AN-Conf/13-WP/311
17/10/18

THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

REPORT OF COMMITTEE A TO THE CONFERENCE ON AGENDA ITEM 2

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

Alexis Brathwaite
Committee Chairperson

Note.— After removal of this covering sheet, this paper should be inserted in the appropriate place in the Report Folder.[*]

[*] (13 pages)

Agenda Item 2: Enabling the global air navigation system
2.1: Aerodrome operations and capacity

2.1 The Committee reviewed AN-Conf/13-WP/14, presented by the Secretariat, which discussed challenges and initiatives related to aerodrome capacity and efficiency in light of the significant traffic growth forecast for the next fifteen years in both passenger volume and aircraft movements at aerodromes serving international operations. ICAO long-term traffic forecasts indicated that global passenger traffic would almost double by 2032, reaching more than 6 billion passengers annually with over 60 million flights. With increasing air traffic, airport congestion remained one of the biggest constraints to enhancing capacity of the civil aviation system. The working paper highlighted areas in which both States and ICAO should increase their efforts to enhance aerodrome capacity and efficiency, including aerodrome certification, airport planning, aerodrome design and operations, and new initiatives such as airport collaborative decision-making (A-CDM), total airport management (TAM), joint civil-military aerodromes and use of new technologies such as folding wing tip (FWT). Acknowledging the challenges faced by States in the area of aerodrome certification, the Committee agreed that further support to States by ICAO was needed. The Committee also agreed that ICAO should continue to work with States, industry and international organizations to further enhance aerodrome capacity and efficiency.

2.2 AN-Conf/13-WP/36, presented by Austria on behalf of the European Union and its Member States[1], the other Member States of the European Civil Aviation Conference (ECAC)[2] and the European Organisation for the Safety of Air Navigation (EUROCONTROL), focused on the concept of TAM which combined and interfaced A-CDM with landside processes for greater efficiency and capacity enhancement. The paper called on ICAO to enhance the aviation system block upgrade (ASBU) modules related to A-CDM and TAM, wake turbulence (WAKE) and network operations (NOPS), which would bring performance benefits to airports and global air traffic management (ATM) system operations, and to develop further provisions in this area. The Committee was informed that work was ongoing within ICAO on provisions related to enhanced wake turbulence separation minima, and the Committee noted the performance to be gained by operating the proposed seven groups of wake separation minima. The Committee supported the TAM concept and its potential benefits.

2.3 The Committee reviewed AN-Conf/13-WP/100, presented by the United Arab Emirates, which provided an overview of the implementation of reduced runway separation minima outside daylight hours. The Committee noted wide support for this paper and that this implementation could provide significant added capacity gains and recalled the importance of a robust safety case. The Committee was also informed that development of provisions relating to this subject was currently under consideration by the relevant ICAO technical expert group.

2.4 The Committee discussed AN-Conf/13-WP/145, presented by China, which highlighted measures taken in the State related to the optimization of planning, design, operations, and management of airport capacity enhancement in a challenging environment of saturated airports and continued traffic growth. The Committee appreciated and supported the initiatives outlined in the working paper and was

[1] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

[2] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Iceland, Republic of Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

informed that the development by ICAO of further provisions to enhance aerodrome capacity had already commenced.

2.5 The Committee discussed AN-Conf/13-WP/184, presented by Airports Council International (ACI), which dealt with aerodrome operations, capacity and efficiency and noted the full support expressed in the array of ICAO activities and strategic objectives in these areas, as outlined in the *Global Air Navigation Plan* (Doc 9750, GANP), as well as the safe use of drones for aerodrome operations such as the inspection of movement areas and wildlife management. The Committee noted that aerodrome operators of States were encouraged to approach ACI for assistance to address issues of concern.

2.6 AN-Conf/13-WP/293 outlined the ACI and International Air Transport Association (IATA) initiative of "New Experience Travel Technologies" (NEXTT) which had been introduced to ensure that the transport of passengers, baggage and cargo would benefit from the latest technological developments related to, among others, enhancing aerodrome capacity through better efficiency and predictability of operations. The Committee noted the work being undertaken by IATA and ACI in this respect and that the emphasis of NEXTT was on automating the exchange of data which partly stemmed from A-CDM.

2.7 Information papers provided by Austria on behalf of the European Union and its Member States[3], the other Member States of ECAC[4] and by EUROCONTROL (AN-Conf/13-WP/47 and AN-Conf/13-WP/48), China (AN-Conf/13-WP/199 and AN-Conf/13-WP/199), Japan (AN-Conf/13-WP/250), the Republic of Korea (AN-Conf/13-WP/241) and the United Arab Emirates (AN-Conf/13-WP/255) were noted.

2.8 As a result of the discussion, the Committee agreed on the following recommendations:

Recommendation 2.1/1 – Aerodrome capacity and efficiency enhancement

That States:

a) review, as needed, all options to increase aerodrome capacity, including increasing the efficiency of existing aerodrome infrastructure, reviewing the need for investment in new infrastructure and mitigating restrictions in surrounding airspace;

b) establish a plan for the certification of aerodromes under their jurisdiction, in accordance with their national regulations, incorporating the identification of gaps and implementation of solutions to overcome those gaps, including the assessment and development of mitigation measures in areas of non-compliance;

[3] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

[4] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Iceland, Republic of Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

That ICAO:

c) progress the work on the development of provisions related to aerodrome design and operations in support of aerodrome capacity and efficiency enhancement;

d) explore new areas for enhancing aerodrome capacity and efficiency, including total airport management (TAM), reduced separation standards, joint civil-military aerodromes and other new initiatives and technologies such as folding wing tip (FWT);

e) continue to provide assistance to States in the area of aerodrome certification; and

f) monitor developments such as New Experience Travel Technologies (NEXTT) and consider the formulation of provisions, where necessary, to support its implementation.

Recommendation 2.1/2 – Total airport management (TAM) and airport throughput

That States:

a) implement airport collaborative decision-making (A-CDM) and, when appropriate, extend A-CDM to incorporate total airport management (TAM);

That ICAO:

b) update provisions and guidance on A-CDM by extending it to TAM with greater integration with air traffic flow management (ATFM);

c) update provisions on wake turbulence and time-based separation; and

d) update provisions on reduced runway separation minima.

Agenda Item 2: Enabling the global air navigation system
2.2: Integrated CNS and spectrum strategy

Long-term evolution of CNS systems and frequency spectrum access

2.9 The Committee reviewed AN-Conf/13-WP/20, presented by the Secretariat, which noted that frequency spectrum was a limited resource and that various sectors of industry, including aviation, competed for access to this resource for the provision of their expanding services. Existing aeronautical communications, navigation and surveillance (CNS) systems were well established, proven and with an exceptionally long active lifespan in comparison with any other industry. While new and ever more frequency-efficient system designs were evolved in some sectors of industry, the lifecycle of existing aeronautical CNS systems went beyond fifty years. As the pressure on the spectrum resource increases, it had become evident that aviation needed to find ways to keep up with the advances of technology. The

Committee noted support in AN-Conf/13-WP/37, presented by Austria on behalf of the European Union and its Member States [5], the other Member States of ECAC [6] and EUROCONTROL, and AN-Conf/13-WP/113, presented by Canada, for the approach outlined in AN-Conf/13-WP/20.

2.10 The Committee further discussed AN-Conf/13-WP/37, which advocated a shift from the traditional technology-based, segregated CNS infrastructure to a cross-domain, integrated CNS architecture and performance-based framework, which would combine physical infrastructure and the delivery of CNS through services to enable key operational concepts such as trajectory-based operations (TBO) while maintaining and enhancing safety and security. The CNS enabling services and infrastructure evolution would need to strengthen civil-military cooperation and interoperability and the integration of new entrants such as unmanned aircraft systems (UAS) and sub-orbital operations and would enable full cross-fertilization and synergies. The Committee noted that this should be through an efficient and effective ICAO-facilitated global collaboration with States and regional modernization programmes from research and development to deployment of interoperable systems. The realization of this new path would benefit all aviation stakeholders, while delivering performance-based and cost-efficient infrastructure services to support the expected traffic growth. Furthermore, it would allow for the development of a pro-active global aviation radio spectrum strategy for ensuring a safe and efficient use and long-term availability of adequate radio spectrum to embrace new opportunities in line with the Global Air Navigation Plan (GANP) and aviation system block upgrade (ASBU) evolution.

2.11 The Committee supported AN-Conf/13-WP/113, presented by Canada, which highlighted the concerns of the aviation industry regarding the ever-increasing pressures from non-aeronautical frequency spectrum users seeking to share aeronautical frequency bands and called for the active engagement of States in the spectrum regulatory process to ensure the protection of the safety-critical operation of CNS systems. The working paper also advocated that safety case assessments of the radio frequency environment be taken into account as part of a safety oversight programme by the designated competent authorities to protect the operational availability of CNS systems, which was also agreed by the Committee.

2.12 Information papers provided by China (AN-Conf/13-WP/198 and AN-Conf/13-WP/244) and Japan (AN-Conf/13-WP/247 and AN-Conf/13-WP/251) were noted.

2.13 As a result of the discussion, the Committee agreed on the following recommendation:

[5] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

[6] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Iceland, Republic of Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

Recommendation 2.2/1 – Long-term evolution of communication, navigation and surveillance systems and frequency spectrum access

That States:

a) engage in the spectrum regulatory process to ensure the continued necessary access to and protection of safety-critical aeronautical communications, navigation, and surveillance (CNS) systems;

b) ensure through the implementation of a safety oversight programme that the designated competent authorities are involved in safety case assessments of the radio frequency environment so as to adequately protect the operational availability of aeronautical CNS systems;

That ICAO:

c) launch a study, built on a multi-disciplinary view of the C, N and S elements and frequency spectrum, to evolve the required CNS and frequency spectrum access strategy and systems roadmap in the short, medium and long term, in a performance-based and service-oriented manner, to ensure that CNS systems remain efficient users of the spectrum resource; and

d) develop provisions, in collaboration with States and regional modernization programmes, to support increased civil-military interoperability and synergies with the optimum reutilization opportunities from State and military aviation technologies and to take advantage of opportunities arising from new entrants, such as unmanned aircraft systems (UAS) and suborbital vehicles.

GNSS evolution

2.14 The Committee reviewed AN-Conf/13-WP/15, presented by the Secretariat, which discussed the evolution of the global navigation satellite system (GNSS) towards the introduction of dual-frequency, multi-constellation (DFMC) services. The working paper outlined the standardization process currently underway, the expected benefits, the long-term goal of seamless global acceptance of DFMC GNSS, and the challenges in achieving the goal, and presented a way forward for States and ICAO to meet those challenges.

2.15 The Committee then reviewed several papers that supported and complemented AN-Conf/13-WP/15, which included: AN-Conf/13-WP/150 and AN-Conf/13-WP/153, presented by the Russian Federation; AN-Conf/13-WP/190, presented by Uganda on behalf of the East African Community; AN-Conf/13-WP/283, presented by the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA)[7]; AN-Conf/13-WP/111, presented by the Interstate Aviation Committee (IAC) and AN-Conf/13-WP/167, presented by IATA and the International Coordinating Council of Aerospace Industries Associations (ICCAIA).

[7] Member States: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Equatorial Guinea, France, Gabon, Guinea-Bissau, Madagascar, Mali, Mauritania, Niger, Senegal, Togo.

2.16 AN-Conf/13-WP/111 provided information on the current status of the ground-based augmentation system (GBAS) of the Global Navigation Satellite System (GLONASS) satellite constellation in the Member States of the IAC and outlined proposals to amend ICAO provisions with regard to the use of GBAS in support of performance-based navigation (PBN) and the integration of GNSS signal monitoring systems in States with neighbouring airspace. The Committee noted the information provided, was apprised of the considerable administrative workload that the inclusion of GBAS approaches into the *Performance-based Navigation (PBN) Manual* (Doc 9613) would entail for unclear added value, and agreed that the paper be referred to the relevant ICAO technical expert groups for consideration.

2.17 AN-Conf/13-WP/150 proposed that a space-to-Earth return link in the 1559-1610 MHz band be incorporated into the ICAO concept of operations (CONOPS) for the Global Aeronautical Distress and Safety System (GADSS) and that provisions enabling use of such a link be included in the International Telecommunication Union (ITU) Radio Regulation*s.* With regard to the first proposal, the Committee was informed that it would be in conflict with consensus achieved in the development of the related Annex provisions and with the non-technology-specific approach of the CONOPS itself. With regard to the second proposal, the Committee was informed that it had been already considered by the relevant ICAO technical expert group, which had concluded that aviation should not be an active proponent of such an action. In light of the information received, the Committee agreed that no further action was necessary.

2.18 AN-Conf/13-WP/153 discussed the current status of the GLONASS constellation in the Russian Federation and its future development and use in the evolution towards multi-frequency, multi-constellation GNSS to ensure flight safety and efficiency in international civil aviation, highlighting the positive experience of Russian operators with combined GLONASS/GPS receivers. The working paper requested ICAO to continue its work in addressing international regulatory issues and stressed the need to avoid prohibitions or exclusions of the use of any given GNSS element or constellations, both at the State and at the industry standardization level.

2.19 AN-Conf/13-WP/167 presented in greater depth the challenges associated with the introduction of DFMC GNSS as outlined in AN-Conf/13-WP/15, with particular regard to the undesirable consequences arising from mandates for equipage or use of specific GNSS elements, signals, and/or services, as well as from any State precluding the use of specific GNSS elements within its airspace. The Committee recognized the validity of the concerns expressed in the paper and the need to resolve them in order to achieve the long-term goal defined in AN-Conf/13-WP/15. The Committee also recognized the critical importance of industry support in enabling a practical way forward for the implementation of DFMC GNSS.

2.20 AN-Conf/13-WP/190 presented an overview of the GNSS monitoring system programme planned for the Eastern African Region and called for joint funds mobilization to support the programme. The Committee noted with appreciation that the plan was consistent with the relevant ICAO Recommended Practice and related guidance. Regarding joint funds mobilization, the Committee agreed that the request be brought to the attention of the ICAO Council.

2.21 AN-Conf/13-WP/283 provided information on the implementation status of the ASECNA satellite-based augmentation system (SBAS) programme and supported the implementation of solutions to ensure that avionics used only the DFMC SBAS elements accepted by States for navigation purposes. The Committee noted with appreciation the ASECNA SBAS programme as a significant contribution to the growing global SBAS infrastructure. With regard to further work on avionics selection

of specific DFMC SBAS advocated by the paper, the Committee agreed that the matter should be referred to the relevant ICAO technical expert groups for consideration.

2.22 In its consideration of GNSS evolution matters, the Committee extensively discussed the issue of mandates for equipage or use of specific GNSS elements and the issue of prohibition of use of specific GNSS elements. In this respect, it was noted that the lack of global uniformity in the acceptance of GNSS would increase equipment complexity and associated costs and would delay achievement of the potential benefits.

2.23 The Committee recognized that DFMC GNSS could provide operational benefits by improving performance and robustness for all CNS applications based on GNSS. The benefits would be gained progressively as aircraft became equipped with DFMC avionics. In particular, the Committee stressed that the long-term goal to be achieved was seamless global acceptance of ICAO-standardized GNSS elements for lateral navigation.

2.24 It was recognized that there were technical and regulatory challenges to be overcome, as evidenced by the discussion. As a way forward towards overcoming those challenges, the Committee identified a number of actions to be taken as part of a collective effort involving States, ICAO and GNSS service providers towards achieving the agreed long-term goal (Recommendation 2.2/2 refers).

2.25 Information papers provided by China (AN-Conf/13-WP/200 and AN-Conf/13-201), Japan (AN-Conf/13-WP/246 and AN-Conf/13-WP/249), the Republic of Korea (AN-Conf/13-WP/240) and South Africa (AN-Conf/13-WP/290) were noted.

2.26 As a result of the discussion, the Committee agreed on the following recommendation:

Recommendation 2.2/2 — Global navigation satellite system (GNSS) evolution

That States:

a) when defining their air navigation strategic plans, take advantage of the improved robustness and performance offered by dual-frequency, multi constellation (DFMC) global navigation satellite system (GNSS) to deliver incremental operational benefits and encourage related industry developments;

b) avoid, in principle, prohibiting the use of available GNSS elements if they perform according to ICAO Standards and Recommended Practices (SARPs) and can meet all safety and regulatory requirements for the intended operations;

c) avoid mandating equipage or use of any particular GNSS core constellation or augmentation system unless clear operational benefits are offered in return and appropriate consultations have been made with the relevant airspace users;

d) ensure implementation of ICAO provisions for publication of information related to the use of GNSS elements in aeronautical information publications (AIP);

e) take timely action to meet the long-term goal whereby every State accepts for lateral navigation use all GNSS elements that are compliant with SARPs, thus creating a positive environment for DFMC GNSS.

That ICAO:

f) continue the development of SARPs and guidance material for existing and future GNSS elements in coordination with recognized standards-making organizations;

g) further develop provisions intended for States and organizations that provide GNSS services regarding publication of service performance standards, regular performance assessment and timely notification of events that may affect the service; and

h) develop additional guidance addressing technical and regulatory aspects to assist States in their acceptance and use of existing and future GNSS elements.

Agenda Item 2: Enabling the global air navigation system
2.3: Future provision of aeronautical meteorological service

2.27 The Committee reviewed AN-Conf/13-WP/3, presented by the Secretariat, which provided an overview of the development of the global requirements for aeronautical meteorology, in progress since the Meteorology (MET) Divisional Meeting (2014), and highlighted those aspects that needed specific emphasis and resources to maximize the benefits for the aviation community as a whole. The Committee noted new aeronautical meteorology initiatives, including, inter alia: space weather information; the provision of information relating to en-route hazardous meteorological conditions, with a focus on meteorological phenomena rather than the current practice of information constrained to individual flight information regions (FIR); development of a cost-recovery mechanism, taking into account the complexity of the provision of services by global and regional systems; and the impact of climate change on aviation.

2.28 The Committee supported the need, highlighted in AN-Conf/13-WP/57, presented by the United States, for the provision of globally harmonized, phenomena-based, hazardous weather information since users had expressed a clear need for information about hazardous meteorological conditions unconstrained by FIR boundaries to improve the safety and efficiency of international air navigation. The Committee recognized that aeronautical meteorology was an important enabler of international air navigation in the *Global Air Navigation Plan* (GANP, Doc 9750). The Committee agreed that ICAO should continue to develop provisions related to aeronautical meteorology as described in the GANP and place emphasis on assisting States in the implementation of new initiatives. The Committee supported AN-Conf/13-WP/183, presented by New Zealand, which highlighted that aeronautical meteorology was critical to the safe and sustainable operation of the global aviation system and that in terms of cost and investment, it brought a net benefit to aviation. The Committee agreed that aeronautical meteorology was undergoing a revolutionary change in the nature of the information it provided, how it was provided and the atmospheric environment with which it was concerned. These changes would have a direct global impact on the provision of seamless aeronautical meteorological information. It was also recognized that to properly develop and implement existing and new global aeronautical meteorology capabilities, ICAO, States and users needed to ensure the sufficient provision of expert capacity to underpin the global development already underway and future developments currently envisaged.

2.29 Following discussion of AN-Conf/13-WP/230 presented by Singapore, which provided an overview of the roles and challenges faced by local and sub-regional meteorological services in the tropics in the provision of meteorological services to air traffic management (ATM) in the context of increased tropical convections and their potential future impact due to climate change, the Committee

agreed to give due consideration to the foreseen aviation impact when refining the relevant operational and meteorology components of the aviation system block upgrades (ASBU) in the GANP.

2.30 The proposal in AN-Conf/13-WP/60, presented by the United States, to address transition from the exchange of aeronautical meteorological information in traditional alpha-numeric code (TAC) format to the ICAO Information Meteorological Exchange Model (IWXXM) format consistent with Amendment 78 to Annex 3 — *Meteorological Service for International Air Navigation*, was supported by the Committee. AN-Conf/13-WP/287, presented by the International Federation of Airline Dispatchers Associations (IFALDA), highlighted the issue of the rapid deployment of said transition and the need for airline dispatch offices worldwide to fully understand the impending changes and the adaptation process required. The working paper also raised issues related to the lack of implementation in some States and their associated MET offices which could add complexity by the continued use of domestic TAC products on the one hand and the use of IWXXM for international flights on the other. In addition, the paper raised a number of implementation concerns that were being addressed by relevant ICAO technical expert groups. The Committee agreed that to ensure the harmonization of aeronautical meteorological information and its accessibility via system-wide information management (SWIM)-enabled systems by aviation users, ICAO should encourage States to transition to the exchange of aeronautical meteorological information only in the IWXXM format by 2026, enabling further integration into SWIM.

2.31 AN-Conf/13-WP/101, presented by Japan, co-sponsored by Australia, Canada and France, discussed global needs for the promotion of further utilization of space weather information service (Amendment 78 to Annex 3), taking into account operational needs by aeronautical users. The working paper, which was supported by the Committee, stressed that close coordination between space weather information service providers and aeronautical users was essential for the establishment of operationally useful space weather information service. The working paper also raised the need for further training and education on the impacts of space weather on international air navigation, which was supported by the Committee.

2.32 AN-Conf/13-WP/128, presented by the United States, requested support for the provision of updated guidelines and guidance on cost recovery for aeronautical meteorological service and that relevant expert group(s) taking on this work should be provided with the necessary assistance in the areas of airport and air navigation services economics. The Committee agreed that the provision of aeronautical meteorological information for civil aviation was expected to undergo a critically fundamental transformation over the next decade and that it was important that any change in how the associated costs were recovered remain consistent with the ICAO policy on cost recovery.

2.33 AN-Conf/13-WP/275, presented by Indonesia, provided the procedures and contingency action on the facilitation of air traffic services (ATS) routes in a volcanic ash situation for the relevant service providers and airspace users in Indonesia, and the system used there to facilitate the various parties in managing the volcanic ash impact on aviation, namely the Integrated Web-based Information System Handling (IWISH). The Committee noted the information provided in the working paper by Indonesia and supported the collaborative decision-making (CDM) mechanism and the information system in the framework of volcanic ash developed to ensure the safety of flight operations.

2.34 Information papers provided by China (AN-Conf/13-WP/196), Japan (AN-Conf/13-WP/248 and AN-Conf/13-WP/253), the Russian Federation (AN-Conf/13-WP/163), Saudi Arabia (AN-Conf/13-WP/269) and the World Meteorological Organization (WMO) (AN-Conf/13-WP/180) were noted.

2.35 As a result of the discussion, the Committee agreed on the following recommendations:

Recommendation 2.3/1: Future provision of aeronautical meteorological service

That States:

a) and international user organizations ensure that adequate expert capacity is applied in the collaborative management and development of aeronautical meteorological services for international air navigation;

That ICAO:

b) ensure it has sufficient capacity and expertise to progress the work on the development of provisions related to aeronautical meteorology, including the foreseen impact on international air navigation due to climate change, to be described in the Sixth Edition of the *Global Air Navigation Plan* (Doc 9750, GANP); and

c) develop implementation assistance, including guidance material, for space weather information service, the provision of globally-consistent, phenomena-based hazardous meteorological information, the meteorological component of system-wide information management (SWIM), cost-recovery solutions for regional and global systems, and potential new initiatives to address issues such as the impact of climate change on aviation, including provision of meteorological services to the air traffic management (ATM) community in the context of increased tropical convective systems.

Recommendation 2.3/2 — Further Development of IWXXM for the Exchange of Aeronautical Meteorological Information

That States:

a) provide ICAO with their ICAO Meteorological Information Exchange Model (IWXXM) implementation plans before 2020;

That ICAO:

b) promote the importance of exchanging meteorological information for aeronautical purposes in compliance with the IWXXM;

c) in close coordination with the World Meteorological Organization (WMO),

1) ensure that the IWXXM format is the only standard exchange format by 2026;

2) develop the policies and procedures necessary to ensure a smooth transition from traditional alpha numeric code (TAC) format to IWXXM format for the purpose of data exchange to support international air navigation, as an interim step toward full IWXXM implementation;

3) promote awareness of the changes brought about by the IWXXM data format, production, dissemination and data exchange among operators; and

4) monitor the status of implementation of IWXXM at State and regional levels.

Recommendation 2.3/3 — Provision of space weather information service meeting the operational needs of users

That States:

a) encourage the research of operational impacts of space weather phenomena on civil aviation using performance-based approaches and establish requirements for the use of space weather information for civil aviation;

That ICAO:

b) continue to facilitate coordination between the space weather information service providers and aeronautical users to clarify the needs and solutions for improved safety and efficiency of civil aviation through the provision of space weather information and training on the use of the information; and

c) coordinate with other international organizations, such as the International Telecommunication Union - Radio communication Sector (ITU-R) and the World Meteorological Organization (WMO), to facilitate research of operational impacts of space weather phenomena on civil aviation using performance-based approaches and develop requirements and/or guidance for the use of space weather information for civil aviation.

Recommendation 2.3/4 – Development of cost-recovery mechanisms for the provision of aeronautical meteorological information

That ICAO:

a) support the need to expeditiously identify how aeronautical meteorological service provision has changed, how it will continue to evolve, and how these changes (including those arising from the impact of climate change on aviation) may affect the recovery of relevant costs associated with service provision on a global, multi-regional, regional, and sub-regional basis; and

b) in close coordination with the World Meteorological Organization (WMO),

   1) review deficiencies in the current cost-recovery systems;

   2) identify new cost-recovery challenges that have arisen (taking into consideration the issues described in a) above); and

   3) identify possible mechanisms to recover these costs in a manner consistent with *ICAO's Policies on Charges for Airports and Air Navigation Services* (Doc 9082).

— — — — — — — —