and the Russian Federation (**PPT18** and **PPT22**). Many best practices in implementation were provided such as use of polygons in TAC SIGMET for translation purposes as well as METAR/TREND times expressed as METAR time as start time and METAR time plus 2 hours as end time.

2.35 The workshop noted that tests of the exchange of IWXXM data were very valuable for both the ROC and States. Issues such as the use of ‘lon lat’ (versus ‘lat lon’) in SIGMET have been discovered by conducting tests.

2.36 The workshop also noted the following States would implement IWXXM 3.0.0: Austria Q2/Q3 2020; Belgium Q1/Q2 2020; France Q1 2020; and Italy Q4 2020.

2.37 Other future plans included the generation of IWXXM at the source, development of web services and SWIM functionalities.

2.38 The workshop noted that the Russian Federation will issue a METNO on providing METAR and TAF in IWXXM format for Armenia and Turkmenistan and issue SIGMET and AIRMET in IWXXM format in early 2020. Lastly, advisory information will be available in IWXXM format by November 2020.

2.39 It was agreed that a Work Package should be opened by DMG per ROC / States in order to help States in their IWXXM transition plan and that it would help if it would take into account all aspects linked to this transition such as AMHS link creation with FTBP capabilities, translation service by the ROC where applicable, and testing MET data in IWXXM from source (State) to the ingestion by its associated ROC.

Industry

2.40 The subject was addressed in **PPT15** provided by IBL. A current status of IWXXM 3.0.0 and issues resolved were provided to the workshop. Visual monitoring of METAR and TAF was demonstrated such as using colour code by severity or comparison of METAR and TAF (e.g. observation worse than forecast – colour red).

2.41 The workshop discussed whether there is a need to provide constraints on how to visualize IWXXM data (TAC-like could be one example). However, the workshop made clear that as service providers, their main focus was to assure quality and standardized MET data was provided to the users and that it was up to the users to decide how to visualize the information. There has not been any identified needs by the users thus far (only by industry) and one reason maybe that they would likely use the same service provider for visualization of their flight documentation no matter where they are located.

Other developments (status of AIRM, AIXM, FIXM)

2.42 The subject was addressed in **PPT16** and **PPT17** provided by ICAO that included an overview of ICAO provisions on AIXM. AIXM enables the collection, verification, dissemination and transformation of digital aeronautical data throughout the data chain, in particular in the segment

that connects AIS with the next intended user. The following main information areas are in the scope of AIXM: Aerodrome/Heliport including movement areas, services, facilities, etc.; airspace structures; organisations and units, including services; points and Navaids; procedures; routes and flying restrictions.

2.43 The current version of Aeronautical Information Exchange Model (AIXM) is 5.1.1 and is controlled by the AIXM CCB. AIXM 5.2 expected to be available by the end of 2019 will enable the provision of ICAO data sets (except for terrain data) and include the initial global implementation of Digital NOTAM. This version of AIXM will also: support the new Runway Condition Report that becomes applicable in November 2020; support the provision of data related to “performance based” ICAO concepts, such as PBN, etc.; include data provision for emerging concepts such as free routes, large-scale use of RPAS, etc.; ensure the interoperability of aeronautical data (AIXM) with flight data (FIXM) and MET data (IWXXM); introduce a deprecation mechanism for features/properties that are no longer used or are replaced by a new concept; and correct issues and limitations detected in the previous versions.

2.44 AIXM 5.3 that is envisioned to be available in 2022 or later will align with the ICAO SWIM requirements and support Flight and Flow Information for a Collaborative Environment (FF-ICE) and time based operations (TBO) as well as ensure interoperability of AIXM with evolving needs of Flight Information Exchange Model (FIXM) and IWXXM.

2.45 As of December 2018 the overall status of implementation was 39% in the ICAO EUR Region noting there are interoperability issues on exchanging the data.

2.46 The workshop noted that the FIXM is an exchange model capturing Flight and Flow information that is globally standardized. FIXM is the equivalent, for the Flight domain, of AIXM and IWXXM both of which were developed in order to achieve global interoperability for, respectively, AIS and MET information exchange. Furthermore, FIXM is a family of technology independent, harmonized and interoperable information exchange models designed to cover the information needs of Air Traffic Management. The FF-ICE concept and the applicable ICAO provisions drive the common and international development of FIXM, and impose requirements on what FIXM will deliver.

2.47 The current version of FIXM is 4.1.0 and the documentation process is managed by the FIXM CCB. Implementation statistics are not yet available since the implementation process involves many stakeholders and considered complicated.

Inter-regional OPMET Gateways coordination

2.48 The subject was addressed in referencing the Interregional COM Chart dated 10 October 2019 presented by DMG.

Inter-regional developments

2.49 The subject was addressed in **PPT19**, **PPT20** and **PPT21** presented by Japan, United States and Brazil.

2.50 Japan provided the functions of RODB Tokyo and related networks and systems; AMHS connection with NAM (via KSLC) since they function as an IROG between APAC and NAM; AMHS connection planned under high priority with Hong Kong and Singapore; plan for OPMET bulletin exchange in IWXXM (system upgrade expected to be completed by March 2020);

IWXXM data volume analysis and present issues as well as concerns.

2.51 The United States provided the status of IWXXM implementation, and in particular, communications setup between the US National Weather Service and the Federal Aviation Administration (FAA). AMHS would be used for international exchange of OPMET data in IWXXM format and AFTN used internally. Currently, there is a plan for international testing between the United States and Cuba. Testing with other States in other Regions was welcomed.

2.52 Brazil provided the status of IWXXM implementation, and in particular, posed questions to the group such as source validation. WG-MIE was working on source validation in three ways (website linked with the AIP, authoritative source, and verification that data is unchanged). Exchange of OPMET data in IWXXM testing has been conducted with Chile and Venezuela, but more States encouraged testing this exchange with Brazil. In addition, the ICAO Regional Office in Lima may be able to assist in this coordination and provide implementation statistics for IWXXM and AMHS.

IWXXM links

2.53 The workshop noted the following useful links related to IWXXM:

Wikipedia <https://en.wikipedia.org/wiki/IWXXM>

WMO

WISWiki <https://wiswiki.wmo.int/tiki-index.php?page=IWXXM-3.0> (needs updating)
No. 306 Vol1.3 <https://wiswiki.wmo.int/tiki-index.php?page=ManualCodes3> (IWXXM 3.0 soon)
Schema repository <https://schemas.wmo.int/>
WMO Codes Registry <https://codes.wmo.int/>
Q&A – IWXXM implementors <https://groups.google.com/a/wmo.int/forum/#!forum/cbs-tt-avxml>
GitHub repositories (development only)
IWXXM <https://github.com/wmo-im/iwxxm/wiki/Common-approaches-across-exchange-models>
IWXXM UML Model <https://github.com/wmo-im/iwxxm-modelling>
TAC-to-IWXXM translation ex. <https://github.com/wmo-im/iwxxm-translation>
WMO/ICAO XML Web Validator <http://wmo-icao-validator.rap.ucar.edu>

ICAO

Doc 10003 https://portal.icao.int/icao-net/ICAO Documents/10003_draft_en.pdf – under revision
Workshop <https://www.icao.int/EURNAT/Pages/Other-Meetings.aspx> - IWXXM 2019
Workshop

Any other business

2.54 Feedback was provided by Georgia in that the workshop was useful in answering many questions on the exchange of information on IWXXM implementation.

3. CONCLUSION

3.1 The moderator, Wim Demol, thanked the participants of the workshop for their good participation and the workshop concluded at 1500 on 6 November 2019.

IWXXM Implementation Workshop
5-6 November 2019, Paris

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ICAO Meteorological Information Exchange Model (IWXXM) Implementation Workshop

5 to 6 November 2019

ICAO EUR/NAT Regional Office, Paris

Draft Provisional Agenda

5 November 2019		
Time	Item	Lead
0900-0930	<i>Registration</i>	--
0930	Welcome and opening of the meeting , including: <ul style="list-style-type: none"> • Purpose and conduct of the Workshop; • Tour de table; and • Adoption of the provisional agenda. 	Secretary
0945	Background information , including: <ul style="list-style-type: none"> • SWIM & ICAO • ICAO high-level IWXXM implementation developments (including WMO developments, MET Panel Working Group on Meteorological Information Exchange (METP WG-MIE) and Information Management Panel (IMP)); 	Belgium PPT01 France/Germany PPT02a/PPT02b
1030	<i>Coffee break</i>	--
1045	Background information , including: <ul style="list-style-type: none"> • Overview of <i>Guidelines for the Implementation of OPMET Data Exchange using IWXXM in the EUR Region</i> (EUR Doc 033); 	Austria PPT03
1200	<i>Lunch</i>	--
1330	Background information , including: <ul style="list-style-type: none"> • Overview of Appendix H of the <i>EUR AMHS Manual</i> (EUR Doc 020) • Steps on IWXXM implementation; • Bilateral testing Status of IWXXM implementation including the use of extended AMHS: <ul style="list-style-type: none"> • Survey results 2019; • B1-AMET implementation status; 	Greece PPT04 Belgium PPT05 Austria PPT06 ICAO PPT07 ICAO PPT08

5 November 2019		
Time	Item	Lead
	<ul style="list-style-type: none"> • Translation agreements; • Regional OPMET Centres (ROC); • Regional OPMET Data Banks (RODB); • National OPMET Centres (NOC); <p>IWXXM implementation</p> <ul style="list-style-type: none"> • Input from States on updated plans 	ICAO PPT09 Belgium PPT11
1515	<i>Coffee Break</i>	--
1530	<p>IWXXM implementation</p> <ul style="list-style-type: none"> • Input from States on updated plans 	France PPT12
1615 - 1630	Open session and recap of the day	

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Time	Item	Lead
0930	<p>IWXXM implementation</p> <ul style="list-style-type: none"> • Input from States on updated plans 	Austria PPT10 Russian Federation PPT18 Italy PPT13
1030	<i>Coffee break</i>	--
1045	<p>IWXXM implementation (continued)</p> <ul style="list-style-type: none"> • Input from States on updated plans <p>(AMHS UA for MET systems implementing IWXXM messaging)</p> <ul style="list-style-type: none"> • Industry (IWXXM implementation feedback) <p>Other developments (status of AIRM, AIXM, FIXM)</p>	SMATSA Llc PPT14 Monitor Soft Ltd. PPT22 IBL PPT15 ICAO PPT16 & PPT17
1200	<i>Lunch</i>	--
1330	<p>Inter-regional OPMET Gateways coordination (e.g. harmonization of METNO procedures; e.g. COM Charts – AMHS from MID and EUR (MP check with Jeddah on exchanging IWXXM with Jeddah; AFI and EUR)</p>	DMG - comm chart Brazil PPT21 Japan PPT19 United States PPT20

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Time	Item	Lead
	Any other business Conclusions	
<i>1500</i>	<i>Close</i>	

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