



THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

Agenda Item 3: Enhancing the global air navigation system

3.1: System-wide information management (SWIM)

REVIEW ON COMPATIBILITY BETWEEN VERSIONS OF SWIM INFORMATION EXCHANGE MODEL

(Presented by the Republic of Korea)

EXECUTIVE SUMMARY

System-wide information management (SWIM) will be a future global platform for the exchange of information and provision of information services via internet protocol (IP) using globally standardized information exchange models (XMs). This paper presents information for development notes and status of each XM and highlights the necessity of compatibility between different XM versions.

Action: The Conference is invited to agree to the recommendation in paragraph 3.1.

1. INTRODUCTION

1.1 With the expected growth in aviation demand and the necessity of improvement in air navigation capacity and efficiency, air traffic management (ATM) system will be increasingly reliant on the accurate and timely information, which must be organized and provided by solutions that support system-wide interoperability and secured seamless information access and exchange. Evolution of information management is needed to integrate the ATM network on a system-wide information management (SWIM) basis.

1.2 SWIM is an integral part of the Global Air Navigation Plan (GANP, Doc 9750) and is covered in a number of aviation system block upgrades (ASBUs) modules, which is related to service improvement through digital aeronautical and meteorological information management and integration (digital ATM information management (DATM), aeronautical meteorology (AMET)), as well as operational performance improvement through flight and flow information for collaborative environment (FF-ICE) and trajectory-based operation (TBO). SWIM will be a future global platform for the exchange of information and provision of information services via internet protocol (IP) using globally standardized information exchange models (XMs) such as aeronautical information exchange model (AIXM), flight information exchange model (FIXM), ICAO meteorological information exchange model (IWXXM), etc.

2. DISCUSSION

2.1 There are currently three information exchange models used in SWIM: AIXM; FIXM; and IWXXM. FIXM and AIXM are managed and developed by each XMs' Change Control Board (CCB), whereas IWXXM is managed and developed by an ICAO expert group in coordination with the World Meteorological Organization (WMO). Latest versions of each XM are AIXM v5.1.1, FIXM v4.1.0 and IWXXM v2.1.1. XMs are being updated continuously in line with the needs and requirements of new information management. The roadmap of each XM is shown in Figure 1.

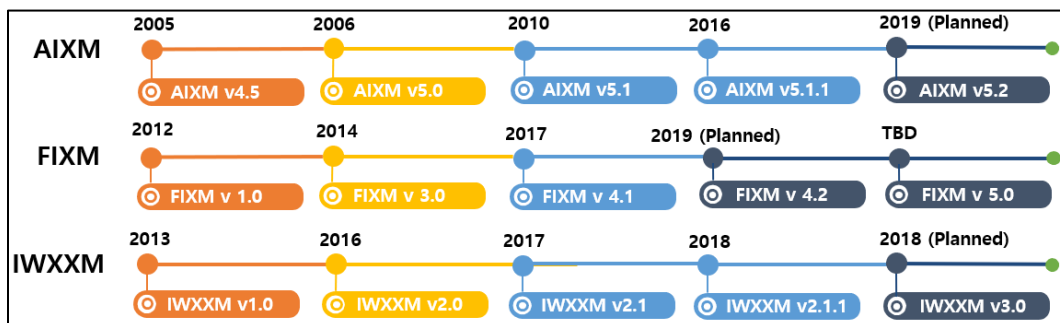


Figure 1. Roadmap of XMs

2.2 The SWIM operational concept and its information services are still in development. XMs should be updated accordingly to reflect newly introduced operational concept and new information services. However, the complete exchange and provision of information is not ensured at the moment when a producer and a consumer use different XM versions. As such, a review on the compatibility between different versions is required.

2.3 The compatibility analysis between different versions of XMs found that the complete transfer of information failed to be ensured due to particular data loss caused by addition/deletion of data elements and introduction of new capabilities during XMs updates. The details on the analysis are as follows:

- a) FIXM v 4.0, in comparison with the previous version, included new elements for FF-ICE and four-dimensional trajectory (4DT), and deleted non-common elements only used by the Federal Aviation Administration (FAA) or Eurocontrol. FIXM v 4.0 was not compatible with the previous version because there were major changes in the core. The latest version, FIXM v 4.1, further reflected the updated requirements for FF-ICE, and deleted partial elements of dangerous goods. However, forward/backward data mapping compatibility is ensured between FIXM v 4.0 and v 4.1;
- b) IWXXM v 2.0, in comparison with the previous version, included new weather information such as AIRMET, tropical cyclone advisory and volcanic ash advisory. IWXXM v 2.0 was not compatible with the previous version because of schematic change. However, the recently released version, IWXXM v 2.1.1, improved traditional alphanumeric code (TAC) to IWXXM translation and fixed minor bugs; and
- c) AIXM v 5.0, in comparison with the previous version, included full aeronautical information publication (AIP) contents and encoding of notice to airmen (NOTAM). AIXM v 5.0 was not fully compatible with the previous version because of

schematic change from custom scheme to geography markup language (GML)-compliant scheme. AIXM v.5.1, which was released in 2010, included coding specification for X-NOTAM, and the advanced AIXM v.5.1.1 was released in 2016. In result, forward/backward data mapping compatibility is ensured between AIXM v 5.1 and v 5.1.1.

2.4 Each XM is closely related to each other, but its development and management are maintained by different entities. To ensure common policy and approach between different domains, a cross-XMs coordination meeting was held in 2017. At the meeting, common versioning and scheme management issues were discussed. The meeting agreed the compatibility to be defined as data mapping compatibility without any data loss, and to be classified into forward and backward compatibility. Proposed common versioning method for cross-XMs was based on semantic versioning 2.0. and its three types of version updates are as follows:

- a) A MAJOR (X.y.z) update: includes major changes such as adaptation of new scheme, removal or addition of capabilities or elements. Forward/backward compatibility is not guaranteed;
- b) A MINOR (x.Y.z) update: includes new capabilities or elements. Forward/backward compatibility is guaranteed for non-deprecated elements or deprecated elements with replacement; and
- c) A PATCH (x.y.Z) update: uses for bug fix. Forward/backward compatibility is guaranteed.

2.5 When SWIM is implemented without any compatibility between different versions of XMs, an additional implementation of a converter would be required to exchange information, and this will result in a complexity of management, additional costs and a validation of conversion. In cases where such introduction of a converter is inevitable for specific circumstantial reasons, a mapping guidance against the major changes or update should be developed (by ICAO) for the effective implementation of the converter.

3. CONCLUSION

3.1 The Conference is invited to agree on the following recommendation:

- a) request ICAO to distinguish XM elements into non-changeable and changeable elements and determine non-changeable elements as soon as possible to minimize the issue of compatibility in SWIM implementation; and
- b) request ICAO to provide a mapping guidance, when there is a major change or update, to implement a converter efficiently.

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