

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

**1.3 The need for a global air navigation plan
:**

A REGIONAL FRAMEWORK FOR THE IMPLEMENTATION OF A GLOBAL ATM SYSTEM – PROGRESS AND CHALLENGES

(Presented by the Secretariat)

SUMMARY

As the formulation of regional, subregional and national plans for air navigation systems — including communications, navigation, and surveillance/air traffic management (CNS/ATM) systems — is progressively gaining maturity, States and aircraft operators are investing in the enabling technologies to gain early benefits. As this equipage progresses, both on the ground and in aircraft, further steps in the planning and implementation of CNS/ATM systems need to be addressed to meet the challenges of integration, interoperability and harmonization of the systems thus leading to a global air traffic management (ATM) system. This working paper discusses the regional framework and a mechanism for harmonization of air navigation systems and calls for a partnership approach for addressing all relevant issues.

Action by the Conference is in paragraph 5.

1. INTRODUCTION

1.1 The world civil aviation community and ICAO share the vision of achieving an interoperable global air traffic management (ATM) system that meets agreed levels of safety, provides for optimum economic operations, is environmentally sustainable, and meets national security requirements for all users during all phases of flight. The ATM operational concept presented in AN-Conf/11-WP/4 provides the global vision to be sought after.

1.2 To achieve this goal, ICAO has been involved in several activities. At the global level, ICAO has developed the *Global Air Navigation Plan for CNS/ATM Systems* (Global Plan, Doc 9750) (AN-Conf/11-WP/22 refers) and the ATM operational concept and has convened the Eleventh Air Navigation Conference. At the regional level, ICAO has been addressing the planning strategy for the implementation of air navigation systems — including CNS/ATM systems, leaving the responsibility for structuring the national plans to the Contracting States. In addition, a number of States are coming together to forge joint ventures — known as *subregional planning* — to implement air navigation systems.

2. A REGIONAL FRAMEWORK

2.1 Approach to harmonization

2.1.1 It should be noted that ICAO's efforts in the realm of ATM are aimed at, inter alia, developing the concepts, strategies, procedures, Standards and guidance material that would lead to a truly global air navigation system. It is therefore necessary that airspace planning and implementation be carried out in an organized and harmonized manner.

2.1.2 With the gradual and phased implementation of CNS/ATM systems, it becomes necessary to reconcile the differences both within regions (intraregional) and with neighbouring regions (interregional) by adopting an approach based on cooperation and consensus-building, as well as by utilizing harmonization tools and techniques. The ultimate objective of harmonization and integration, leading to a global ATM system, is to provide transparent air traffic services, so that users can operate globally across disparate systems seamlessly with a consistent level of safety and with minimum requirements for equipment carriage. Interoperability and seamlessness are addressed in AN-Conf/11-WP/9.

2.1.3 The need for harmonization and integration of air navigation systems at the regional level giving rise to a global ATM system arises from:

- a) fragmented airspace and diversity in air traffic control infrastructure;
- b) lack of similar functionality;
- c) differing requirements at the national, subregional and regional levels;
- d) multiple operational and technical options; and
- e) differing time frames for implementation.

2.1.4 Furthermore, as traffic volumes grow worldwide, the demands on the air traffic service (ATS) provider in a given airspace increase, as do the complexities of ATM. The number of flights unable to follow optimum flight paths also increases with an increase in traffic volume. This creates pressure to upgrade the level of ATS by, inter alia, reducing separation minima. On the other hand, harmonized implementation of air navigation systems can enhance airspace capacity allowing for accommodation of the increased demand, while producing additional benefits in the way of more efficient flight profiles and increased levels of safety. While it is recognized that the regional approach of harmonized implementation

could significantly reduce service costs, it will also require new arrangements in the provision of services and consequent changes in ATM procedures.

2.1.5 The limitations listed in paragraph 2.1.3 are intrinsic to the systems themselves and thus the problems cannot be overcome on a regional and global scale except by a common and global vision, which will, in turn, guide implementation of future ATM systems as defined in AN-Conf/11-WP/4. Therefore, it could be concluded that there is a need to put into place a mechanism, the process and tools for harmonization and integration of air navigation systems resulting in a global continuum of airspace that will overcome present limitations as well as meet future growing traffic volumes on a cost-effective basis.

2.2 Implementation strategy

2.2.1 The overall strategy for the realization of a global ATM system through an evolutionary process should be planned and implemented within the framework of the global ATM operational concept. The strategy would consist of a mix of top-down and bottom-up approaches and would be guided by expectations of the ATM community. To promote the evolution and minimize the risks associated with the changes in the ATM infrastructure, a multiple sequence of step changes is encouraged within the time frame of twenty-five years, as defined in the ATM operational concept. Recognizing that the requirements are not the same in each region, it is not possible to implement each change simultaneously. Implementation in an initial area would therefore be followed by progressive extension to other areas. The collective commitment is central to the success of this regional implementation framework.

2.3 Implementation process

2.3.1 *Political plane:* The political will is essential for the realization of functional integration and interoperability between neighbouring regions. It should be noted that, under Article 28 of the *Convention on International Civil Aviation* (Doc 7300), ICAO Contracting States derive their respective sovereignty over their national airspace. Such individual responsibility of ICAO Contracting States is not likely to cause challenges for integration and interoperability. The key political issue is to define a grouping of States and service providers that collectively identifies a continuum of airspace for the benefit of the ATM community.

2.3.2 *Institutional aspects:* The institutional arrangements for the provision of air navigation services currently are not unified in many parts of the world, resulting in discontinuities in the management of airspace thus reflecting the complexity at the political level. The experience in different regions has proven that political will is achieved only when the technical approach has demonstrated feasibility. To attain the long-term goal of a global ATM system through the regional implementation framework, the States and the air navigation service providers should be encouraged to create/strengthen regional operating agencies and organize regular and systematic consultations between themselves and users. International cooperation between States on a subregional, as well as on a regional basis, in the form of international operating agencies, joint charges collection agencies, multinational facilities and services and joint financing arrangements is encouraged. One significant development common to all ATM institutions is the provision of services (e.g. navigation and communication services) by global service providers on a multi-user basis thus contributing to interoperability and seamlessness, resulting in harmonization at the regional level.

2.3.3 *Operational matters:* The global ATM operational concept acknowledges sovereignty but encourages airspace that is organized globally. It states clearly that homogeneous ATM areas should be kept to a minimum and that consideration should be given to consolidating adjacent areas. The operational concept

encourages that coordinated planning between adjacent areas should be conducted with the objective of achieving a single airspace continuum and, within that continuum, airspace should be free of operational discontinuities and inconsistencies and that transition between areas should be transparent to the users at all times. The operational concept and the Global Plan provide a road map for the next twenty-five years for use by States, subregional groups and planning and implementation regional groups (PIRGs) to plan their air navigation infrastructure and develop their planning documents in a coordinated and harmonized manner.

2.3.4 *Technical issues:* The essence of the regional implementation framework is that ATM would move away from a system based on national boundaries to one arranged around traffic patterns and changing situations. Nevertheless, different areas/regions will still have the option to implement different functionality to cater for differing user requirements. The ATM operational concept addresses the functions needed for ATM without reference to any specific technology and is open to new technology. Communications, navigation and surveillance systems would be used to functionally combine the ground-based and airborne system elements into a fully integrated and interoperable ATM system. This will allow flexibility across regions, homogeneous areas or major traffic flows to meet the requirements of a global ATM system.

2.4 Implementation mechanism

2.4.1 At the strategic level, the Global Plan provides a global framework for the implementation of CNS/ATM systems. At the functional level, the regional planning and implementation process is the principal engine of ICAO's work on air navigation systems encompassing all related issues with a focus on achieving harmonization. It is here that the top-down approach comprising global guidance and regional harmonization measures converge with the bottom-up approach constituted by planning at subregional levels and by States. The development of regional plans for air navigation systems is undertaken by ICAO's seven PIRGs with the assistance of ICAO's regional offices. These regional CNS/ATM plans are at different stages of development and, when they gain maturity, will be integrated into the more comprehensive regional air navigation plans (ANPs), which are currently being converted to a new format comprising a Basic ANP (Volume I) and a Facilities and Services Implementation Document (FASID) (Volume II).

3. PROGRESS ACHIEVED

3.1 The PIRGs, through subregional groups and States, have implemented and also put in place a number of ongoing initiatives enveloping ATM, communications, navigation, surveillance, economic and institutional areas that would enhance and expedite the process of attaining regional harmonization and eventually resulting in a global ATM system. It may be noted that some of the projects such as Europe, Middle East, Asia Route Structure South of Himalayas (EMARSSH), and reduced vertical separation minimum (RVSM) have been implemented in multiple regions using an interregional approach.

3.2 Standardization plays a key role in providing interoperability and seamlessness of air navigation systems across regions. It will be necessary to develop and adopt common specifications and functionality that would standardize the ATM environment within which all aircraft types can operate. A number of actions have been taken by ICAO, related standard-setting organizations as well as manufacturers with regard to development of Standards and Recommended Practices (SARPs), avionics standards and guidance material.

4. CHALLENGES AND PLANS FOR THE FUTURE

4.1 In order to progress with the harmonized implementation of air navigation systems, further steps are required in terms of identification and addressing the interface issues that would accelerate the process. An examination of the interface issues such as development of the ATM requirements, promulgation of SARPs for the implementation of global navigation satellite system (GNSS) and coordinated action for protection of aviation frequency bands, indicate that all of the CNS/ATM partners will have to work collectively in order to put in place a plan of action to address the next steps to achieve an integrated global ATM system on the basis of a regional approach which is safe, seamless and cost-effective. This work will likely take on new urgency and direction as the ATM operational concept is integrated into the overall planning framework.

5. ACTION BY THE CONFERENCE

5.1 The Conference is invited to:

- a) note the regional framework for the implementation of a global ATM system; and
- b) agree on the following recommendation:

Recommendation 1/ — Harmonization of air navigation systems

That ICAO and the CNS/ATM partners place emphasis on addressing the interregional interface issues with a view to facilitating the harmonized implementation of air navigation systems giving rise to a global ATM system.

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