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TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

REPORT OF THE COMMITTEE TO THE CONFERENCE ON AGENDA ITEM 1

The attached report has been approved by the Committee for submission to the Plenary.

Captain John F. McCormick
Committee Chairman

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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 INTRODUCTION

1.1.1 With a focus on harmonization and interoperability leading to a global air traffic management (ATM) system, this agenda item introduced the revised draft Fourth Edition of the *Global Air Navigation Plan* (Doc 9750, GANP). The Committee noted that this version builds on past planning documents in that it provides a global planning framework which, among other things, provides a timeline for which future improvements can be implemented by States in accordance with their needs. In addition, it identifies the need for the development of standards and recommended practices, regulatory requirements, procedures and technology associated with the aviation system block upgrades (ASBU). The ASBUs are supplemented by communications, navigation, surveillance (CNS), avionics and information management roadmaps. High-level impediments to implementation such as cyber security were identified and considered during the discussions. Arrangements to ensure the periodic update of the ASBUs and roadmaps on a rolling fifteen-year planning horizon were discussed.

1.1.2 The Committee agreed that the ASBUs and associated technology roadmaps were an integral part of the GANP and a valuable implementation tool kit.

1.1.3 The Committee agreed that the policy and associated principles in the GANP were fundamental to long-term planning and therefore put forth a significant effort in establishing high-level principles to guide development of the policy in the appendix to this report.

1.2 GLOBAL AIR NAVIGATION PLAN – FRAMEWORK FOR GLOBAL PLANNING

1.2.1 The Committee discussed the draft revised GANP and its supporting concepts including the ASBUs, the technology roadmaps and a regional planning framework and associated metrics. The Committee also discussed the importance of adequate frequency spectrum to support the ASBUs. As a result of the discussions, the following recommendations were accepted by the Committee:

Recommendation 1/1 – The draft Fourth Edition of the *Global Air Navigation Plan* (Doc 9750, GANP)

That States:

a) agree in-principle, with the inclusion of high level policy principles and other proposed improvements made at this conference, with the updated draft Fourth Edition of the GANP; and

b) should have the opportunity to provide any final comments on the updated draft GANP to ICAO before it is considered by the ICAO Assembly in 2013;

That ICAO:

c) include the key air navigation policy principles presented in the appendix under "What is the Global Plan" into the Fourth Edition of the *Global Air Navigation Plan* (Doc 9750, GANP);

d) convene a symposium in 2014 where interested stakeholders will be invited to join together to provide end-to-end system demonstrations of new air traffic management (ATM) concepts;

e) develop financial policies which support efficient acquisition and implementation of global air navigation services infrastructure and aircraft equipage;

f) taking a total systems and performance-based approach, create a Standards and Recommended Practices development plan for the aviation system block upgrades including the establishment of agreed global priorities between the different blocks and modules;

g) define a stable and efficient process for endorsement by the 38th Session of the ICAO Assembly, for updating the GANP that ensures stability in module timelines for any future updates; and

h) ensure that the nature and status of the planning information in the various documents pertaining to the GANP are consistent and complete and allow due account to be taken of the inputs from ATM research, development and deployment programmes.

Recommendation 1/2 – Implementation

That ICAO:

a) through its regional offices, provide guidance and practical assistance to States and regions and subregions when they decide to implement individual blocks or modules of the ASBUs;

b) establish a group and improved mechanism for interregional cooperation to ensure harmonization of ATM; and

c) assist States and regions in training and capacity-building towards implementation of the relevant modules of the aviation system block upgrades.

Recommendation 1/3 – Guidance on business cases

That ICAO complete the development of guidance material on business case analysis, adopting such appropriate guidance material that may be already available or under development.

1.2.2 The Committee noted the ASBU Block 0 modules gap analysis and referred the details thereto for consideration during the review and finalization of Block 0 modules.

1.3 TECHNOLOGY

1.3.1 The Committee addressed a range of technology issues and enablers that support the modules of the aviation system block upgrades (ASBUs) and agreed that available and emerging technologies and a supporting regulatory framework, including ICAO Standards, Recommended Practices, Procedures and guidance material would be necessary to support the successful implementation of the ASBUs and the associated modules. It was also agreed that technology roadmaps and regional planning, supported by performance measurement metrics would be necessary to measure progress and the effectiveness of implementation noting further work by ICAO was also required in this area.

1.3.2 The Committee recognized the need to have a common understanding of the architecture of the ATM system as an instrument to facilitate the implementation of the ASBUs.

1.3.3 Following this, the Committee addressed a proposed method to support "self-reserved data wireless networks in the air". Although the technical merits of this were accepted by the Committee, it was referred to ICAO for further consideration due to the fact that existing technologies with a significant installed based satisfied current and future operational requirements.

1.3.4 The Committee considered the impact of increasing levels of automation on the global ATM system and accepted the need for a roadmap showing the evolution of ATM automation systems in support of the GANP.

1.3.5 Based on the discussions above, the following recommendations were accepted by the Committee:

Recommendation 1/4 – Architecture

That ICAO:

a) develop, for inclusion in the first update of the GANP after the 38th Session of the ICAO Assembly, a global ATM logical architecture representation in support of the GANP and planning work by States and regions; and

b) develop a breakdown of the logical architecture of the ground system to the level needed to best address the global interoperability issues.

Recommendation 1/5 – Time reference accuracy

That ICAO define the accuracy requirements for the future use of a time reference and to prepare the necessary amendments to Standards and Recommended Practices.

Recommendation 1/6 – Data communications issues

That ICAO:

a) organize a multidisciplinary review of air traffic control communication requirements and issues; and

b) review the operation, management and modernization of a regional digital network technical cooperation project and other similar regional experiences with the aim that this efficient practice can be adapted for use in other ICAO regions;

That States:

c) explore multi-modal solutions when appropriate to overcome transition issues; and

d) anticipate and accelerate the migration of air traffic management communication systems towards more efficient technologies to timely service the aviation system block upgrade modules.

Recommendation 1/7 – Automatic dependent surveillance — broadcast

That States:

a) recognize the effective use of automatic dependent surveillance — broadcast (ADS-B) and associated communication technologies in bridging surveillance gaps and its role in supporting future trajectory-based air traffic management operating concepts, noting that the full potential of ADS-B has yet to be fully realized; and

b) recognize that cooperation between States is key towards improving flight efficiency and enhancing safety involving the use of automatic dependent surveillance — broadcast technology;

That ICAO:

c) urge States to share automatic dependent surveillance — broadcast (ADS-B) data to enhance safety, increase efficiency and achieve seamless surveillance and to work closely together to harmonize their ADS-B plans to optimize benefits.

1.3.4 The Committee agreed that there was a need to ensure that the minimum set of global CNS systems required to meet aviation's safety and capacity requirements was clearly identified; that where necessary duplication exists, reasoned justification is provided; and that, when new systems and technologies are introduced, implementation strategies clearly define sunset clauses to phase out older systems where this is feasible. On this basis, the Committee accepted the following recommendations:

Recommendation 1/8 – Rationalization of radio systems

That ICAO and other stakeholders to explore strategies for the decommissioning of some navigation aids and ground stations, and the rationalization of the on-board communications, navigation and surveillance systems while maintaining safety and coordinating the need for sufficient system redundancy.

Recommendation 1/9 – Space-based automatic dependent surveillance — broadcast

That ICAO:

a) support, subject to validation, the inclusion in the GANP, development and adoption of space-based automatic dependent surveillance — broadcast surveillance as a surveillance enabler;

b) develop Standards and Recommended Practices and guidance material to support space-based automatic dependent surveillance — broadcast as appropriate; and

c) facilitate needed interactions among stakeholders, if necessary, to support this technology.

Recommendation 1/10 – Automatic dependent surveillance — self-organizing wireless data networks

That ICAO consider the use of self-organizing wireless data networks based on VDL Mode-4 technology taking into account:

a) possible technical advantages;

b) whether it satisfies any unmet operational need; and

c) its impact of forward and retro-fit on the global air transport fleet.

Recommendation 1/11 –Automation roadmap

That ICAO:

a) develop a global roadmap for the evolution of ground air traffic management automation systems in line with aviation system block upgrade implementation; and

b) develop performance-based system requirements for air traffic management automation systems so that:

   1) where necessary these systems are interoperable across States and regions; and

   2) the function and operation of these systems will result in consistent and predictable air traffic management system performance across States and regions.

1.4 SPECTRUM

1.4.1 On the continuing development of aeronautical frequency spectrum as a resource, the Committee agreed that frequency spectrum is fundamental to aviation safety and aviation operations. It is essential that aviation maintains access to sufficient, suitably protected spectrum to support the current

and future global ATM system. The Committee noted that in order to achieve this, aviation needs to continue to be engaged in the radio regulatory process (World Radiocommunication Conferences (WRC) and ITU-R preparatory process). The Committee supported the need for a common globally coordinated ICAO position and sufficient resources devoted to ensure that future aviation spectrum needs are recognized and met, and to ensure that potential and actual threats are identified and addressed. Based on its discussions, the Committee accepted the following recommendation:

Recommendation 1/12 –Development of the aeronautical frequency spectrum resource

That States and stakeholders:

a) recognize that a prerequisite for the deployment of systems and technologies is the availability of adequate and appropriate radio spectrum to support aeronautical safety services;

b) work together to deliver efficient aeronautical frequency management and “best practices” to demonstrate the effectiveness and relevance of the industry in spectrum management;

c) support ICAO activities relating to the aviation spectrum strategy and policy through relevant expert group meetings and regional planning groups; and

d) support Assembly Resolution A36-25 and the requirement for sufficient State representation of aviation interests at World Radiocommunication Conferences (WRCs) and relevant International Telecommunication Union WRC preparatory meetings;

That ICAO:

e) develop and implement a comprehensive aviation frequency spectrum strategy to be referenced to the GANP, which includes the following objectives:

   1) timely availability and appropriate protection of adequate spectrum to create a sustainable environment for growth and technology development to support safety and operational effectiveness for current and future operational systems and allow for the transition between present and next generation technologies;

   2) demonstrate efficient use of the spectrum allocated through efficient frequency management and use of best practises; and

   3) clearly state in the strategy the need for aeronautical systems to operate in spectrum allocated to an appropriate aeronautical safety service;

f) establish timelines and methodologies to complement the GANP planning objectives with a frequency spectrum strategy;

g) continue to allocate adequate resources with a far-sighted approach to its work programmes regarding aviation spectrum challenges;

h) consider a methodology to enable ATM stakeholders to effectively share ICAO material on aviation frequency spectrum as a common guidance for securing the aviation position at World Radiocommunication Conferences; and

i) consider structuring the *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including Statement of Approved ICAO Policies* (Doc 9718) by using a web-based platform as appropriate, to further support States in their implementation of the spectrum strategy.

1.4.2 **Specific issues related to the agenda of ITU WRC-15**

1.4.2.1 The Committee noted that WRC-15 will consider a potential regulatory action to facilitate the use of fixed satellite service spectrum for the command and control link for remotely piloted aircraft systems (RPAS), consistent with the safety of life aspects of RPAS operations. The Committee agreed that it is important that States and ICAO support the on-going International Telecommunication Union Radio Communication Sector (ITU-R) preparatory studies on this issue to ensure that the safety of life concerns, if using a non-safety spectrum allocation, will be sufficiently addressed. Based on its discussions, the Committee accepted the following recommendation:

Recommendation 1/13 – Potential use of fixed satellite service spectrum allocations to support the safe operation of remotely piloted aircraft systems

That ICAO support studies in the International Telecommunication Union Radio Communication Sector (ITU-R) to determine what ITU regulatory actions are required to enable use of frequency bands allocated to the fixed satellite service for remotely piloted aircraft system command and control (C2) links to ensure consistency with ICAO technical and regulatory requirements for a safety service.

1.4.3.2 The Committee noted that very small aperture terminal (VSAT) satellite networks in the C-band (3400 – 4200 MHz) are used to facilitate Safety of Life CNS services where terrestrial infrastructure is non-existing or not sufficiently reliable. Due to atmospheric and rainfall attenuation in higher frequency bands, the C-band remains the most suitable frequency band for this service, especially in tropical regions. C-band VSAT networks are currently in use in all regions of the world. However, it was recalled that at WRC-07, an allocation specific to ITU Region 1 (Europe and Africa) was made to the international mobile telecommunications (IMT) service in the C-band. This has resulted in interference and reduced access for aeronautical C-band networks, especially in Africa.

1.4.3.3 Furthermore, the Committee noted that the outcome of WRC-15 Agenda Items 1.1 and 0.1.5 may negatively impact the continued operation of C-band VSAT networks on a worldwide basis, unless aviation interests are sufficiently supported during the WRC. The Committee agreed that long-term VSAT spectrum availability and protection from interference needs to be guaranteed across the entire African continent and other parts of the world. Based on the above, the Committee accepted the following recommendation:

Recommendation 1/14 –Long-term very small aperture terminal spectrum availability and protection

That:

a) ICAO and Member States not support additional international mobile telecommunications spectrum allocations in the fixed satellite service C-band spectrum at the expense of the current or future aeronautical very small aperture terminal networks; and

b) ICAO and Member States pursue this matter in the International Telecommunication Union Radio Communication Sector (ITU-R) and during the World Radiocommunication Conference (WRC-15), with a coordinated proposal to promote a solution where the international mobile telecommunications spectrum allocation does not compromise the availability of the aeronautical very small aperture terminal networks.

1.5 METRICS

1.5.1 The Committee noted that the implementation of "One Sky" would require the use of a common "language" regarding performance monitoring and measurement. This implies a coordinated approach across States and stakeholders for data provision, collection, storage, protection, dissemination, indicator calculation and use of the results to support the various ATM improvement processes. It was agreed that there was a need to develop a global methodology, to identify metrics and indicators which could be used to allow States and regions to measure and evaluate the effectiveness of their ATM performance initiatives. In doing so, particular attention should be given to avoiding duplication of efforts and to use, to the maximum extent possible, existing arrangements and solutions. As a result of its deliberations, the Committee agreed to the following recommendation:

Recommendation 1/15 – Performance monitoring and measurement of air navigation systems

That ICAO:

a) establish a set of common air navigation service performance metrics supported by guidance material, building on existing ICAO documentation (e.g. *Manual on Global Performance of the Air Navigation System* (Doc 9883) and the *Manual on Air Navigation Services Economics* (Doc 9161));

b) promote the development and use of "leading safety indicators" to complement existing "lagging safety indicators" as an integral and key component to drive improvement in performance and in the achieved management of risk; and

c) encourage the early and close involvement of the regulator and oversight bodies in the development, proving of concepts and implementation of the aviation system block upgrades and regional programmes.

Recommendation 1/16 – Access and equity considerations

That States:

a) ensure, as part of the aviation system block upgrade implementation, the principles of access and equity are included in all airspace modernization and redesign efforts; and

b) detail how they will monitor the service providers to ensure that they are providing fair, equitable, and efficient access to all aviation services including general aviation.

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APPENDIX

WHAT IS THE GLOBAL AIR NAVIGATION PLAN

1. INTRODUCTION

1.1 The ICAO Global Air Navigation Plan (GANP) is an overarching framework that includes key aviation policy principles to assist ICAO regions, subregions and States with the preparation of their regional and State air navigation plans.

1.2 The objective of the GANP is to increase capacity and improve efficiency of the global aviation system whilst improving or at least maintaining safety. The GANP also includes strategies for addressing the other ICAO Strategic Objectives.

1.3 The GANP includes the aviation system block upgrade (ASBU) framework, its modules and its associated technology roadmaps covering inter alia communications, surveillance, navigation, information management and avionics.

1.4 The ASBUs are designed to be used by the regions, subregions and States when they wish to adopt the relevant blocks or individual modules to help achieve harmonization and interoperability by their consistent application across the regions and the world.

1.5 The GANP, along with other high level ICAO plans, will help ICAO regions, subregions and States establish their air navigation priorities for the next fifteen years.

1.6 The GANP outlines ICAO's ten key aviation policy principles guiding global, regional and State air navigation planning.

CHAPTER I

ICAO'S TEN KEY AIR NAVIGATION POLICY PRINCIPLES

1. *Commitment to the implementation of ICAO's Strategic Objectives and Key Performance Areas*

1.1 ICAO regional and State air navigation planning will cover each of ICAO's Strategic Objectives and all eleven ICAO Key Performance Areas.

2. *Aviation safety is the highest priority*

2.1 In air navigation planning and in establishing and updating their individual air navigation plans, ICAO regions and States will give due consideration to the safety priorities set out in the Global Aviation Safety Plan (GASP).

3. ***Tiered approach to air navigation planning***

3.1 ICAO's Global Aviation Safety Plan and Global Air Navigation Plan will guide and harmonize the development of ICAO regional and individual State air navigation plans.

3.2 ICAO regional air navigation plans, developed by the regional planning and implementation regional groups (PIRGs), will also guide and harmonize the development of individual State air navigation plans.

3.3 When developing their regional air navigation plans, PIRGs should address their intra and interregional issues.

4. ***Global Air Traffic Management Operational Concept (GATMOC)***

4.1 The ICAO endorsed GATMOC (Doc 9854) and companion manuals, which include inter alia, the *Manual on Air Traffic Management System Requirements* (Doc 9882) and the *Manual on Global Performance of the Air Navigation System* (Doc 9883) will continue through their evolution, to provide a sound global conceptual basis for global air navigation and air traffic management systems.

5. ***Global air navigation priorities***

5.1 The global air navigation priorities are described in the GANP. ICAO should develop provisions, supporting material and provide training in-line with the global priorities for air navigation.

6. ***Regional and State air navigation priorities***

6.1 ICAO regions, subregions and individual States through the PIRGs should establish their own air navigation priorities to meet their individual needs and circumstances in line with the global air navigation priorities.

7. ***Aviation system block upgrades (ASBUs), modules and roadmaps***

7.1 The ASBUs, modules and roadmaps form a key attachment to the GANP, noting that they will continue to evolve as more work is done on refining and updating their content and in subsequent development of related provisions, support material and training.

8. ***Use of ASBU blocks and modules***

8.1 Although the GANP has a global perspective, it is not intended that all ASBU modules are to be applied around the globe.

8.2 When the ASBU blocks and modules are adopted by regions, subregions or States they should be followed in accordance with the specific ASBU requirements to ensure global interoperability and harmonization of air traffic management.

8.3 It is expected that some ASBU modules will be essential at the global level and therefore may eventually be the subject of ICAO mandated implementation dates.

9. ***Cost benefit and financial issues***

9.1 The implementation of air navigation measures, including those identified in the ASBUs can require significant investment of finite resources by ICAO regions, subregions, States and the aviation community.

9.2 When considering the adoption of different blocks and modules, ICAO regions, subregions and States should undertake cost benefit analyses to determine the business case for implementation in their particular region or State.

9.3 ICAO should complete the development of guidance material on cost-benefit analysis for the purposes of advising the States and implementing the GANP.

10. ***Review and evaluation of air navigation planning***

10.1 ICAO should review the GANP every three years and if necessary, all relevant air navigation planning documents through the established and transparent process. Each new edition of the GANP should, after ANC review, be submitted to the Council for endorsement, and then to the next session of the ICAO Assembly for approval, as the future strategic direction for global air navigation.

10.2 The appendices to the GANP should be analysed annually by the Air Navigation Commission to ensure they remain accurate and up-to-date.

10.3 The progress and effectiveness of ICAO regions and States against the priorities set out in their respective regional and State air navigation plans should be annually reported, using a consistent reporting format, to ICAO.

10.4 This will assist regions and States adjust their priorities to reflect actual performance and address any emerging air navigation issues.

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