

## **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**

#### **“INTEROPERABILITY” AND “SEAMLESS” CONSIDERATIONS IN AIR TRAFFIC MANAGEMENT**

(Presented by the Secretariat)

##### **SUMMARY**

The terms “interoperability” and “seamless” are often used when describing the future air traffic management (ATM) system; however, a common understanding of these notions is not always obvious. This paper presents the work of the Air Traffic Management Operational Concept Panel (ATMCP) on establishing a common understanding of the notions of “interoperability” and “seamless” and includes a high-level framework for their use within the context of the ATM operational concept and of a global ATM system.

Action by the Conference is in paragraph 3.

### **1. INTRODUCTION**

1.1 The terms “interoperable”, “interoperability”, “seamless” and “seamlessness” are often used when referring to the future air traffic management (ATM) system and, in particular, when attempting to convey the expectations of that system. The Air Traffic Management Operational Concept Panel (ATMCP) therefore found it necessary to come to a common understanding of these terms in order to progress its work and to fully describe the future ATM system.

1.2 In attempting to arrive at a common understanding of the notions of “interoperability” and “seamless”, the ATMCP reviewed the work of other bodies in this respect and found that, in most cases, such work was based on a more technical framework and was referenced to technical systems. It was therefore necessary to develop these notions within the context of an ATM system, which includes operators, pilots, air traffic controllers, procedures, as well as systems and other agents.

1.3 A number of relevant factors were identified that served to characterize the notions of “interoperability” and “seamless” and that need to be addressed when considering these terms. Among these factors are issues of:

- a) scalability;
- b) human and non-human agents;
- c) whether interoperability should have defined qualifiers;
- d) relationship to expectations of uniformity;
- e) what constitutes a “seam” or discontinuity;
- f) visibility of transitions, as some visibility may be useful;
- g) whether imbedded standards are implied or required;
- h) the wide range of meanings of these terms in current use;
- i) discontinuities occurring over an extended time period;
- j) whether seamless implied interoperability, and whether the definition of seamless should refer to interoperability;
- k) domain of common standards; and
- l) the importance of perspective in relation to seamless.

1.4 Based on the above, and in order to help with the understanding of the ATM operational concept, the following explanations of the notions of interoperability and seamless were developed by the ATMCP to serve as working terms for use toward development of the ATM operational concept.

1.5 *Interoperability* within the ATM system may be described as the ability to transfer information or effect functionality across any discontinuity, in order to enable operations.

1.6 *Seamless* within the ATM system may be described as the property that allows a transition across any discontinuity which, from the perspective of the transiting agent, does not require a considered action to facilitate the transition. It should be noted that, in this context, seamless does not imply ATM systems convergence into singleness.

1.7 From the above, it can be seen that interoperability is primarily associated with the need for systems, people and procedures, among other things, to operate effectively across disparate systems. Seamless is primarily associated with the needs of the user or operators of a system. An important objective of a seamless ATM system is to ensure that as aircraft operate across different regions where various levels of service exist, those services would be delivered in a manner that allows the aircraft to operate seamlessly,

with a consistent level of safety being provided. The global ATM system should be interoperable in all cases, and seamless wherever and whenever possible.

## **2. EFFECT ON ATM REQUIREMENTS**

2.1 The importance of having a more precise understanding of the terms “interoperability” and “seamless” is reinforced by the growth and evolution of systems that lack global uniformity in technical definition.

2.2 It is apparent that systems existing within a highly prescriptive and technically standardized environment have a commonality of definition, design, function, and application which makes the notions of “interoperability” and “seamless” superfluous in the manner described above. In such cases, there is no need to prescribe interoperability or seamlessness requirements as all systems and models would be produced by a few manufacturers to the highly prescriptive technical standards mentioned above (e.g. airborne collision avoidance system (ACAS)). While this may be beneficial in some ways for a limited number of systems, it would have an overall negative effect on the global aviation system if it were applied across all systems. The temptation to excessively apply prescriptively-defined standards at a global level for all levels of ATM requirements in order to achieve a transparency of functions, procedures and operations must, therefore, be avoided. There is a balance needed that would accommodate existing systems while ensuring that emerging systems and new technological solutions can be integrated in the air navigation infrastructure.

2.3 In achieving balance, it is important to consider the need for consistency in ATM functionality both for system development and user interface. This can be achieved respectively by defining interoperability requirements and designs that provide for seamlessness.

2.4 Under cover of AN-Conf/11-WP/21, the meeting will discuss the need for ICAO to develop ATM requirements based on the ATM operational concept. When determining ATM requirements, it will be essential that minimum corresponding requirements for interoperability and seamlessness are defined. This would provide the appropriate “top-down” specification for a globally interoperable ATM system.

2.5 To achieve the desired balance between specificity and flexibility, the ATM requirements must not be over-specified.

2.6 The figure in the Appendix provides some examples of the relationship between a common domain of standards and interoperability. It shows how interoperability can be achieved across differing domains of standards.

## **3. ACTION BY THE CONFERENCE**

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

**Recommendation 1/ —**

That ICAO, when developing ATM requirements, define corresponding minimum requirements for interoperability and seamlessness.

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