

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**
1.1: The global ATM operational concept

THE GLOBAL ATM OPERATIONAL CONCEPT

(Presented by the Secretariat)

SUMMARY

The Air Traffic Management Operational Concept Panel (ATMCP) was created by the ICAO Air Navigation Commission to develop and describe, in sufficient clarity and detail, a gate-to-gate air traffic management (ATM) operational concept, that would facilitate the evolutionary implementation of an integrated ATM system. The version of the operational concept attached to this working paper was developed by the ATMCP and presented at ATMCP/1 (18 to 28 March 2002). Following this, the concept was circulated to States and international organizations for review and to provide comments for improvement. The ATMCP then reviewed the comments and updated the operational concept in line with the Commission's instructions. The Commission decided that the operational concept should be presented to the Conference for assessment.

Action by the Conference is in paragraph 3.

1. INTRODUCTION

1.1 In follow-up to the Tenth Air Navigation Conference (Montreal, 5 to 20 September 1991), ICAO, at the global level, States, international organizations, and all ICAO planning and implementation regional groups (PIRGs) embarked on communications, navigation, surveillance/air traffic management (CNS/ATM) planning and implementation programmes intended to improve aviation operations by making use of CNS/ATM technologies. However, it was recognized that technology was not an end in itself, and that a comprehensive concept of an integrated and global ATM system, based on clearly-established requirements, was needed. This concept, in turn, would form the basis for the coordinated implementation of CNS/ATM technologies.

1.2 To develop an ATM operational concept, the ICAO Air Navigation Commission, on 12 March 1998, agreed to the establishment of the Air Traffic Management Operational Concept Panel (ATMCP) to undertake specific studies with a view to developing Standards and Recommended Practices

(SARPs), procedures and, where appropriate, suitable guidance material necessary for the evolutionary implementation of an integrated air traffic management system.

1.3 The ATMCP was established with a primary work programme element of developing and describing, in sufficient clarity and detail, a gate-to-gate ATM operational concept that would facilitate the evolutionary implementation of a seamless, global ATM system. The work programme also required that the ATM operational concept:

- a) be visionary in scope;
- b) not be limited by the present level of technology;
- c) lead to realization of all the benefits expected from CNS/ATM systems; and
- d) provide the basis for cost-benefit analyses associated with the introduction of ATM systems.

1.4 The operational concept contained in the Appendix addresses the critical element of the work programme described above. The operational concept presents the results of progress achieved by the ATMCP toward development of a vision of an integrated, harmonized and interoperable ATM system. This vision, presented in the form of an operational concept, was presented to the Commission in follow-up of the first meeting of the ATMCP (18 to 28 March 2002). After the Commission's review, the operational concept was circulated to States and international organizations for assessment and to make recommendations for improvement.

1.5 The comments received from States and international organizations were reviewed by the ATMCP in accordance with the instructions of the Commission. This led to several changes. The Commission then reviewed the revised operational concept and the way in which the ATMCP acted on each of the comments and agreed that the concept should be presented to the Conference for assessment. The Commission agreed to take further action on the ATM operational concept on the basis of the results of the Conference.

2. THE GLOBAL ATM OPERATIONAL CONCEPT

Introduction

2.1 Early in its work, the ATMCP recalled Article 1 to the Convention on International Civil Aviation dealing with sovereignty. In this context, the operational concept clearly states that global implementation of a seamless ATM system through the provision of CNS/ATM facilities and services shall neither infringe nor impose restrictions upon States' sovereignty, authority or responsibility in the control of air navigation. Therefore, even though the operational concept envisages airspace that is organized globally, it acknowledges sovereignty.

2.2 The planning horizon used for development of the operational concept is up to and beyond the year 2025. The baseline against which the significance of the changes proposed in the operational concept may be measured is the global ATM environment in the year 2000.

2.3 In progressing its work, the ATMCP was unanimous that safety must continue to be the highest priority in planning and implementation of the future ATM system and the role of the ATM system in enhancing

safety must be fully realized. At the same time, the ATMCP agreed that recognition of the ATM community's expectations of the future ATM system would be fundamental to the acceptance of the operational concept.

2.4 While the operational concept is considered visionary, many of the current practices and processes will continue to exist through the planning horizon. In this sense, the operational concept document should be seen as evolutionary. Therefore, nothing precludes immediate movement toward implementation of parts of the concept where this is appropriate.

2.5 The operational concept was developed, to the greatest extent possible, in a technology-independent manner. This was done on the basis that within a planning horizon of more than twenty years, much of the technology that exists or is in development today may change or cease to exist.

2.6 Emerging technologies are capable of expanding the possibilities for more efficient and environmentally sustainable flight operations by supporting a variety of system designs and implementation options and configurations. The operational concept recognizes that technology alone is not a solution unto itself. The implementations of the various CNS/ATM technologies must be based on well-developed plans that take into account the specific requirements and objectives of ATM.

Scope of the operational concept

2.7 An operational concept is a statement of “what” is envisaged. It asks and answers the question of what outcomes are required in the case of the ATM system of the future. It is a vision statement. It is not a technical manual or blueprint nor does it detail “how” the concept elements will be enabled; that lies in a lower document in the hierarchical structure, which may include concepts of operation or use, technical standards and strategic plans.

2.8 The operational concept describes the services that will be required to operate the global air traffic system up to and beyond 2025. It addresses what is needed to increase user flexibility and maximize operating efficiencies in order to increase system capacity and improve safety levels in the future ATM system.

Scalability and adaptability

2.9 In many areas, simple solutions based on regional harmonization or cooperation across homogeneous areas may provide satisfactory short- or medium-term responses to the requirements of this operational concept, while in other areas, sophisticated ATM systems may be required.

Expected changes

2.10 The operational concept outlines a range of conceptual changes that will evolve through the planning horizon. Key to the philosophy adopted within the operational concept is the notion of global information utilization, management and interchange. This is seen as the enabler of significant change in the roles of all participants within the ATM system which should then facilitate enhancements in safety, economy and efficiency across the ATM system. It is envisaged that this goal will be supported by evolution to a holistic, cooperative and collaborative decision-making environment, where the expectations of the members of the ATM community will be balanced to achieve the best outcome and in line with the ATM community's expectation of “equity and access”.

2.11 The ATM environment is driven by safety and increasingly by commercial or personal outcome expectations. While there are standards in place for global interoperability, many States' systems have evolved within a standards framework that sustains only their individual requirements; however, they now struggle or

fail to meet the ever-growing user expectations of global harmonization and interoperability. These limitations are outlined in the operational concept.

Benefits

2.12 The ATM operational concept seeks to bring benefits to the international civil aviation community. From an airspace user perspective, greater equity in airspace access, greater access to timely and meaningful information for decision support and more autonomy in decision-making including conflict management, will provide the opportunity to better deliver business and personal outcomes, within an appropriate safety framework. In particular, system harmonization and integration will provide high levels of assurance of predictability to airline operators and their customers.

2.13 From a service provider perspective, including that of airport operators, the ability to operate within an information-rich environment, with real-time data, as well as system trend and predictive data, fused with a range of automated decision-support or decision-making tools, will enable optimization of services to airspace users.

2.14 From a regulator perspective, safety systems are envisaged to be robust and open, allowing safety not only to be more easily measured and monitored, but also compared and integrated on a global basis.

Concept components

2.15 This operational concept defines seven “concept components”. These can be seen as building blocks, or services, that are integrated to form the ATM system. They are: airspace organization and management, aerodrome operations, demand and capacity balancing, traffic synchronization, conflict management, airspace user operations, and ATM service delivery management. The “glue” that binds these components together is the management, utilization and transmission of data and information, generically referred to in the operational concept as information management. These seven components should be seen as being integrated into one system, and not as independent elements.

Common themes and guiding principles

2.16 The ATM system is based on the provision of services. This service-based framework considers all resources, inter alia, airspace, aerodromes, aircraft, humans, etc. to be part of the ATM system. The primary functions of the ATM system will enable flight from/to an aerodrome into airspace, safely separated from hazards, within capacity limits, making optimum use of all system resources. The description of the concept components is based on realistic expectations of human capabilities and ATM infrastructure at any particular time in the evolution to the ATM system described by this operational concept and is independent of reference to any specific technology.

Pace of change

2.17 The operational concept describes the components and, in general terms, their interdependencies, in a global sense. However, the concept also recognizes that reaching the “end-state” cannot be achieved by revolution — rather, it will be an evolutionary process, with the ultimate goal of global harmonization not later than the concept horizon of 2025. This allows States and regions to plan the significant investments that will need to be made, and the time frame for those investments, in a collaborative decision-making environment, and within a framework of safety and business case.

Differing regional expectations

2.18 The expectations enunciated within any one particular region will be different to an adjacent or distant region, in the initial stages of evolution to the ATM system described in this operational concept. The concept allows that different emphasis can be placed on the various concept components to derive identified operational benefits. However, any such emphasis must still recognize that each component is a standard and a uniformly understood “building block”, that facilitates the movement of aircraft through regions with little or no change to equipment or procedures. Ultimately, the goal is to achieve global harmonization and interoperability.

Regional coordination

2.19 Recognizing that not all States or regions can be expected to immediately implement the ATM system described in this concept, the operational concept contains details on an expected planning and evolutionary process within the ICAO framework.

2.20 The implementation of the concept is provided for by strategic plans, inter alia, the *Global Air Navigation Plan for CNS/ATM Systems* (Global Plan, Doc 9750), regional plans and State implementation plans, which also describe the progressive intermediate steps toward that goal. The plans of all States need to be aligned to ensure, to the greatest extent possible, that solutions are internationally harmonized and integrated and do not unnecessarily impose multiple requirements for equipment carriage in the air or for a proliferation of ground equipment requirements.

Future work

2.21 The operational concept provides the vision to achieve an interoperable air traffic management system. The development and eventual implementation of such a system requires a multitude of design, specification, planning and assessment activities. This process began with the conception of an operational concept and should progress through the various levels. As part of its future work, there are plans to develop transition strategies and ATM requirements which will lead to development of SARPs and Procedures for Air Navigation Services (PANS) as well as changes to the Global Plan. Regional air navigation plans will also be amended to reflect the changing requirements for facilities and services as these are agreed to. This body of work will guide development and implementation of the global ATM system.

2.22 The operational concept and the future work toward implementation of a system based on the concept must have a strong performance orientation in order to ensure that expectations are being met and that, as systems are increasingly integrated and new operational procedures are introduced, the system will continue to achieve agreed levels of safety. Therefore, the operational concept addresses ATM system performance and safety management. Further work on measuring performance must therefore be undertaken. This is addressed under Agenda Item 3 of the Conference.

Conclusion

2.23 The operational concept provides a vision that will allow States and regions to align their planning processes, allow system solution engineering to be directed toward a harmonized and interoperable outcome, allow airspace users and service providers to share data and information to best mutual outcome, and enhance levels of safety, economy and efficiency, for the good of all members of the ATM community.

3. **ACTION BY THE CONFERENCE**

3.1 The Conference is invited to review and assess the global ATM operational concept at the Appendix and make recommendations to ICAO for further work.

— — — — —