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TWELFTH AIR NAVIGATION CONFERENCE

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REPORT OF THE COMMITTEE TO THE CONFERENCE ON AGENDA ITEM 4

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 4: Optimum capacity and efficiency – through global collaborative ATM**4.1 INTRODUCTION**

4.1.1 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. Under this agenda item, the modules that support the key performance area of optimum capacity and flexible flights were presented.

4.1.2 These are Improved Operations through Free Routing, Enhanced Flow Performance through Network Operational Planning, Better Operational Decisions through Integrated Weather Information, Increased Capacity and Flexibility through Integrated Weather Information, Increased Capacity and Flexibility through Interval Management, and Initial Integration of Remotely Piloted Aircraft Systems into Non-Segregated Airspace.

4.1.3 The Conference was presented with general developments in the area of collaborative decision-making (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 airspace in both the civil/civil and civil/military context remain a pressing need and the Conference sought to identify improvements based on automated sharing of real time information including aircraft surveillance data between agencies. Discussions took place on the subject of unmanned aircraft systems/remotely piloted aircraft systems (UAS/RPAS) took place and the Committee agreed that this should be a priority in the ICAO work programme.

4.1.4 Finally, developments in the digitization of aeronautical information management (AIM) data and integration of digital meteorological (MET) data were considered.

4.1.5 Under this agenda item, the aviation system block upgrade (ASBU) modules that support the key performance area of optimum capacity and efficiency were introduced. These comprise the following:

- a) B0-10, B1-10 and B3-10 – Enhanced en-route trajectories;
- b) B0-35, B1-35 and B2-35 – Improved flow performance through network wide planning;
- c) B0-84 – Ground-based surveillance;
- d) B0-85, B1-85, B2-85 and B3-85 – Air traffic situational awareness and airborne separation applications;
- e) B0-86 – Improved access to optimum flight levels;
- f) B1-90, B2-90 and B3-90 – Remotely piloted aircraft;
- g) B0-101 and B2-101 – Airborne collision avoidance system (ACAS) improvements;

- h) B0-102 and B1-102 – Ground-based safety nets; and
- i) B0-105, B1-105 and B3-105 – Meteorology in support of air traffic management improvements.

4.2 AIR TRAFFIC FLOW MANAGEMENT

4.2.1 The Committee reviewed the overall strategy, the incremental development, the technology requirements and deployment considerations related to network operations. It was noted that network operations may be described as a series of processes to manage flows or groups of flights to improve overall traffic fluidity and that it takes into account a process for capacity management and planning, as well as airspace design and management. Network operations also enhances collaborative decision-making (CDM) amongst stakeholders in real-time to take advantage of system capabilities and adopt user preferences to assist air traffic flow management (ATFM) in making the most efficient use of airspace resources on an equitable basis.

4.2.2 The Committee recognized that the implementation of effective and efficient network operations depends upon several key elements involving real-time coordination between airspace users and ground based stakeholders, including the military. It was recognized that progressive deployment of flight and flow – information for a collaborative environment (FF-ICE) should benefit advanced ATFM, capacity management and CDM applications. It was also recognized that development of ICAO provisions on ATFM, data exchange format including trajectory information was necessary.

4.2.3 The Committee was informed that detailed information on the CDM and ATFM components of network operations and on the means to implement an ATFM service taking into account the performance objectives of the different participants and regions, could be found in the *Manual on Collaborative Air Traffic Flow Management* (Doc 9971).

4.2.4 The Committee was informed of several national and regional CDM and ATFM implementation projects and urged that procedures both regionally and globally should be harmonized.

4.2.5 The Committee recognized that State and subregional initiatives related to ATFM and CDM would serve as a pre-requisite for air traffic management (ATM) performance delivery as well as serve as effective means to establish operational partnerships among the principal stakeholders, i.e. civil and military airspace users, air navigation service providers (ANSPs), airports and other functions, including ATFM intra and interregional and requested ICAO to develop a programme for regional training on CDM and ATFM to enhance and harmonize CDM and ATFM knowledge.

4.2.6 The Committee was informed that some cooperative ATFM activities are currently being addressed by an ATFM forum that has include participation of some States and international organizations with experience in ATFM and that the global community would benefit from a more formalized status to this initiative with ICAO involvement.

4.2.7 Based on the discussions on network operations, the Committee expressed its support to the modules associated with it and agreed that there was a need for future standardization of processes and procedures associated with CDM and ATFM integration into ATM.

4.3 SEPARATION

4.3.1 The Committee accepted a proposal to modify the strategic direction for airborne surveillance aiming at not pursuing self-separation (B3-85) at this stage. The Committee also agreed to a recommendation to pursue Modules B0-85 and B1-85 and agreeing in principle with B2-85 “airborne separation” pending a review of the concept and terminology for that module.

4.3.2 The Committee acknowledged the interactions between airborne separation and the airborne collision avoidance system (ACAS) and the need to modify the block upgrade modules accordingly.

4.3.3 Any review of airborne separation should take into account the provisions on self-separation and conflict management given in the *Global ATM Operational Concept* (Doc. 9854).

4.4 SAFETY NETS

4.4.1 The Committee reviewed the overall strategy, the incremental development, the technology requirements and deployment considerations related to airborne collision avoidance systems (ACAS) and ground-based safety nets.

4.4.2 The Committee was informed that safety nets, which comprise ACAS and ground-based safety nets for air traffic controllers, monitor aspects of the operational environment and generate an alert if a safety risk is predicted exists or remedial action is necessary to assure flight safety. The Committee recognized the need for short-term improvements to both systems as well for future improvements to allow airborne collision systems to adapt to ATM operations.

4.4.3 With regard to the effects of downlinking ACAS Resolution Advisories (RAs) to air traffic controllers, the Committee agreed that:

- a) careful evaluations and validations of the effects from technical, safety and human performance perspectives are essential;
- b) recurrent pilot and air traffic controller training is important; and
- c) there was a need to ensure that the downlinking of ACAS RAs does not introduce new ambiguities concerning the division of responsibility between flight crews and air traffic controllers and develop new guidance material.

4.4.4 The Committee was informed of State and regional initiatives related to the current ACAS version, a new generation of ACAS and ground-based safety nets for those that have the capability to do so. Regarding the new generation of ACAS, the Committee recognized that this new generation of ACAS must be available and accessible to all States and concluded that this would benefit from coordination through ICAO.

4.4.5 Finally, the Committee noted the importance of position tracking in oceanic and remote areas as well as the transmission of flight data triggered by significant safety events to facilitate search and rescue operations.

4.5 FLEXIBLE USE OF AIRSPACE

4.5.1 Under this item, the Committee considered issues related to civil/military coordination/cooperation and flexible use of the airspace and issues related to the limited access by civil traffic to military segregated airspace in many areas of the world. This keeps aircraft from operating along their preferred trajectories resulting in excess fuel consumption and related emissions. The Committee noted that the situation has improved little in recent years despite ICAO having held global and regional events throughout the world and the wide distribution of guidance material (Circular 330, Civil/Military Cooperation in Air Traffic Management).

4.5.2 The committee also recognized that successful cooperation between civil and military airspace users and planners requires collaboration based on education, communication, and mutual trust and requested ICAO to continue addressing civil/military coordination and cooperation matters to not only increase efficiency and capacity, but also to enhance safety.

4.5.3 The committee agreed that a balanced and collaborative approach to airspace management was needed, in a way that meets military activity needs and those of air transportation. It was also agreed that specific steps should be taken, that provide a more proactive approach aligned with the implementation of Block 0 components, to bring clear operational benefits in specific areas serving international traffic flows. It was also agreed that ICAO should develop a set of criteria or metrics to enable objective measurement of progress in civil/military cooperation and to continue documenting best practices related to civil/military cooperation.

4.5.4 While the efficiency in airspace utilization remains one of the main objectives of civil/military cooperation, the rapid evolution of avionics and aeronautical technologies demands for an expanded collaboration in a much wider spectrum of areas. In seeking a wider approach to civil/military cooperation, and in covering as many items of common interest as possible, we believe this would contribute to the overall performance of the global aviation system, promoting positive synergies and integrated solutions for optimization of available resources.

4.6 REMOTELY PILOTED AIRCRAFT SYSTEM

4.6.1 The Committee reviewed the aviation system block upgrade (ASBU) module on remotely piloted aircraft (RPA), including the overall strategy, the incremental development, the technology requirements and deployment considerations that will eventually lead to seamless operation of RPA in non-segregated airspace and at aerodromes.

4.6.2 The Committee noted that certification requirements for remotely piloted aircraft systems (RPAS), detect and avoid function, command and control, ATC communication capabilities and predictable behaviour in any operational situation were key enablers for RPA integration. The Committee recognized that provisions to support RPAS will be necessary in virtually all ICAO annexes.

4.6.3 The Committee acknowledged that availability of globally harmonized provisions for RPAS was essential to facilitate development of required technologies and certification methods to permit the operation of RPA in non-segregated airspace and at aerodromes and should be prioritized by ICAO.

4.7 METEOROLOGY

4.7.1 The Committee noted that meteorological information was an integral component of the future system-wide information management (SWIM) environment, alongside aeronautical information, flight and flow information and other information sources. As meteorological information transitions to interoperable, non-proprietary code forms within the SWIM environment using new exchange models, it was noted that tremendous potential existed to enhance the safety and the efficiency of the global ATM system through enhanced availability and use of meteorological information. With this in mind, the Committee endorsed a plan promoting the use of integrated meteorological information to enhance operational decision making, as proposed for inclusion in the ASBU framework to be included in the Global Air Navigation Plan. It was further agreed that the provision of OPMET and space weather information should be included in Block 0 and Block 1 respectively of the ASBU for meteorological information.

4.7.2 The dynamic integration of ATM and meteorological information was endorsed to enable real-time identification, increased predictability and deployment of operationally effective ATM solutions to accommodate changing conditions, as well as facilitate tactical avoidance of hazardous meteorological conditions. The increased use of airborne capabilities to detect and report meteorological parameters, and enhanced cockpit displays of meteorological information to enhance situational awareness, were additional elements of the strategy. The Committee agreed that the integration of ATM and meteorological information requirements was essential and that a roadmap should be developed by a cross-disciplinary group of experts to ensure the harmonized development of provisions for the future. The Committee noted the tentative scheduling of an ICAO Meteorology Divisional Meeting to be held in July 2014 and requested that such a meeting develop an appropriate long-term strategy for the development and full implementation of provisions relating to meteorological information in support of the global ATM system.

4.7.3 It was recognized that some support would be beneficial for States struggling to meet their obligations in the implementation of the ASBUs for meteorological information.

4.7.4 The Committee noted recent regional work to develop crisis management procedures that would support a coordinated response to crises adversely impacting aviation and urged other regions to develop and publish similar arrangements. It was noted that provisions for the development of contingency plans already existed in Annex 11 — *Air Traffic Services* and that such work should build upon foundations provided by the International Volcanic Ash Task Force (in respect of the volcanic ash regional contingency plan template for volcanic eruptions) as well as the procedures developed in the European Region.

4.8 On the basis of the discussions, the following recommendations were accepted by the Committee:

Recommendation 4/1 – Efficient management of airspace and improved flow performance through collaborative decision-making

That the Conference:

- a) endorse the aviation system block upgrade modules relating to network operations included in Block 1 and recommend that ICAO use them as the basis of its work programme on the subject;

- b) agree in principle with the aviation system block upgrade modules relating to network operations included in Blocks 2 and 3 as the strategic direction for this subject;

That ICAO:

- c) include, following further development and editorial review, the aviation system block upgrade modules relating to network operations in the draft Fourth Edition of the *Global Air Navigation Plan*;
- d) include in its work programme the future standardization of all elements to support the collaborative decision-making process underlying the air traffic control (ATC)-air traffic flow management (ATFM) integration as well as of the technical exchanges between ATFM and ATC;
- e) develop and incorporate into the ICAO *Manual on Collaborative Air Traffic Flow Management* (Doc 9971) implementation guidance on Airport-CDM and provisions on air traffic flow management data exchange format including trajectory information;
- f) develop and execute global communications, roll-out and training plan for the ICAO *Manual on Collaborative Air Traffic Flow Management* (Doc 9971); and
- g) develop further provisions and guidance on flexible use of airspace principles for future use and in preparation for future 4D trajectory-based airspace management.

That States:

- h) accelerate the implementation of collaborative decision-making processes in the provision of services at the regional level, being guided by the principles set forth in the *Manual on Collaborative Air Traffic Flow Management* (Doc 9971) and the *Manual on Flight and Flow – Information for a Collaborative Environment* (Doc 9965);
- i) according to their operational needs, implement the aviation system block upgrade modules relating to network operations included in Block 0;

Recommendation 4/2 – ICAO aviation system block upgrades relating to ground surveillance using automatic dependent surveillance – broadcast/multilateration, air traffic situational awareness, interval management and airborne separation.

That the Conference:

- a) endorse the aviation system block upgrade modules relating to interval management included in Block 1 and recommend that ICAO use them as the basis of its work programme on the subject;
- b) agree in principle to the aviation system block upgrade modules relating to airborne separation included in Block 2 as the strategic direction for this subject;

That ICAO:

- c) include, following further development and editorial review, the aviation system block upgrade modules relating to airborne separation in the Appendices to the draft Fourth Edition of the *Global Air Navigation Plan*;
- d) agree in principle to review the concepts and terminology of the “airborne separation” concepts involving controllers assigning tasks to flight crews, with controllers able to apply different, risk-based separation minima for properly equipped ADS-B IN aircraft;
- e) in the development of provisions, acknowledge the relationship between airborne separation and airborne collision avoidance system;
- f) modify aviation system block upgrade (ASBU) Module B2-85 to reflect d) and e), modify ASBU Module B2-101 to reflect f); and
- g) agree in principle to review the concepts and terminology supporting B2-25 “airborne separation” and amend the module accordingly.

That States:

- h) according to their operational needs, to implement the aviation system block upgrade modules relating to ground surveillance, improved air traffic situational awareness and improved access to optimum flight levels included in Block 0;

Recommendation 4/3 – ICAO aviation system block upgrades relating to airborne collision avoidance systems and ground-based safety nets

That the Conference:

- a) endorse the aviation system block upgrade module relating to ground-based safety nets included in Block 1 and recommend that ICAO use it as the basis of its work programme on the subject;
- b) agree in principle to the aviation system block upgrade module relating to airborne collision avoidance systems included in Block 2, as the basis of the strategic direction for this subject;

That ICAO:

- c) include, following further development and editorial review, the aviation system block upgrade modules relating to airborne collision avoidance systems and ground-based safety nets in the Appendices to the draft Fourth Edition of the *Global Air Navigation Plan*;
- d) adopt a coordinated approach towards reviewing and developing as necessary Standards and Recommended Practices, Procedures for Air Navigation Services and guidance material for ground-based and airborne safety nets, taking into account careful evaluation and validations of the:

- 1) effects on safety and performance of downlinking airborne collision avoidance system (ACAS) Resolution Advisories (RAs) to controllers; and
- 2) communication from ACAS to ground-based safety nets;
- e) when considering Standards and Recommended Practices for airborne collision avoidance system (ACAS) downlink, to emphasize the significant amount of training material already existing and the importance of increased pilot and air traffic controller training on the responsibilities and requirements to reacting correctly to ACAS RA events and then communicating;
- f) develop an ICAO Manual for Ground-based Safety Nets, which includes provision for tools for validation and certification of these;
- g) incorporate the new generation of airborne collision avoidance system (ACAS X) into its work programme;
- h) encourage the Federal Aviation Administration to work with other States with the capacity and capability to do so, in the development of new generation of airborne collision avoidance system (ACAS X);

That States:

- i) according to their operational needs, to implement the aviation system block upgrade modules relating to airborne collision avoidance systems and ground-based safety nets included in Block 0;

Recommendation 4/4 – Positioning and tracking over oceanic and remote areas, and flight data triggered transmission

That ICAO:

- a) continue the evaluation of the necessary changes in the field of transmission of flight data, bearing in mind the cost associated with any of these changes as well as the need to improve search and rescue operations; and
- b) develop suitable proposals for the amendment of ICAO documents, as necessary.

Recommendation 4/5 – Civil/military coordination/cooperation and sharing of airspace

That States:

- a) planning and implementation regional groups, and ICAO to analyse the benefits that could be achieved through improved civil/military cooperation and sharing of the airspace serving international traffic flows and express the results of this analysis in terms of:
 - 1) capacity increases and reduction in routine delays as measured by traffic volumes on major traffic flows;

- 2) document fuel savings and emission reductions through the use of the fuel savings estimation tools; and
- 3) other additional benefits;
- b) based on the analysis made by States, planning and implementation regional groups, and ICAO, urge States to develop plans to implement improvements for the cooperative use of airspace related to the top areas of opportunity and establish concrete targets using tools already available for this purpose;
- c) in relation to international traffic flows, for each ICAO region urge the planning and implementation regional groups and their associated States to identify the top areas of opportunity that could benefit the most from improvements in civil/military cooperation and sharing of the airspace and develop concrete targets for improvement;

That ICAO:

- d) develop a set of criteria or metrics to enable objective measurement of progress in civil/military cooperation; and
- e) continue to develop guidance material on the flexible use of their airspace, airspace design, interoperability and integration of humanitarian assistance flights in crisis response scenarios in their airspaces to facilitate integrated use of the airspace.

Recommendation 4/6 – ICAO aviation system block upgrades relating to integration of remotely piloted aircraft into non-segregated airspace

That the Conference:

- a) endorse the aviation system block upgrade module relating to remotely piloted aircraft included in Block 1 and recommend that ICAO use it as the basis of its work programme on the subject;
- b) agree in principle to the aviation system block upgrade modules relating to remotely piloted aircraft included in Blocks 2 and 3 as the strategic direction for this subject;

That ICAO:

- a) as a matter of urgency, develop the necessary regulatory framework in its entirety to support the integration of remotely piloted aircraft into non-segregated airspace and at aerodromes including and clearly showing the scope of such regulation;
- b) investigate the need for and scope of oversight of datalinks related to command, control and air traffic control communications for remotely piloted aircraft systems;
- c) include, following further development and editorial review, the aviation system block upgrade modules relating to the integration of remotely piloted aircraft into

non-segregated airspace in the Appendices to the draft Fourth Edition of the *Global Air Navigation Plan*;

That States:

- d) be cognizant of the recent amendments to Annexes 2 — *Rules of the Air* and 7 — *Aircraft Nationality and Registration Marks* related to remotely piloted aircraft systems and to support the continuation of this work at ICAO;
- e) work closely with ICAO and each other to ensure harmonization of provisions if they have an urgent need to accommodate remotely piloted aircraft system operations.

Recommendation 4/7 – ICAO aviation system block upgrades (ASBUs) relating to meteorological information

That the Conference:

- a) endorse the aviation system block upgrade module relating to meteorological information included in Block 1, including the addition of the provision of information on space weather, and recommend that ICAO uses it as the basis of its work programme on the subject;
- b) agree in principle the aviation system block upgrade module relating to meteorological information included in Block 3 as the strategic direction for this subject;

That ICAO:

- c) include, following further development and editorial review, the aviation system block upgrade modules relating to meteorological information in the draft Fourth edition of the *Global Air Navigation Plan*;
- d) undertake the development of the air traffic management-meteorological information integration plan and an associated roadmap by a cross-disciplinary group of experts;
- e) work on defining the meteorological information exchange model as an enabler for system-wide information management;
- f) invite the next Meteorology Divisional Meeting, held in coordination with the World Meteorological Organization, to develop initial provisions in Annex 3 — *Meteorological Service for International Air Navigation* relating to the aviation system block upgrade modules concerning meteorological information and f) above, and to develop a long-term strategy to support their further development and full implementation;

That States:

- g) according to their operational needs, to implement the aviation system block upgrade module relating to meteorological information included in Block 0, including the addition of the provision of OPMET information;

- h) work together in the implementation of the aviation system block upgrades relating to meteorological information and to increase investment in education and training.

Recommendation 4/8 – Crisis coordination arrangements and contingency plans

That ICAO:

- a) consider how crisis coordination arrangements for potentially disruptive events, similar to that used for volcanic eruptions, could be established on a regional basis; and
- b) and regional offices continue to support the development, promulgation, maintenance of contingency plans, including the holding of practical exercises, in preparedness for potentially disruptive events, including those events that may adversely impact aviation safety.
