FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, 26 August to 6 September 2024

**REPORT OF THE COMMITTEE
ON AGENDA ITEM 4**

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

Mr. Padhraic Kelleher
Committee Chairperson

Note.— After removal of this covering sheet, this paper should be inserted in the appropriate place in the Report Folder[1]

---

[1] (5 pages)

Agenda Item 4:   Hyper-connectivity of air navigation system
**   4.1:   Connected aircraft concept and associated challenges**

4.1   The Conference reviewed AN-Conf/14-WP/13, presented by the Secretariat, which outlined a draft connected aircraft concept describing a framework for the use of performance-based communication links to accommodate the expected growth in demand for the extensive information exchange between the aircraft and other aviation stakeholders on the ground. The paper also highlighted the value of technical and operational validation to mature the draft concept and to identify the areas requiring further investigation to determine the need and appropriate level of standardization through ICAO provisions.

4.2   The proposed actions in AN-Conf/14-WP/13 were supported and reinforced by AN-Conf/14-WP/34 presented by Iran (Islamic Republic of); AN-Conf/14-WP/21 presented by the International Coordinating Council of Aerospace Industries Associations (ICCAIA) and Civil Air Navigation Services Organisation (CANSO) and co-sponsored by International Business Aviation Council (IBAC); AN-Conf/14-WP/20 presented by ICCAIA and CANSO, and co-sponsored by IBAC; and AN-Conf/14-WP/62, presented by Hungary on behalf of the European Union and its Member States[2], the other Member States of the European Civil Aviation Conference (ECAC)[3], the European Organisation for the Safety of Air Navigation (EUROCONTROL) and the United States and co-sponsored by the United Arab Emirates, Egypt and Libya.

4.3   The Conference further discussed a concept called "hyper-connected air traffic management (ATM)" presented in AN-Conf/14-WP/20 concerning the use of non-safety critical "off-the-shelf" air-ground communication links as an additional means to support safety-critical communications, and proposed solutions for air-ground communication infrastructure and operations, supporting air traffic services (ATS), aeronautical information service (AIS) and aeronautical operational control (AOC) presented in AN-Conf/14-WP/62.

4.4   Acknowledging the increasing demand for air-ground connectivity, the Conference recognized the urgent need for secure, scalable, cost-efficient and spectrum-efficient air-ground data links that offered a significant increase in capacity and other technical performance. The Conference also recognized the value of a carefully considered and integrated global concept on the use of additional performance-based communication links to support both safety and non-safety critical communications. The Conference underscored the importance of collaboration amongst all stakeholders throughout the process of the development, validation, and standardization of the concept, as well as certification and implementation. While noting the ongoing and planned work of ICAO, the Conference agreed on the need for further work to expand on the connected aircraft concept to incorporate related concepts.

4.5   The Conference discussed and agreed on the areas requiring further analysis as listed in AN-Conf/14-WP/13, AN-Conf/14-WP/34, AN-Conf/14-WP/21, AN-Conf/14-WP/20 and AN-Conf/14-WP/62, including cybersecurity-related matters and aeronautical frequency spectrum usage. Regarding cybersecurity, the Conference highlighted the need for further assessment of associated risks and mitigation measures in the context of the hyper-connected ATM solution. Noting the need to ensure globally continued and sustainable future use of protected aeronautical spectrum, the Conference called for a careful and holistic consideration before selecting any specific technical solution. The Conference emphasized that commercial off-the-shelf non-safety aircraft connectivity solutions, as a means to supplement aviation safety communication services, should be considered

---

[2] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.
[3] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Iceland, Republic of Moldova, Monaco, Montenegro, North Macedonia, Norway, San Marino, Serbia, Switzerland, Türkiye, Ukraine, and the United Kingdom.

only after the completion of sufficient research, as well as risk and impact assessments. The need to avoid any unintended consequences to the aviation access to, and use of, frequency spectrum critical for safe aircraft operations was also strongly emphasized. The Conference, therefore, underscored the importance of close coordination with ITU as well as the need for support from appropriate expert group(s) to conduct a comprehensive analysis on aeronautical frequency spectrum usage and the potential use of commercial services in frequency bands allocated for non-safety. The Conference also agreed on the need for further evaluation and validation of the concept and for a comprehensive gap analysis to identify areas requiring ICAO provisions and guidance to support the safe, globally harmonized and interoperable implementation of the connected aircraft concept.

4.6   Concerning AN-Conf/14-WP/62, the Conference noted that several of the proposed actions would be contingent on the future work concerning the connected aircraft concept, which would integrate the hyper-connected ATM, while the rest were already on the work programme of ICAO. Consequently, the Conference agreed that the content of the paper relevant to the ongoing work of ICAO be referred to appropriate expert group(s) for consideration in progressing their respective work programmes.

4.7   Information papers provided by Brazil, supported by the United States (AN-Conf/14-WP/135); China (AN-Conf/14-WP/176); and by the United States (AN-Conf/14-WP/103 and AN-Conf/14-WP/199) were noted.

4.8   As a result of the discussion, the Conference agreed on the following recommendation(s):

Recommendation 4.1/1 –Validation, standardization and implementation of the connected aircraft concept and air-ground connectivity strategy

That States:

a)   together with industry stakeholders, evaluate the technical and operational aspects to further mature and validate the draft connected aircraft concept, including further assessing the hyper-connected air traffic management solution, and provide ICAO with the results; and

that ICAO:

b)   further examine:

1)   the need for and implications of leveraging commercial off-the-shelf non-safety aircraft connectivity solutions as a means to supplement current and future air-ground safety critical communications for air traffic management;

2)   a strategy of future aeronautical frequency spectrum usage and the possible use of commercial services in frequency bands allocated for non-safety, in close coordination with the International Telecommunication Union, including safety assessments conducted by appropriate expert group(s), in a manner which avoids unintended consequences;

3)   cybersecurity risks and mitigation measures in the context of the hyper-connected ATM solution.

c)   further examine other components of the connected aircraft concept, including but not limited to;

1)   interoperability and communication continuity across flight information regions;

2)   minimum airborne and ground infrastructures to operate in a multilink environment while maintaining interoperability;

3)   end-to-end performance requirements for new functions supporting air traffic services, aeronautical information service and aeronautical operational control;

4)   evolution of electronic flight bag capabilities and its impact on aircraft avionics certification and operational authorization;

5)   role of the humans in the connected aircraft concept;

6)   exchange, use and integration of additional information obtained from aircraft;

d)   update the draft connected aircraft concept, the long-term future connectivity strategy and relevant threads of the Aviation System Block Upgrade framework in the Global Air Navigation Plan to guide the development of ICAO provisions and guidance material, as necessary, taking into account input from the Conference and the results of the States' evaluation;

e)   conduct a comprehensive gap analysis to identify areas requiring ICAO provisions and guidance to support the safe, globally harmonized and interoperable implementation of the connected aircraft concept, taking into account input from the Conference; and

f)   update relevant ICAO provisions and guidance material based on the updated draft connected aircraft concept and the comprehensive gap analysis above, as necessary.

Agenda Item   4:   Hyper-connectivity of air navigation system
**   4.2:   Cybersecurity and information system resilience**

Cybersecurity Policy

4.9   The Conference reviewed AN-Conf/14-WP/14, presented by the Secretariat, which detailed core elements of an aviation cybersecurity framework for consideration by States and stakeholders, and called for a cross-cutting and harmonized approach at the global, regional and national levels, as well as alignment with global and regional plans.

4.10   AN-Conf/14-WP/100, presented by the United States, emphasized that cybersecurity guidance material should be developed and maintained in an agile manner to keep pace with the development of the cyber threat landscape of civil aviation.

4.11   The Conference acknowledged the importance of addressing cybersecurity in civil aviation, and the need for aviation cybersecurity guidance material that is cross-cutting, holistic and consistent across civil aviation disciplines, in coordination with other UN bodies. The Conference also supported investigating methods

for accelerating guidance material development, review and distribution to stakeholders, while ensuring that the quality of deliverables was maintained. The Conference further underscored the need for coordination and alignment with global and regional plans through existing ICAO regional and expert groups, to ensure a harmonized approach to cybersecurity that supports States and stakeholders in addressing and sharing information on cyber threats and risks to civil aviation critical infrastructure.

4.12   The Conference supported the draft Recommendations set out in AN-Conf/14-WP/14 and AN-Conf/14-WP/100 and agreed to refer the actions to the appropriate expert group(s) for consideration.

4.13   The Conference discussed AN-Conf/14-WP/136 Revision No.1, presented by Brazil, supported by 20 Members States[4] of Latin American Civil Aviation Commission (LACAC), which detailed Brazil's experience in implementing cyber information sharing through the Malware Information Sharing Platform (MISP), and highlighted the platform's benefits. The Conference was informed that ICAO had published guidance material on cyber information sharing which includes a discussion of MISP. The Conference concluded that a new expert group on this matter would not be required and agreed to refer the paper to the appropriate expert group(s).

4.14   AN-Conf/14-WP/142 presented by Colombia, requested the formation of a coordination group for cybersecurity. The Conference was informed that the creation of a cybersecurity "Point of Contact Network" to accomplish this aim is included in the ICAO cybersecurity work programme. The Conference noted that ICAO already had expert groups in place to support and coordinate the topic, and agreed to refer the paper to the appropriate expert group(s) for consideration.

4.15   The Conference discussed AN-Conf/14-WP/143, presented by Colombia, which proposed the development of guidelines for cybersecurity incident response teams (CSIRTs). In discussing the paper, the Conference was informed that the establishment and operation of a CSIRT were not within ICAO's mandate. While the Conference expressed support for the paper in general, it noted that the determination of critical infrastructure should be considered at the national level by States and other relevant stakeholders, and that the paper should be referred to the appropriate expert group(s) for consideration.

Air navigation services cybersecurity

4.16   The Conference reviewed AN-Conf/14-WP/113, presented by Chile and co-sponsored by 20 LACAC Member States[5] which invited air navigation services providers (ANSPs) to consider the broad management of cyber-related risks in an integrated manner, and to continuously improve such processes. The Conference supported the concept of integrated management of cyber-related risks and agreed to refer the paper to the appropriate expert group(s).

4.17   AN-Conf/14-WP/124, presented by Argentina and co-sponsored by 19 LACAC Member States[6] promoted the value of a harmonized regulatory framework in ATS for addressing cyber risks. The Conference, noting that the promotion of cybersecurity culture was included in the current ICAO work programme, agreed to refer the paper to the appropriate expert group(s).

---

[4] Argentina, Aruba, Belize, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela (Bolivarian Republic of).

[5] Argentina, Aruba, Belize, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela (Bolivarian Republic of).

[6] Aruba, Belize, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela (Bolivarian Republic of).

4.18   AN-Conf/14-WP/125, presented by Argentina and supported by 19 LACAC Member States[7], highlighted the need for including cyber considerations in the management systems of ANSPs and for the development of technologies, procedures and arrangements for the safe provision of ATS and recovery from cyber incidents. The Conference noted that the development and implementation of specific technologies was not within ICAO's remit. However, it agreed on the need for measures, including appropriate competencies and skills, to be in place for recovery from cyber incidents, recognizing that cyber incidents had the potential to impact other areas beyond air traffic control. The Conference further agreed to refer the paper to the appropriate expert group(s).

4.19   Information papers provided by Argentina and supported by 21 LACAC Member States[8] (AN-Conf/14-WP/126); the United Arab Emirates (AN-Conf/14-WP/44); the United States (AN-Conf/14-WP/202); and International Federation of Air Traffic Safety Electronics Association (IFATSEA) (AN-Conf/14-WP/173) were noted.

4.20   As a result of the discussion, the Conference agreed on the following recommendation(s):

Recommendation 4.2/1 – Aviation cybersecurity

That States:

a) develop and implement a national plan to address cyber threats and risks to civil aviation in a holistic manner across all aviation domains, and in coordination with relevant non-aviation stakeholders using the core elements as a reference;

b) align aviation cybersecurity activities in the regional air navigation, safety, and security and facilitation plans through the coordination processes of the planning and implementation regional groups, regional aviation safety groups and regional aviation security and facilitation groups; and

c) report to ICAO their experience in implementing ICAO provisions and guidance material related to aviation cybersecurity, through the appropriate expert group(s) or through the processes of the planning and implementation regional groups, regional aviation safety groups and regional aviation security and facilitation groups;

that ICAO:

d) provide guidance on the core elements to support States and stakeholders in addressing aviation cybersecurity, and integrate all aviation cybersecurity activities holistically in a consistent and coordinated manner; and

e) deliver timely, relevant and actionable cybersecurity guidance material to meet the needs of Member States and other aviation stakeholders.

— END —

---

[7] Aruba, Belize, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela (Bolivarian Republic of).
[8] Aruba, Belize, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela (Bolivarian Republic of).