INTERNATIONAL CIVIL AVIATION ORGANIZATION

AFI PLANNING AND IMPLEMENTATION REGIONAL GROUP
EIGHTEENTH MEETING (APIRG/18)
Kampala, Uganda (27 – 30 March 2012)

Agenda Item 3.7: Other Air Navigation Matters:
Twelfth Air Navigation Conference (AN-Conf/12) – Aviation System Block Upgrades

TWELFTH AIR NAVIGATION CONFERENCE

(Presented by the Secretariat)

SUMMARY

This paper presents information related to the convening of the Twelfth Air Navigation Conference (AN-Conf/12) to be held in Montreal, from 19 to 30 November 2012 to discuss subjects related to air navigation systems.

Action by APIRG/18 is in paragraph 6.

Related ICAO Strategic Objective(s): A (Safety) and C (Environmental Protection and Sustainable Development for Air Transport)

1. INTRODUCTION

1.1 The Air Navigation Commission, at the fifth meeting of its 185th session on 1 December 2010, agreed that Contracting States and appropriate international organizations be consulted through State letter ST/13/1-11/10, dated 31 March 2011, on the convening of the Twelfth Air Navigation Conference (AN-Conf/12) to discuss subjects related to air navigation systems.

1.2 On 6 October 2011, the Air Navigation Commission, at the third meeting of its 188th session, reviewed the comments received from Contracting States and international organizations and confirmed that there was a need for an AN-Conf/12 and agreed to recommend to Council that the meeting be held in Montreal from 19 to 30 November 2012.

1.3 The AN-Conf/12 will address the aviation system block upgrades that were introduced to the international community at the Global Air Navigation Industry Symposium (GANIS) held at Montreal from 20-23 September 2011 and will consider the communication, navigation, surveillance and avionics roadmaps for the Global Air Navigation Plan.

1.4 Security and environment will be addressed within the scope of the AN-Conf/12 as they have an important influence on the air navigation system. However, the larger issues related to security and the environment are addressed in other forms related to these fields of expertise such as the Committee for Aviation Environmental Protection (CAEP) and the Aviation Security Panel (AVSECP). The primary expertise required are air navigation experts in the fields of aerodromes, air routes and ground aids (AGA), aeronautical information management (AIM), air traffic management (ATM), communications, navigation and surveillance (CNS), meteorology(MET), operations (OPS) and search and rescue (SAR). The Conference would also benefit from expertise in air navigation related security and environment issues.

2. NEED FOR THE CONFERENCE

2.1 *Developments in air navigation systems*: The last air navigation conference (AN-Conf/11) was held in 2003. The main outcomes of that conference included the endorsement of a Global Air Traffic Management Operational Concept (operational concept), the establishment of the Global Air Navigation Plan (GANP) and the initiation of the performance-based planning framework. Further to AN-Conf/11, a number of important developments took place offering many opportunities to integrate global activities and work toward harmonized global air navigation system architecture. Many of these evolving technical work programmes reached maturity in an independent manner and, therefore, it would be advantageous to integrate and provide greater focus to the many implementation programmes towards globally harmonized objectives.

2.2 *Purpose*: The purpose of the AN-Conf/12 is to gain consensus, obtain commitments and formulate recommendations to achieve a harmonized global air navigation system for international civil aviation. The objective is to optimize the opportunities in technology and maturing work programmes toward common global objectives. The Conference will consider proposed aviation system block upgrades and the communications, navigation, surveillance and avionics roadmaps of the Global Air Navigation Plan. The Conference would also provide stakeholders with an opportunity to coalesce around major themes, set priorities and refine the way forward based on lessons learned. Special consideration would be given to utilization of existing capacity of enabling systems and planning for their expansion, taking into consideration user requirements.

3. THEME OF THE CONFERENCE: ONE SKY

3.1 *Vision – To achieve an integrated global ATM system in a progressive, cost-effective and cooperative manner*: As the air navigation system gains maturity, ICAO continues to address the challenge of the integration, interoperability and harmonization of the systems leading to the concept of "One Sky" for international civil aviation. The One Sky concept revolves around conceiving the notion globally, developing the implementation plans regionally, and implementing the infrastructure locally. It addresses international traffic flows from end to end with the purpose of increasing overall capacity, efficiency and improving safety, while also reducing the impact on the environment. The One Sky high- level global architecture should enable the digital environment, integrate aerodromes with a block-to-block strategy, facilitate trajectory-based ATM and support performance-based technologies.

3.2 *Application*: It is envisioned that the streams for discussion at the Conference will be presented as proposed operational improvements for international civil aviation rather than as aviation disciplines. Elements such as security and the environment can then be addressed within the context of air navigation. It is expected that operational improvements will be outlined in logical stepwise block upgrades that at a minimum: identify the operational benefit; determine the necessary procedures; nominate the required technology; develop the business case; and propose a preliminary strategy for regulatory approval.

4. EXPECTATIONS OF THE CONFERENCE

4.1 *Expectations*: The Conference is a formal ICAO meeting that provides opportunity to work together toward establishment of a global strategy for air navigation planning and implementation. Furthermore, it would set priorities, coalesce around major operational objectives to bring the global aviation community into agreement on an agenda to drive the next ten years of air navigation planning and implementation. It would allow ICAO to plan work programmes of panels and PIRGs toward finalization of operational improvements objectives and provide a stimulus to air navigation planning and implementation.

5. TIMING AND ORGANIZATION OF THE CONFERENCE

5.1 *Timing, organization and expertise required*: As the Conference would deal with all of the air navigation operational and infrastructure elements: AGA, AIM, ATM, CNS, MET, OPS and SAR, as well as relevant environmental and security aspects. The Commission agreed that a structure based on one committee was appropriate. The Conference will meet in Plenary the morning of the first day and again the last day to approve the Report of the Conference. All agenda items will be dealt within one committee.

6. ACTION BY APIRG/18

6.1 The Meeting is invited to:

Note the developments related to the convening of the 12th Air Navigation Conference in November 2012.

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APPENDIX A

AGENDA FOR THE TWELFTH AIR NAVIGATION CONFERENCE (2012)

As the air navigation system evolves, ICAO continues to address the challenge of the integration, interoperability and harmonization of systems leading to the concept of "One Sky" for international civil aviation. The One Sky concept emanates from the ICAO *Global Air Traffic Management Operational Concept* (Doc 9854) and supports its evolution. It revolves around conceiving the notion globally, developing the implementation plans regionally, and implementing required infrastructure and procedures both regionally and locally. Under One Sky, international traffic flows are addressed from end-to-end with the objective of increasing overall capacity and efficiency, and improving safety, while also reducing the impact on the environment. Using an enhanced long-term global planning regime based on Aviation System Block Upgrades (ASBUs) initiative feeding into communications, navigation, surveillance, avionics and aeronautical information management roadmaps, the One Sky high level global architecture should enable the digital environment, integrate aerodromes with a block-to-block strategy, facilitate trajectory-based air traffic management and support performance-based technologies.

Security and environment subjects will be addressed within the scope of the AN-Conf/12 as they have an important influence on the air navigation system. However, the larger issues related to security and the environment are addressed in other dedicated forums related to these fields of expertise such as the Committee for Aviation Environmental Protection (CAEP) and the Aviation Security Panel (AVSECP).

Agenda Item 1: Strategic issues that address the challenge of integration, interoperability and harmonization of systems in support of the concept of "One Sky" for international civil aviation

1.1: Global Air Navigation Plan (GANP) – performance framework for global planning

a) ASBU methodology and contents
b) Communications roadmap
c) Navigation roadmap
d) Surveillance roadmap
e) Avionics roadmap
f) AIM roadmap

With a focus on harmonization and interoperability leading to a global ATM system, this agenda item has the primary objective is to develop agreed roadmaps to support the ASBUs, that reflect short-, medium- to long-term planning horizons in terms of systems, procedures and technologies to be available to States and users. The five roadmaps will form the basis for development of a frequency spectrum strategy to support implementation. In all cases, a performance-based approach is to be utilized, based on identified operational improvement outcomes to ensure the end-to-end interoperability of systems. High-level impediments to implementation such as cyber security should be identified and considered as part of the roadmap development process. Arrangements to ensure the periodic update of the ASBUs and roadmaps on a rolling fifteen-year planning horizon will be proposed.

The Conference will be invited to:

a) endorse communication, navigation, surveillance, avionics and AIM roadmaps;
b) agree on what more needs to be done in terms of the further development of the roadmaps, as well as the way in which this will done;

c) establish timelines and methodologies for the development of a frequency spectrum strategy to complement the communication, navigation, surveillance, avionics and AIM roadmaps;
d) agree with the inclusion of roadmaps and ASBUs as appendices to the Global Air Navigation Plan; and
e) identify and endorse a methodology to periodically update GANP to ensure there are systematic updates to the rolling fifteen-year planning horizon for ASBUs and roadmaps.

In this context, papers should provide proposed inputs to the respective ASBUs and roadmaps along with supporting justification. Papers on environment and security matters should be limited to issues directly related to air navigation.

Agenda Item 2: Aerodrome operations – improving airport performance

2.1: Airport capacity
2.2: Performance-based navigation (PBN) – a practical way to improve airport performance with safety and efficiency

Increased runway infrastructure and advances in airborne traffic handling capabilities are fundamental to increasing airport capacity, but are to little avail if overall airport surface operations are not also optimized to improve airport performance. Complementary operational procedures that maximize the usage of PBN capabilities are essential to increasing capacity, and will also provide safety enhancements through approaches with vertical guidance and stabilization of approaches to help mitigate runway excursions. At the same time, implementations of collaborative decision-making arrangements that share information between operational partners at an airport are required in order to improve situational awareness and realize substantial efficiencies in the management of surface traffic. Predictability and punctuality, including aspects related to the transit of security and border control points, are significant contributors/limiters to efficient surface operation. The routine, real time collaboration and coordination between airport stakeholders in these and many other respects is critical to optimizing the timely and effective use of airport surface infrastructure.

Agenda Item 3: Interoperability and data – through globally interoperable system-wide information management (SWIM)

3.1: Performance improvement through the application of system-wide information management (SWIM)
3.2: Improved operational performance through flight and flow information for a collaborative environment (FF-ICE)
3.3: Service improvement through digital aeronautical information management (AIM)
3.4: Enhance operational decision-making through integrated meteorological information

Global system-wide information management requires system-level information management solutions rather than individual solutions to integrate the ATM network in the information context – a global aviation intranet. This goal will be achieved by globally linking the capabilities of multiple suppliers and users of ATM-related information thus providing a tool for individual and collaborative decision-making. The adoption of system-level solutions requires agreement on the various ground/ground and air/ground interfaces, types of data and exchange models to be utilized, quality/integrity requirements for data and consideration of commercial and national security aspects. Implementation methodologies need to be carefully considered to ensure functional, risk-managed

deployment strategies across the global system. In particular, developments in terms of the digitization of AIM data and integration of digital MET data will be considered and, recognizing the pivotal role played by an aircraft's flight plan in the data chain, the Conference will be invited to consider proposals for the phased implementation of an advanced flight planning and information sharing concept known as flight and flow information for a collaborative environment (FF-ICE).

Agenda Item 4: Optimum capacity and efficiency – through global collaborative ATM

4.1: Efficient management of airspace and improved flow performance through collaborative decision-making (CDM)
4.2: Dynamic management of special use airspace

Although recognizing that collaborative decision-making ideally commences as early as the cost/benefit and business case discussions for new or upgraded infrastructure investment, the search for increased capacity and efficiency in day to day operations may be largely served by CDM activities at the operational level. The wide collaboration of operational stakeholders supported by appropriate information and decision-support tools will enable decisions to be made that include consideration of the preferences expressed by respective airspace users while ensuring the most efficient use of, and greatest possible access to, all airspace resources on an equitable basis. The Conference will be appraised of general developments in the area of CDM, with specific attention to the progress in overall air traffic flow management within and across flight information regions (FIRs) and the advances in arrival and departure management functions enabled by automated systems. Enhancements to the management of special use airspaces in both the civil/civil and civil/military context remain a pressing need and the Conference will seek to identify improvements based on automated sharing of real time information including aircraft surveillance data between agencies. The discussion of the use of automation will include the need to analyze the ability of the human operators to intervene when and as needed to preserve the overall safety of the system and other aspects of the human in the loop. An information exchange in relation to unmanned aircraft systems/remotely-piloted aircraft systems (UAS/RPAS) developments will take place under this agenda item.

Agenda Item 5: Efficient flight paths – through trajectory-based operations

5.1: Traffic synchronization through 4D trajectory-based operation (TBO)
5.2: Increased efficiency in descent and departure profiles

A move from the present clearance-based control model (where the present location of the aircraft is known) to a trajectory-based management concept (where the future location of the aircraft is known) is fundamental in increasing the efficiency of flight paths. Using shared dynamic trajectory information to facilitate wide area CDM between adjacent air navigation service provider (ANSP) authorities and FIRs, the ATM system will be able to analyze and accurately predict future situations based on three-dimensional and ultimately four-dimensional parameters in order to achieve the best system performance. Flights will be accommodated in a manner that achieves the optimum system outcome with minimal deviation from the user, preferred 4D flight trajectory. Automation, both in the air and on the ground, will be used to create an efficient and safe flow of traffic for all phases of flight and requirements for airspace users to adhere to the agreed trajectory will remove much of the uncertainty regarding the future positions of aircraft. The discussion of the use of automation will include the need to analyze the ability of the human operators to intervene when and as needed to preserve the overall safety of the system. The Conference will consider developments in regard to the synchronization of traffic flows at merging points in the en-route environment, and in terminal control areas (TMAs) to optimize landing sequence, by application of time-based metering at intermediate points. The Conference will be invited to discuss the deployment of departure and arrival procedures that take into account airspace and

traffic complexity while facilitating flight via optimum profiles by enabling continuous climb operations (CCOs), continuous descent operations (CDOs) and optimized profile descents (OPDs). Supporting ATM procedures and arrangements such as conflict management, airspace organization and management, demand and capacity balancing and environmental management will be an essential component of these discussions.

Agenda Item 6: Future direction

6.1: Implementation issues
6.2: Standardization – approach to SARPs development in support of One Sky

At the strategic level, the operational concept provides a vision and the Global Plan provides a global framework for the implementation of air navigation systems. The regional planning and implementation process is the principal engine of ICAO's implementation work of air navigation systems. It is here that the top-down approach comprising global guidance and regional harmonization measures converge with the bottom-up approach constituted by national planning by States. This agenda item will discuss and determine the way forward in implementing a new Global Plan comprising of ASBU methodology/CNS-AIM-avionics roadmaps and will address all related issues including training.

Civil aviation is served by a number of standards-making bodies at the global, regional, national and industry level, with the high-level standards produced by ICAO providing the basis for development of detailed State and industry standards. In an increasingly multidisciplinary environment, ensuring the efficient development and delivery of relevant global standards in a coordinated and timely manner remains a challenge for ICAO. Discussions will focus on identifying multi-party approaches to standards development that take advantage of structured coordination and collaboration arrangements within the ICAO/State relationship, and between ICAO and standards bodies, to support implementation timeframes specified in the roadmaps. Human factors must be addressed in every case where there is or could be human interaction, as a user and/or as an information source. This is specifically the case with AIM, SWIM, avionics and flight procedure design, or any automated function where the fallback may be human operation. The human factors assessment should also determine where there is a need for global standardization, for example, of graphical or textual notations and checklists.

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