International Civil Aviation Organization

AN-Conf/12-WP/45
5/10/12

WORKING PAPER

TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 3: Interoperability and data – through globally interoperable system-wide information management (SWIM)
3.3: Service improvement through digital AIM

AIM DEVELOPMENTS AND AIXM IMPLEMENTATION IN EUROPE

(Presented by the Presidency of the European Union on behalf of the European Union and its Member States[1]; by the other Member States of the European Civil Aviation Conference[2]; and by the Member States of EUROCONTROL)

SUMMARY

This paper presents the European experiences concerning the transition from AIS to AIM, introduces the European AIS Database (EAD) as an enabler for AIM implementation; describes the state of the game of AIXM and the AIM developments in Europe.

Action: The Conference is invited to agree to the recommendation in paragraph 8.

1. INTRODUCTION

1.1 The 11th Air Navigation Conference (AN-Conf/11), held in Montreal in 2003, endorsed the operational concept and recognized that, in the global ATM system environment envisioned, AIS would become one of the most valuable and important enabling services. The global ATM system operational concept is increasingly relying on automated systems at all levels to ensure a collaborative decision-making environment, shared situational awareness and 4D trajectory management, the timely availability from authoritative sources of high-quality digital aeronautical, airspace and flow management information will be necessary in order to perform these functions.

1.2 AN-Conf/11 developed Recommendation 1/8 — Global aeronautical information management and data exchange model, which called upon ICAO:

a) when developing ATM requirements, define corresponding requirements for safe and efficient global aeronautical information management that would support a digital, real-time, accredited and secure aeronautical information environment;

[1] Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. All these 27 States are also Members of ECAC.

[2] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Iceland, Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

b) urgently adopt a common aeronautical information exchange model, taking into account operational systems or concepts of data interchange, including specifically, AICM/AIXM, and their mutual interoperability; and

c) develop, as a matter of urgency, new specifications for Annexes 4 and 15 that would govern provision, electronic storage, on-line access to and maintenance of aeronautical information and charts.

2. ICAO PROGRESS WITH AIM

2.1 The Global AIS Congress held in 2006 made ten recommendations directed at ICAO and States (A36-WP/51 refers). The Technical Commission of the 36th Assembly recognized the need for the ICAO Secretariat to support the recommendations of the Congress together with the need for further coordination and transparency. These issues have been pursued by the ICAO Secretariat with the assistance of the Aeronautical Information Services-Aeronautical Information Management Study Group (AIS-AIMSG) which was established in 2008.

2.2 Some initial good progress has been made on actions called for by these recommendations:

a) Amendment 36 to Annex 15 included a provision enabling digital data exchange;

b) guidance material for the aeronautical information exchange based on AIXM is being developed for inclusion in the Aeronautical Information Services Manual (Doc 8126);

c) the roadmap for the transition from AIS to AIM has been developed by the ICAO Secretariat with the assistance of the AIS-AIMSG; and

d) further work on the evolving AIM concept is being undertaken including the creation of a PANS-AIM document as envisaged by the AIS-AIMSG. The document will be more constraining than the content of a Manual, and will allow the publication of formalised key interoperability requirements for AIS, such as the use of AIXM; too technical for inclusion in an Annex.

2.3 However, much more is still required as is highlighted in the following sections.

3. EUROPEAN AIS TO AIM IMPLEMENTATION

3.1 The European and North Atlantic Office of ICAO carried out a survey related to the transition from AIS to AIM with the European States. The survey highlighted the following:

3.1.1 An important number of States had not yet developed/provided a National Plan for the transition from AIS to AIM, based on the ICAO roadmap.

3.1.2 Seven over 37 States had completed the implementation of Phase 1 (consolidation).

3.1.3 States are at different stages for the implementation of the steps identified in Phase 2 of the roadmap (Going digital). The requirements for data quality monitoring (P-01), data integrity monitoring (P-02), the provision of electronic terrain datasets (P-13), obstacle datasets (P-14) and aerodrome mapping (P-15) represent the main difficulties. A realistic timeframe for the implementation of Phase 2 would be 2012-2015.

3.1.4 With regard to Phase 3 (Information management), the majority of States are already using AIXM 4.5 or 5.1 as an aeronautical exchange model; however the requirements related to communication (P-10) have not yet been well defined. The implementation of electronic aeronautical charts (P-20) and the

interoperability with meteorological products (P-19) requires the development of necessary specifications and ICAO standards.

3.1.5 Step P-16 – AIM training should be addressed in Phase 1 (Consolidation) and not in Phase 3 (Information Management). It is important to set up the training well in advance of Phase 3 as training always requires a long lead time.

3.1.6 Some States indicated that in the first version of the ICAO Roadmap for the transition from AIS to AIM, the description of the steps is basic and insufficient. Accordingly, a more detailed description of the different steps of the Roadmap is required.

3.1.7 The majority of States confirmed that they are encountering/expecting some difficulties during the transition from AIS to AIM, in particular:

a) financial constraints in terms of justifying the required investments;
b) manpower availability, capacity, and knowledge (required expertise);
c) training of staff;
d) lack of detailed ICAO guidance material; in particular an AIS-AIM Transition Manual with detailed description of steps to assist States in the implementation process;
e) necessity & time to amend the National Regulations to include AIM requirements;
f) institutional issues (especially regarding electronic/digital data as an authoritative data source);
g) implementation of an Integrated Aeronautical Information Database;
h) increased workload for the regulators for the oversight of the whole data chain (e.g. surveyors, aerodromes, etc.);
i) implementation of data quality (including data integrity monitoring) according to ICAO provisions and EU regulations;
j) awareness and commitment of data originators, and adoption of appropriate arrangements with all data originators;
k) electronic data exchange with all data originators; and
l) eTOD implementation.

3.2 Digital NOTAM (P-21) is an implementation objective of the European ATM Master Plan and also an element of the ICAO AIS to AIM Transition Roadmap. It is based on the concept of encoding the NOTAM data enabled via AIXM datasets and it was developed jointly by EUROCONTROL and the Federal Aviation Administration of the United States (FAA), with the support of the international AIS community.

3.3 An implementation roadmap for Digital NOTAM in the ECAC Area has been developed in consultation with all involved stakeholders. The goal is to minimise stakeholder implementation costs while also enabling sufficiently rapid development of the benefits throughout the ATM system through an incremental approach.

3.4 Following the implementation schedule for the first increment, the European AIS Database (EAD) is planning to deliver the initial digital NOTAM capability in 2012/2013. The ultimate objective is to achieve the complete implementation of the first increment by 2016. Detailed rules for the encoding of the information are developed together with FAA, in the form of a Digital NOTAM Event Specification. The latter is already used by industry which has started developing prototypes of Digital NOTAM applications. This brings confidence that the software manufacturing industry will be able to support a world-wide deployment of Digital NOTAM in the coming years.

4. EAD AS AN ENABLER FOR AIM IMPLEMENTATION

4.1 Operational since 2003, the European AIS Database (EAD) Service delivers a reference repository for aeronautical information. The EAD ensures high quality data, through multilevel data checking

processes, as well as the online, timely and efficient electronic distribution of aeronautical information. It resolves the current shortcomings inherent in the usage of multiple data sources by ensuring harmonisation through the definition, the implementation and the application of common standards. In providing a centralised service, the EAD offers a substantial improvement to current facilities and processes, for the acquisition, the maintenance and distribution of quality assured AIS data (static data, NOTAM, AIPs and charts). As such it enables the exchange and distribution of data between AIS Data Providers (states, ANSP's, MIL, etc.) and AIS Data Users (airports, airlines, pilots, flight plan service providers, MET service providers, etc.).

4.2 At the end of 2011, 93% of the ECAC States are connected, maintain and make available AIS data through the EAD. 70% of these connected data providers have fully migrated to the EAD and are able to build on the improved data quality and increased functionality to reduce their costs. Specific requirements and needs of MIL stakeholders, in their role as data providers, are being defined enabling their future migration. Furthermore, the EAD is being adopted by data providers outside the ECAC area, giving the data exchange platform an even broader geographical reach. Currently over 150 organisations are using the EAD, including aircraft operators, airports, ANSP, etc.

4.3 As the EAD is based on AIXM, it offers aeronautical data in a digital format. With the forthcoming implementation of AIXM 5.1 it will enable an even more friendly & powerful way of exchanging aeronautical data between systems. In terms of data quality, the before mentioned data harmonisation and consistency are already firmly embedded in the EAD today. A dedicated static data completeness initiative has been put in place to support the participating data providers in achieving data completeness objectives. In addition to this, the ADQ (see paragraph 6.2) requirements are currently being studied for implementation within the EAD, enabling an even more integrated data chain from data originator to end end-user.

4.4 With the upgrade of the EAD to AIXM 5.1 and the implementation of the ADQ requirements, the EAD is to be considered as a key enabler for the AIS to AIM transition.

5. STATE OF PLAY OF AIXM

5.1 AIXM has developed in the meantime as the de-facto global standard for aeronautical data exchange with implementations happening around the world. To reflect the maturity of AIXM EUROCONTROL and FAA have developed a Change management process taking into consideration the guidance provided by various AIXM stakeholders, in particular ANSPs and manufacturing industry. The primary objective of this process is to support the governance of the evolution of the AIXM model whilst ensuring the transparent access of all stakeholders to the corresponding process.

5.2 The associated Change control board will be primarily responsible for the technical maintenance of the AIXM model, which includes the AIXM UML model, the AIXM XML/GML Schema and the Temporality Concept and the associated documentation. The governance of the model implementation is globally performed through ICAO mechanisms, regionally initiatives.

5.3 At present, the effort of the AIXM community is focused on the development of implementation guidelines, such as for the encoding of metadata, Geography Mark-up Language (GML) profile, data validation rules, etc.

6. AIM DEVELOPMENTS

6.1 The European Commission adopted on 26 January 2010 the Regulation 73/2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky. The overall objective of this Regulation is to achieve aeronautical data and information of appropriate quality (accuracy, resolution and integrity), timeliness and granularity as a key enabler of the European ATM Network. In terms of scope, the Regulation extends from the original data sources (e.g. surveyors, procedure designers, etc.) through Aeronautical Information Services (AIS) and publication to the end users of the data and information.

The Regulation addresses to a large extent the elements of the ICAO AIS to AIM roadmap, strengthens some of the ICAO requirements in Annex 15 and introduces other requirements in a number of areas such as the digital dataset, safety management, tool verification/validation and conformance aspects.

6.2 The European Commission (EC) has taken initiatives to develop a draft interoperability implementing rule that complements Commission Regulation (EU) N° 73/2010 (also referred to as ADQ), laying down requirements on the quality of aeronautical data and aeronautical information for the Single European Sky (SES), to achieve aeronautical information of sufficient quality in the aeronautical data chain, from post-publication by the Aeronautical Information Service (AIS) provider to the end-user (ADQ-2). The drafting of the Implementing Rule is planned for 2012.

6.3 Besides the regulatory and pan-European harmonisation approach, the transition from AIS to AIM in Europe also starts to occur through a sub-regional approach within the 'Functional Airspace Blocks (FAB)', where States with a similar aeronautical environment team up for harmonised and/or joint AIM services for ATM in line with the SES initiative.

6.4 Concerning AIM, the SESAR SWIM activities concentrate on building on the "AIS to AIM developments" and introducing a Service Orientated Architecture (SOA) approach preparing the path for an evolution towards full information management. This will mean a further move away from aeronautical information products to (digital) services and a call for a closer cooperation between the different ATM Data domains (AIM, MET, Flight & Flow, etc).

6.5 Despite the good progress made, the cited difficulties on the transition from AIS to AIM and the ongoing SESAR developments provide a strong argument for the need to accelerate the ICAO AIM activities including a further strengthening of the digital data exchange provisions, as well as digital data services complementing/replacing paper products and for a controlled evolution from AIM towards future information management & SWIM.

7. THE NOTAM SYSTEM

7.1 The current system for the distribution of dynamic aeronautical information, the NOTAM system, has been in place for many years. The ICAO AFS is made use of to distribute these time and safety critical notices throughout the aviation industry.

7.2 At the recent (ICAO) AIS to AIM Study Group #6, there were lengthy discussions regarding the proliferation of NOTAM. Statistics show a significant growth in the number of NOTAM being distributed globally, with the distribution of international NOTAM alone increasing from 300,000, in year 2000, to over 800,000 in 2011.

7.3 This volume of NOTAM is adding considerable pressure on end users and system developers. This is made worse due to the confines of legacy systems, which have limited addressing capabilities, a non-flexible format and no graphical functionality. Additionally, the system is being utilised beyond its original intent, and non-compliance with established procedures, combined with the need for a more robust oversight mechanism, have a further impact on the value of the current system for industry.

7.4 In the long term, the Digital NOTAM concept (as described in 3.2 to 3.4) will contribute towards resolving some though not all of these issues. Digital data processing will assist with the control of significantly larger amounts of NOTAM data, as compared with the current 'text' based processes. However, until the Digital NOTAM is fully implemented world-wide, and as long as legacy NOTAM users exist, there is a need to reduce NOTAM proliferation

7.5 Work has been initiated at European level to investigate and identify the reasons for the increase in NOTAM publication. While recognising that in today's aviation environment there is the need for a growing

amount of information to be exchanged between stakeholders, this work will focus on improving oversight activities as well as developing guidance material for use by NOTAM originators.

7.6 This regional level activity will address the origination aspects, though to be of global benefit, this work should be conducted by all States. It is recommended that ICAO encourages States to review their NOTAM publication procedures, provide appropriate guidance to NOTAM originators and ensure adequate oversight of the NOTAM publication process is conducted.

7.7 Equally, the current NOTAM system needs to be addressed and options for a replacement system, building further on the digital NOTAM activities, developed. The new system should employ 21st century techniques and technologies and have improved messaging capabilities, as well as being compatible with current systems.

8. RECOMMENDATIONS

8.1 The Conference is invited to:

a) encourage States and regions to accelerate transition from AIS to AIM by implementing a fully automated digital aeronautical data chain;

b) encourage States to implement necessary processes to ensure the quality of aeronautical data and information from the origin to the end users;

c) encourage intra-regional and interregional cooperation for an expeditious transition from AIS to AIM in a harmonized manner and digital data exchange;

d) invite States to consider regional or subregional AIS databases as an enabler for the transition from AIS to AIM;

e) encourage industry to support the transition towards AIM by providing appropriate systems supporting automation and the exchange of aeronautical data in a globally standardised manner; and

f) request ICAO to accelerate relevant Annex specifications for both the current AIS to AIM transition and the NextGen and SESAR AIM & SWIM developments;

g) request ICAO to encourage States to review their NOTAM publication procedures, provide appropriate guidance to NOTAM originators and ensure adequate oversight of the NOTAM publication process is conducted; and

h) request ICAO to initiate a review of the current NOTAM system, building further on the digital NOTAM activities, including the development of options for a replacement system that would enable Web-based applications and compliant with the system-wide information management (SWIM) principles that are being developed for the ATM system.

— END —