International Civil Aviation Organization

WORKING PAPER

A38-WP/265
TE/119
12/9/13
English only

ASSEMBLY — 38TH SESSION

TECHNICAL COMMISSION

Agenda Item 36: Air Navigation — Emerging Issues

USE OF A GLOBAL DIGITAL ATM DATA MODEL AND EXCHANGE FORMAT IN THE CONTEXT OF ASBU PERFORMANCE IMPROVEMENT AREA 2

(Presented by the United Arab Emirates)

EXECUTIVE SUMMARY

In supporting the Aviation System Block Upgrades in the Performance Improvement Area 2 (Globally Interoperable Systems and Data), the development and the implementation of a common model and a data exchange format for the aeronautical digital data is one of the fundamentals of the transition to aeronautical information management (AIM).

This paper presents the UAE's progress towards the transition to AIM and the recommendations for enhancing the harmonization and the interoperability of the digital aeronautical data exchange.

Action: The Assembly is invited to:

a) recommend the recognition of the need for a long-term and stable solution for the digital AIM in terms of a data model and a data exchange format;
b) recommend to develop Standards and Recommended Practices (SARPs) and guidance material in support of a global adoption f data model and a data exchange format for the digital AIM; and
c) support the continuous improvement and update of AIXM 5.1 in order to address the new concepts and developments emerging from the Performance Improvement Area 2, Digital ATM.

Strategic Objectives:	This working paper relates to the Safety and the Environmental Protection and Sustainable Development of Air Transport Strategic Objectives.
Financial implications:	Not applicable
References:	Annex 15 — *Aeronautical Information Services* ICAO Roadmap for the transition from AIS to AIM

1. INTRODUCTION

1.1 With the evolution of the air traffic management and with the increasing worldwide air traffic, new concepts and a performance-driven approach to air navigation have been developed and are currently under implementation

1.2 The aeronautical information is one of the key components of the ATM system. The demand for accurate and timely available aeronautical information and data, supported by a high quality services is the driving factor for the transition to aeronautical information management (AIM).

1.3 The United Arab Emirates (UAE) is one of the fastest growing markets in terms of air traffic. Hence, the ATM and its constituents, including the airspace management and the AIM are required to undertake a fast pace evolution in order to support the current and forecasted demands and to provide safe and quality assured services.

2. TRANSITION FROM AIS TO AIM IN THE UNITED ARAB EMIRATES (UAE)

2.1 The Civil Aviation Authority (GCAA) of the UAE is responsible for the maintenance of the national AIP with its amendments and supplements, as well as for the issuing of the AIC and NOTAM and for the production of the Aeronautical Chart – ICAO 1:500 000.

2.2 Following the ICAO transition from AIS to AIM Roadmap, the GCAA is undertaking the necessary steps in order to move from the product centric to a digital data environment in the aeronautical information context. The transition has been initiated with an analysis for the existing digital data models, notably AIXM 4.5, AIXM 5.1 and ARINC 424. The analysis was based on the technical requirements and the cost benefit balance in order to support:

a) the current provisions of the ICAO SARPs (Annexes 4 and 15), including the electronic terrain and obstacle data (eTOD);

b) the exchange of the data with the aeronautical information stakeholders, notably the airports, the ATC and the Data Houses;

c) the interoperability based on the international and industry standards (e.g. ISO 19000 series, ARINC);

d) the current and future strategic implementation of air and ground operations, such as PBN, including GBAS procedures, known to be highly dependent on aeronautical data (e.g. FAS Data Block); and

e) the extensibility capabilities for regional and local variations and implementations allowing a minimisation of the changes and the associated costs

2.3 The analysis concluded that the best suited candidate to fulfil the current and foreseen requirements is AIXM 5.1. Consequently, GCAA decided to adopt this data and exchange model, and started its implementation in 2011 with the development of an AIXM 5.1 database containing the aeronautical data necessary for the production of the UAE AIP in an electronic format (based on the EUROCONTROL Specification for the eAIP, edition 2.0).

2.4 As part of the first step of the implementation of the system wide information management (SWIM), the GCAA AIM is exchanging AIXM 5.1 data with the UAE ACC allowing the population of the FDPS and the ATC screen maps.

2.5 The next steps in the UAE transition from AIS to AIM are the data-driven design of the aeronautical charts from the AIXM 5.1 system and extending the exchange of digital data with the internal and external (including international) stakeholders.

3. COMMON STANDARDS FOR DIGITAL DATA

3.1 The development and the implementation of an aeronautical digital data model is one of the fundamentals of the transition to AIM in supporting the Aviation System Block Upgrades in the Performance Improvement Area 2 (Globally Interoperable Systems and Data).

3.2 The data modelling provided by AIXM 5.1 is often self-explanatory, however, from the GCAA AIM experience in managing the database and encoding the data, several areas have been highlighted where different options and different principles may be applied with regard to the same aeronautical concepts. GCAA also recognized that the same data can be presented in various manners, tailored to its intended use or to the target stakeholders. For example, the charting requirements of ICAO Annex 4 — *Aeronautical Charts* may be better addressed by explicitly encoding the geometry of an instrument approach procedure, while for the processes following the AIS publication, such as the data integration into the on-board systems (e.g. FMS), the path and terminators of the procedure legs may take precedence over the geometry, especially in the area navigation (RNAV) environment.

3.3 Although there are sufficient specifications for the development of systems based on AIXM 5.1, there are also variations adopted by the industry, within the limits of the existing standards that may produce final results in terms of data exchange with various degrees of interoperability and interpretation.

3.4 In order to minimize the impact of such variations and such interpretations, GCAA recognizes the need for further standardization under the ICAO coordination and for the development of guidance and training material aimed at increasing the interoperability and the exchange of the aeronautical data as well as the harmonization of the aeronautical concepts as transposed into a digital format.

4. CONCLUSION

4.1 The first aspect to be considered towards achieving the required level of interoperability would be to globally adopt a single data model and a single exchange model for the AIM implementation. Given the maturity and the already demonstrated compliance with the provisions of the ICAO SARPs, in the context of the Aviation System Block Upgrades, Performance Improvement Area 2 (Globally Interoperable Systems and Data), we propose the adoption of a digital data model and an exchange format based on or evolved from AIXM 5.1. This would also be in line with the principles and the requirements of the airspace users operating world-wide, similar to the convention of using English in the air-to-air and air-ground international communications.

4.2 In order to achieve a common understanding and reference to the aeronautical data expressed in a digital format, there is a need to further clarify and harmonize certain aeronautical

concepts, especially in the context of the integration with the ATM and flight operations data, as foreseen by the ASBU, Performance Improvement Area 2, Block 1 – Service Improvement through Integration of all Digital ATM data (B1-DATM).

4.3 We recommend a fundamental update of the ICAO SARPs, especially but not limited to Annex 15 — *Aeronautical Information Services* in order to support the transition to the digital environment of aeronautical data and to support the ASBU Block 0 and Block 1. The structure of Annex 15 is still tailored to the current aeronautical information principles and contains provisions for conventional product-based AIS rather than for the digital environment required by the transition to AIM. The digital data-oriented SARPs should adopt the semantic interoperability of the digital data model as a conceptual model and also a temporality model in order to address the dynamic data (Digital NOTAM).

4.4 Apart from the SARPs, there is a need for extensive guidance material, similar to what ICAO *Aeronautical Information Services Manual* (Doc 8126) represents for the product-based Aeronautical Information Services. Such guidance material should detail the corresponding SARPs and should take into account the current and the intended use of the digital data.

4.5 Considering the fundamental changes in the concept of AIS provision and the transition to AIM, as well as the recurrent need for training, ICAO should also develop training material aimed at educating the AIS personnel in addressing these changes and supporting them in the context of the new ATM environment as foreseen in the Performance Improvement Area 2 of ASBU.

4.6 UAE is encouraging ICAO to take the lead in guiding the evolution of the digital data model and exchange format in order to address the developments such as PBN and the Global ATM Operational Concept.

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