

Module B0-DATM

Module B0-DATM: Service Improvement through Digital Aeronautical Information Management

Summary	The initial introduction of digital processing and management of information, through aeronautical information serve (AIS)/aeronautical information management (AIM) implementation, use of aeronautical information exchange model (AIXM), migration to electronic aeronautical information publication (AIP) and better quality and availability of data.	
Main performance impact as per Doc 9854	KPA-03 – cost-effectiveness, KPA-05 – Environment, KPA-07 Global interoperability, KPA-10 – Safety.	
Operating environment/ Phases of flight	All phases of flight	
Applicability considerations	Applicable at State level, with increased benefits as more states participate	
Global concept component(s) as per Doc 9854	IM – information management	
Global plan initiatives (GPI)	GPI-18: Electronic information services	
Main dependencies	NIL	
Global readiness checklist		Status (ready now or estimated date)
	Standards readiness	✓
	Avionics availability	✓
	Ground systems availability	✓
	Procedures available	✓
	Operations approvals	✓

1. Narrative

1.1 General

1.1.1 The subject has been discussed at the Eleventh Air Navigation Conference (Doc 9829, AN-Conf/11) which made the following recommendation:

Recommendation 1/8 – Global aeronautical information management and data exchange model

That 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:
- b) Urgently adopt a common aeronautical information exchange model, taking into account operational systems or concepts of data interchange, including specifically, aeronautical information conceptual model (AICM)/aeronautical information exchange model (AIXM), and their mutual interoperability; and
- c) Develop as a matter of urgency, new specifications for Annex 4 – *Aeronautical Charts* and Annex 15 – *Aeronautical Information Services* that would govern provision, electronic storage, on-line access to and maintenance of aeronautical information and charts.

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1.1.2 The long term objective is the establishment of a network-centric information environment, also known as system-wide information management (SWIM).

1.1.3 In the short to medium-term, the focus is on the continuing transition of the services provided by aeronautical information services (AIS) from a product-centred, paper-based and manually-transacted focus to a digitally-enabled, network-centred and service-oriented aeronautical information management (AIM) focus. AIM envisages a migration to a data centric environment where aeronautical data will be provided in a digital form and in a managed way. This can be regarded as the first step of SWIM implementation, which is based on common data models and data exchange formats. The next (long-term) SWIM step implies the re-thinking of the data services in terms of a “network” perspective.

1.1.4 AIS must transition to a broader concept of AIM, with a different method of information provision and management given its data-centric nature as opposed to the product-centric nature of traditional AIS provision.

1.1.5 The expectations are that the transition to AIM will not involve many changes in terms of the scope of information to be distributed. The major change will be the increased emphasis on data distribution, which should place the future AIM in a position to better serve airspace users and air traffic management (ATM) in terms of their information management requirements.

1.1.6 This first step towards SWIM is easy to make because it concerns information that is static or does not change often, yet it generates substantial benefits even for small States. It allows for initial experience to be gained before making further steps towards full-SWIM implementation.

1.2 Baseline

1.2.1 The baseline is the traditional provision of aeronautical information, based on paper publications and NOTAMs.

1.2.2 AIS information provided by ICAO Member States has traditionally been based on paper documents and text messages (NOTAM) and maintained and distributed as such. In spite of manual verifications, this did not always prevent errors or inconsistencies. In addition, the information had to be transcribed from paper to automated ground and airborne systems, thus introducing additional risk. Finally, the timeliness and quality of required information updates could not always be guaranteed.

1.3 Change brought by the module

1.3.1 The module continues the transition of AIS from traditional product provision to a digitally enabled service oriented environment with information exchange utilizing standardized formats based on widely used information technology standards (UML, XML/GML). This will be supported by industrial products and stored on electronics devices. Information quality is increased, as well as that of the management of aeronautical information in general. The AIP moves from paper to electronic support.

2. Intended Performance Operational Improvement

2.1 Metrics to determine the success of the module are posed in the *Manual on Global Performance of the Air Navigation System* (Doc 9883).

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<i>Cost Effectiveness</i>	Reduced costs in terms of data inputs and checks, paper and post, especially when considering the overall data chain, from originators, through AIS to the end users.
<i>Environment</i>	Reducing the time necessary to promulgate information concerning airspace status will allow for more effective airspace utilization and allow improvements in trajectory management.
<i>Global Interoperability</i>	Essential contribution to interoperability.
<i>Safety</i>	Reduction in the number of possible inconsistencies. Module allows reducing the number of manual entries and ensures consistency among data through automatic data checking based on commonly agreed business rules
<i>Cost Benefit Analysis</i>	The business case for the aeronautical information conceptual model (AIXM) has been conducted in Europe and in the United States and has shown to be positive. The initial investment necessary for the provision of digital AIS data may be reduced through regional cooperation and it remains low compared with the cost of other ATM systems. The transition from paper products to digital data is a critical pre-requisite for the implementation of any current or future ATM or air navigation concept that relies on the accuracy, integrity and timeliness of data.

3. Necessary Procedures (Air and Ground)

3.1 No new procedures for air traffic control are required, but the process for AIS needs to be revisited. To obtain the full benefit, new procedures will be required for data users in order to retrieve the information digitally, for example, to allow airlines provide digital AIS data to on-board devices, in particular electronic flight bags (EFBs).

4. Necessary System Capability**4.1 Avionics**

4.1.1 No avionics requirements.

4.2 Ground systems

4.2.1 The aeronautical information is made available to AIS through digital processes and to external users via either a subscription to an electronic access or physical delivery; the electronic access can be based on Internet protocol services. The physical support does not need to be standardized. The main automation functions that need to be implemented to support provision of electronic AIS are the national aeronautical data, NOTAM (both national and international) and meteorological management including data collection, verification and distribution.

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5. Human Performance

5.1 Human factors considerations

5.1.1 The automated assistance is well accepted and proven to reduce errors in manual transcription of data.

5.1.2 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failure however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

5.2 Training and qualification requirements

5.2.1 Training is required for AIS/AIM personnel.

6. Regulatory/standardization needs and Approval Plan (Air and Ground)

- Regulatory/standardization: use current published requirements that include material given in Section 8.
- Approval plans: to be determined, based upon regional applications.

7. Implementation and Demonstration Activities (as known at time of writing)

7.1 Current use

- **Europe:** the European AIS Database (EAD) became operational in June 2003. Electronic AIP (eAIP) providing fully digital versions of the paper document based on a EUROCONTROL eAIP specification, have been implemented (on-line or on a CD) in a number of States including Armenia, Belgium and Luxemburg, Hungary, Jordan, Latvia, Moldova, Netherlands, Portugal, Slovak Republic and Slovenia (for full and latest list of States operational with eAIP, see: <http://www.eurocontrol.int/articles/electronic-aeronautical-information-publication-phase-2-p-11>). EAD and eAIP are essential milestones in the realization of the digital environment. The EAD was developed using the aeronautical information conceptual model (AICM) and aeronautical information exchange model (AIXM). Whilst some European States have chosen to use the EAD client system and software, others implement their own AIM solution instead and connect it to EAD in a system-to-system connection (e.g. France).
- **United States:** Digital NOTAM is currently deployed and in use in the United States using the AIXM 5.1.
- **Other regions:** Azerbaijan, Japan, and Jordan have implemented the eAIP.

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- AIXM-based systems are in various stages of implementation in several countries around the world, including Australia, Brazil, Canada, Fiji, India, Panama, South Africa, Singapore, ASECNA, etc.

7.2 Planned or ongoing activities

7.2.1 The current trials in Europe and the United States focus on the introduction of Digital NOTAM, which can be automatically generated and used by computer systems and do not require extensive manual processing, as compared with the text NOTAM of today. More information is available on the EUROCONTROL and FAA websites:

http://www.EUROCONTROL.int/aim/public/standard_page/xnotam.html

<http://notams.aim.faa.gov/fnsstart/>

8. Reference Documents

8.1 Standards

8.1.1 Further changes to ICAO Annex 15 – *Aeronautical Information Services* are in preparation.

8.2 Procedures

8.2.1 In preparation.

8.3 Guidance material

- ICAO Doc 8162, *Aeronautical Information Services Manual*, including AIXM and eAIP as per Third Edition
- ICAO Doc 8697, *Aeronautical Chart Manual*
- *Roadmap for the Transition from AIS to AIM*
- Manuals on AIM quality system and AIM training.
