AN-Conf/11-WP/78
24/7/03
English, French, Spanish and Russian only*

ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 1: Introduction and assessment of a global air traffic management (ATM) operational concept
1.2 Enabling concepts in support of the global ATM operational concept :

ENHANCED AERONAUTICAL INFORMATION EXCHANGE FOR GLOBAL INTEROPERABILITY

(Presented by the European Organisation for the Safety of Air Navigation (EUROCONTROL) on behalf of its Member States and those of ECAC[1])

SUMMARY

The implementation of communications, navigation, and surveillance/air traffic management (CNS/ATM) is reliant on the interoperability of both ground and airborne systems. A key enabler for this is the provision of the right information of the right quality, to the right person at the right time. Studies have shown that, currently data integrity does not meet the requirements of Annex 15 — *Aeronautical Information Services*.

This paper discusses developments within the EUROCONTROL Organisation which shows that there is a clear need to migrate to a digital environment and for the adoption of a platform-independent common data exchange model (or models) to enable interoperability.

Suggested action by the Conference is at paragraph 7.

---

[1] The ECAC Member States are: **Albania**, Armenia, **Austria**, Azerbaijan, **Belgium**, Bosnia and Herzegovina, **Bulgaria**, **Croatia**, **Cyprus**, **the Czech Republic**, **Denmark**, Estonia, **Finland**, **France**, **Germany**, **Greece**, **Hungary**, Iceland, **Ireland**, **Italy**, Latvia, Lithuania, **Luxembourg**, **Malta**, **Moldova**, **Monaco**, **the Netherlands**, **Norway**, Poland, **Portugal**, **Romania**, Serbia and Montenegro, **the Slovak Republic**, **Slovenia**, **Spain**, **Sweden**, **Switzerland**, **The former Yugoslav Republic of Macedonia**, **Turkey**, Ukraine **and the United Kingdom**).

The 31 Member States of EUROCONTROL appear in **bold**.

(5 pages)

*French, Spanish and Russian versions provided by EUROCONTROL.

1. INTRODUCTION

1.1 Air transport is an essential component of global economic activity. It continues to grow, albeit at present at a reduced rate, and the capacities of airspace and airports in their current configurations are finite resources in the core area of Europe. The need to increase capacities has therefore been, and continues to be, a constant theme of and challenge to Air Traffic Management (ATM).

1.2 With traditional solutions nearing exhaustion, new and innovative ways of providing capacity must be found. A key element for progress is the establishment of efficient interoperable systems, which will be reliant on the provision and exchange of timely, relevant and accurate quality information.

1.3 Assured aeronautical information is required to allow the ATM community to make informed decisions in collaboration rather than in the relatively isolated manner of today. When shared on a system-wide basis and exploiting advances in information technology, aeronautical information will allow ATM activity and operations to be conducted in an efficient and cost-effective way.

1.4 ATM has become reliant on aeronautical information, but this dependence is not yet widely recognised although it is one of the most valuable and important resources for all stakeholder groups. Its enhancement and its effective management are, therefore, critical tasks that must be addressed on a global basis if the goals of CNS/ATM are to be realised.

2. MANAGEMENT OF AERONAUTICAL INFORMATION

2.1 Aeronautical Information must be managed effectively to ensure that quality assured information is provided in support of ATM operations. The objective is to ensure that the right information reaches the end-user where and when required. The exchange of aeronautical information is a global business. Managed effectively, it will facilitate collaborative decision-making (CDM), and will provide the means to ensure interoperability, both of which are essential for the realisation of (CNS/ATM). The key issue, therefore, is to establish the means by which aeronautical information can be managed and exchanged world-wide.

2.2 The Aeronautical Information Management Unit (AIM) must incorporate, at a high level, the structure, delivery, and the critical nature of all ATM-relevant information exchanged between Partners, such as: aeronautical information, meteorological data, flight planning, planned and real-time status of ATM and CNS systems, and airspace and sector configurations. Specifically, the decisions taken by controllers, pilots, dispatchers, flight planners, weather forecasters, etc. represent information that is used by others as inputs to their own planning and decision-making processes. Therefore, information sharing will enable the concept of collaborative decision-making by the ATM Partners. Moreover, the full benefit of information management will only accrue if pertinent information is made available to all appropriate participants. In order for the ATM network to function properly, all of this information (decisions and inputs to decision-making) must be available when and where needed. In consequence, a review of the requirements specified in

Annex 4 — *Aeronautical Charts* and in Annex 15 is recommended to ensure that all categories of relevant information are provided.

2.3 Studies have shown that the integrity requirements listed in Annex 15 can be significantly improved by automating the end-to-end processing of aeronautical information and its publication in electronic form. Interoperability is therefore dependent on the migration to a fully digital environment with aeronautical information explicitly described in terms of data features and attributes published in the form of a common data dictionary, and on the exchange of this information through the medium of a common exchange model.

2.4 The quality of a given information item (such as availability, relevance, accuracy, integrity, timeliness, security, confidentiality, etc.), is important and may well be flight critical. In consequence, the processing of aeronautical information from origination, through publication to incorporation into an end-user system must be managed throughout. The key to the future is in the provision of digital aeronautical information with interoperability assured through the establishment of commonly agreed media for the exchange of such information. Successful information management will depend on the common definition and/or determination of a minimum set of features and attributes, established within an entity relationship model(s), and the establishment of the means to exchange it. This can be enabled through the adoption of platform-independent aeronautical information exchange models, to embrace all aspects of aeronautical information.

2.5 Information produced for one purpose (for example Aircraft Operator scheduling) will have quality of service attributes that are appropriate for that purpose and experience has shown that they may be useful within other parts of ATM if they can be made available in a suitable form.

2.6 The adoption of AIM will enable a seamless transfer of relevant information between different partners in a flexible, adaptable and scalable information environment, where a need for new information or a new use of existing information can be accommodated with minimal impact on all information providers and users.

3. POTENTIAL APPLICABILITY

3.1 To ensure interoperability, AIM will apply at any time and anywhere in the system. It is a foundation service without which no other service can be provided. AIM can be implemented first by interfacing existing systems to provide quality maintained data, based on common information elements and interactions. This interfacing may start on an ad-hoc basis, but will quickly require the progressive development and introduction of commonly agreed standards and procedures to ensure global applicability. It is, in fact, the first demonstration of the concept of System-Wide Information Management (SWIM). This is a concept being developed by the Air Traffic Management Operational Concept Panel (ATMCP) for applicability by circa 2015 and beyond.

3.2 Aeronautical information should be explicitly described in terms of data features and attributes published in the form of a common data dictionary. This should be accompanied by industrial system components for advanced applications and, to some extent, this is already happening through the development of information requirements for digital aeronautical information service (AIS), Airport Mapping, Obstacles and Terrain and the models by which the information shall be exchanged.

4. EXPECTED CONTRIBUTION TO IMPROVED ATM PERFORMANCE

4.1 AIM will contribute to several objectives and at various degrees through the operational services that it enables. There will be a direct contribution to improvement in terms of the maintenance of the quality of the information. In turn, that quality may provide significant other benefits. For example, the wide availability of high-quality aeronautical data presented to all airspace users in a machine-readable format should contribute to increased aviation safety.

4.2 International standards for aeronautical information requirements and the means by which such information shall be exchanged must be agreed and implemented to allow a common way to describe the representation and structure and the subsequent regulation of information. This predicates a revision of ICAO Annex 4 (Aeronautical Charts) and Annex 15 (AIS) to include the aeronautical information required to satisfy all phases of flight, and to enable the Standards and Recommended Practices Standards and Recommended Practices (SARPs) for the digital age.

4.3 The introduction of SWIM techniques will provide the capabilities that will ensure that the common, up-to-date shared view of all relevant ATM information is maintained in a distributed stakeholder environment, in accordance with defined scope, quality and integrity requirements. This will satisfy the information needs of ATM partners - both within and outside the ATM network - in a much more flexible, cost effective manner than today.

5. OTHER CONSIDERATIONS

5.1 **Temporality and issuance.** All data is temporal, but the period of validity of individual data varies greatly: some changes can be prepared in advance and are applicable for a long period whilst other change in real-time and are immediately obsolete. Nevertheless, the general principle should be that valid and relevant information is made available when it becomes available. This will impact the organisation and issuance of data. It may be convenient to group some data for practical reasons due to the medium that carry them to some users, to reduce the transmission cost and the amount of messages, and to avoid information overload. The result will be an environment where information related to a flight is personalised and filtered, and can be accessed as the flight is planned and then progresses.

5.2 **Media.** The reference for aeronautical data will be more and more an electronic and networked environment, with printouts reduced to temporary memorisation and visualisation support to human operators. The development of the electronic AIP (eAIP), a fully digital version of the paper document, is well underway, and the pan-European AIS Database (EAD) of static and dynamic data, will become operational in mid-2003. Both of these developments are essential milestones in the realisation of the digital environment.

5.3 **Provision of temporal aeronautical information.** Clearly, the evolving dynamic environment cannot be restrained by fixed publication cycles, though there may always be a need to retain such a capability when faced with major airspace changes. Created at a time where paper mail and teletypewriter were the only tools, these concepts are being re-examined within the context of the applicability of the flexibility and specificity afforded by standard data exchange models.

5.4 **"True" temporality**. The recognition that all data temporal will render the present division of aeronautical information into static and dynamic components meaningless. New proposals, which will be compatible with the systems of today, are evolving and will provide the means to deliver timely, quality-controlled digital information to any suitable system on the ground or in the air.

6. CONCLUSION

6.1 The implementation of CNS/ATM is reliant on the interoperability of both ground and airborne systems. A key enabler for this is the provision of the right information of the right quality, to the right person at the right time. There is a clear need, therefore, to migrate to a digital environment and for the adoption of a platform-independent common data exchange model (or models) to enable interoperability. It should be noted though that adoption of these proposals will have significant implications for the revision of Annexes 4 and 15.

7. ACTION BY THE CONFERENCE

7.1 The Conference is invited to:

a) recognise the need for an efficient global aeronautical information management structure;

b) endorse the principle of migration to a digital aeronautical information environment;

c) call for the adoption by ICAO of a common aeronautical information exchange model; and

d) recommend that Annexes 4 and 15 be reviewed to ensure their suitability to support the digital environment.

— END —